Awareness, Knowledge and Acceptance of the Artificial Pancreas by Patients

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ABSTRACT,
Introduction: Innovation acceptance of medical devices is a very difficult process, since a lot of medical innovations seem very promising but are never accepted by the patient. It is important to research the attitudes of patients which are formed by Awareness and Knowledge. This research focuses on the influence awareness and knowledge have on intention to use.
Theory: Most literature linked to awareness and knowledge describes these as one or two phases where the customer moves through in order to go towards the purchase decision of an innovation.
Study Design: A survey was completed by 398 type 1 diabetes patients from the Netherlands and the results analyzed by using SPSS.
Results: The results show causal relation between awareness and intention to use and knowledge and intention to use, where knowledge has a stronger relation to intention to use then awareness.
Conclusion: Knowledge has a greater effect on intention to use than awareness. It is therefore important to assist patients in gathering knowledge about the innovation instead of only gathering new leads. A firm can help a customer by answering their enquiries.

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1. INTRODUCTION

In order to change the future of healthcare, and to be able to positively influence the life of diabetes patients, health care needs people to understand innovation, but also the way it spreads and diversifies across institutions.(Berwick, 2003) It is very important to study which factors lead to a successful adoption of a medical innovation, since some scientifically less solidly supported innovations are widely adopted whereas the innovations that appear to be stronger due to their scientific support fail to be conceived as a standard practice. (Denis, Hébert, Langley, Lozeau, & Trottier, 2002) In light of this statement, analyzing determining factors of technology adoption in more detail for their relevance in medical innovation acceptance would be very beneficial. Scientific research has focused mostly on explaining technology adoption by explaining all the relevant determinants, in order to bring new insights into the field of technology acceptance. However, seen the time frame and to propose a new field of study, an in depth study of one of those determinants would help reveal more specific knowledge on how this factor influences the adoption process. Awareness and knowledge are at the starting point of the acceptance framework and therefore very interesting to study at this point in time. Research has focused mostly on the attitude a person has towards an innovation which comes in the stage after knowledge gathering. The link between awareness, knowledge and acceptance is not extensively studied in the field of medical innovations and would therefore be a very interesting topic.

The uniqueness of the Artificial Pancreasa new method to treat diabetes, is that it delivers two hormones. Not only the insulin but also glucagon, which helps when blood sugars are very low. (Inreda, 2014) Currently a patient has to eat sugars when their blood glucose levels are low, but this is of course not always possible or very practical. Next to delivering two hormones to the diabetes patient, the Artificial Pancreas also serves as a combination of a CGM device with a pump system. This means that a diabetes patient needs only one device to monitor and inject hormones. The continuous monitoring of a patients' blood is necessary to maintain a stable blood glucose level and to quickly deliver insulin or glucagon to the patient when needed. Compared to blood pricks this is a lot more effective. The idea is that the Artificial Pancreas increases the Quality of Life of patients. The care for patients will be brought to their homes and they will less frequently visit physicians or the hospital to manage their disease. They don't have to inject themselves anymore and especially not monitor their blood levels constantly, which is a continuous process throughout the day. Having a hypo or hyperglycemia makes a patient very sick, so if these can be avoided the productivity of the patients will increase. They do not have to stop during their tasks because they do not feel so well due to their sugar.

The Artificial Pancreas is expected to be ready for the market, and thus to be brought to patients, by the end of 2015. (Inreda, 2014) For Inreda it is difficult to formulate their marketing strategy, since there are a lot of participants in diabetes care, which results in different decision makers about influencing the implementation of the device. To understand how this Artificial Pancreas can be introduced we first need to understand how the Artificial Pancreas is currently viewed by market participants. Awareness plays a large role in this field, since it is important that the stakeholders know about the Artificial Pancreas and the producer of it, Inreda. Awareness is often the first step to acceptance of a new (medical) innovation(Agarwal & Prasad, 1998; M. Fleuren, Wiefferink, & Paulussen, 2004; Rogers, 2010). The next step is often interest in a new (medical) device or innovation. An individual that is aware of an innovation does not necessarily have to be interested in this innovation or device. When a potential adopter reaches the stage of interest the potential purchase and adoption of an innovation or device will thus increase. (Brennan, Canning, & McDowell, 2010; Jung, Chan-Olmsted, Park, & Kim, 2012) Therefore it is very useful to study the degree of awareness and interest among stakeholders about the Artificial Pancreas and Inreda. Increasing awareness is something very practical since Inreda B.V. could start with increasing awareness before the product is ready for the market. The goal of this study is thus to examine the existing literature on the link between awareness and acceptance of an innovation. This hypothesized link will be tested in a survey among Diabetes type 1 patients that are potential adopters of the Artificial Pancreas.

The Artificial Pancreas, a new medical device for Diabetes patients, is currently being developed by Inreda. Diabetes patients have to deal with the effects of their disease on a daily basis. A patient with diabetes has high blood sugar and an increased chance to mayor complications like heart disease, kidney failure and blindness. When blood sugar is too high, hyperglycemia will occur, while when blood sugar is too low, hypoglycemia will occur. Both can cause a patient to feel very sick and unable to continue with what they were doing at that exact time. Blood Glucose levels are managed by the hormone insulin which is produced by the pancreas. A diabetes Type 1 patient has a body failure when the pancreas does not produce insulin. These patients are dependent on insulin intake on a daily basis, about 10% of the diabetes mellitus patients have type 1 Diabetes. A diabetes Type 2 patient is resistant to the insulin the body produces and deals with less effective or decreased sensibility to insulin. Usually they are told to regulate their sugar intake and to follow a diet. Type 2 diabetes is often described as lifestyle diabetes whereas type 1 Diabetes is inherited. Diabetes Type 1 patients need to take insulin in order to treat their disease. There are different ways a patient can insert insulin into their body. Research is searching for new ways of insulin intake which would make life easier for a patient. Currently a patient can control his or her insulin intake by insulin pens, insulin pumps or insulin pumps combined with a CGM (Continue Glucose Monitor). An Insulin pen is some sort of an injection needle, only the needle is smaller and the pen can be refilled with new shots of insulin. A patient has to test their blood with a device that pricks in their finger to see what value has their blood. Then they decide to inject insulin or not. A patient has to anticipate events like eating, sports or stress, since they all can have an effect on their blood glucose levels. A patient can also have an insulin pump, which is already positioned on the body. When they want to receive insulin, they can choose to do so with touching the buttons on the device. But still the patient needs to prick their blood to test their levels. The only way to avoid this in current treatment is to take a CGM, a continuous glucose monitor. It is adhered to the body like an IV, and constantly measures the blood glucose levels. If the blood glucose levels are unacceptably high or low, an alarm will go off to warn the patient. They can then monitor the insulin pump or inject themselves with insulin pens to adjust their blood glucose level.

The research question is as follows: *To what extent does the degree of awareness and knowledge of the diabetes patient influence their intention to use the Artificial Pancreas?*

The research question will be answered by first reviewing existing literature on this topic in chapter 2. Chapter 3 will give the outline of the research conducted with the subjects of study and the measurements of the survey. Chapter 4 will discuss the results of the survey and the analysis of the survey. The

discussion and conclusion section in chapter 5 will conclude this research.

2. THEORY

It is argued that a favorable attitude towards an innovation is the beginning of the adoption of new technologies. (Agarwal & Prasad, 1998; Jung, et al., 2012) This attitude is formed by the aspects an individual learns about this innovation. Therefore the following paragraph will look at awareness and knowledge as the two phases that shape the attitude of an individual. Furthermore intention to use is described as a measure of acceptance.

2.1 Awareness

Awareness of a new technology or innovation is often used by scientists to explain the beginning of the acceptance of an innovation (Brennan, et al., 2010; Rogers, 2010). Awareness is defined by Rogers as awareness-knowledge, a specific type of knowledge that is either gained actively or passively. Passive awareness is when a user stumbles upon an innovation by coincidence. They see the innovation somewhere before they could have actively searched for information. This information can be seen in media through communication channels. Active awareness is when a user searches themselves for a solution to their problem and finds the innovation of the company. In the context of the Artificial Pancreas this would mean that a patient looks for different diabetes treatment options and finds the Artificial Pancreas. It is a different kind of awareness since the first mentioned is something the company, and thus Inreda, is doing whereas the second is something that is initiated by the patient.

In other literature this distinction is less prevailing. Awareness as mentioned by Brennan,(Brennan, et al., 2010) is the first step in the communication mix of acquiring customers. Awareness generates leads for the company but they are in some sort of funnel, of the leads generated in the awareness stage only a few will make the purchase decision. The article by Jung (Jung, et al., 2012) finds it necessary to explain that at the awareness stage an individual has not yet developed an attitude towards the innovation, only curiosity and propensity. One well-known theory is the buyer readiness stages by Kotler. (Kotler & Armstrong, 2010) The buyer readiness stages help a firm to determine in what stages their customers are and how to approach them. Again, this theory starts with awareness about an innovation where after knowledge and liking follow. It instructs companies to first assess at which of the six stages a customer currently is before making their communication strategy. It is intended to direct customers to the purchase of a product. The initial intention is to create awareness and later on to create knowledge. After having knowledge about a product, a customer comes at the phase of either liking or disliking the product. However, as we can see in all the awareness innovation acceptance models, awareness has not yet to do with the attitude towards a product, this attitude will be formed in later stages towards the purchase/acceptance. If you regard awareness as mentioned here, it does not yet have a high impact on the decision to accept a new innovation.

2.2 Knowledge

Knowledge, as called by Rogers (Rogers, 2010) and in buyer readiness (Kotler & Armstrong, 2010) is the phase where the user is already aware of the innovation, but needs to acquire more information about the innovation. They need to know if this innovation is useful for them, if it fits their needs and if it is what they expect it to be. This can only be found out if the user himself/herself will go out and look for information themselves. Rogers believes hat in this phase of knowledge acquiring the user will look for two kinds of knowledge: how-to knowledge and principles knowledge. The user needs this knowledge for the next stage of Rogers' model: the 5 innovation characteristics complexity, trialability, relative advantage, ease of use and perceived usefulness. This persuasion stage is where the customer expresses their attitude towards the innovation, but this attitude is already formed by the knowledge gained in the knowledge phase. Brennan's model (Brennan, et al., 2010) which is based on Anderson and Narus' work (Anderson, 2004) calls the phase after awareness the interest phase. In the interest phase a customer wants to know more about a product, hence the 'interest', and they will acquire more information about this product. They do this by making enquiries and a company should be ready to handle customer search for answers to their questions. A customer in this phase moves towards making a purchase of the product.

2.3 Intention to Use

Intention to use is the construct in this research measuring acceptance. It measures the degree of a patients willingness to use the Artificial Pancreas (Davis, 1989). Intention to use has a close link to actual behaviour since it does not ask about how much a user actually uses the product but more about their intentions. (Teo, 2011) Since the Artificial Pancreas is not yet existing it would be better to test their intention to use rather than questions based on their actual use. Intention to use in this research is more about the liking factor of the Artificial Pancreas. The liking factor, or interest, is when a user has an opinion about a product but has not yet made the purchase of the product. Since we can only measure the intention to use and not the actual usage, intention is what comes after the knowledge phase. After the knowledge gathering phase, a user will form an opinion about the information they have gathered. This information is assessed and used to compare products to their current products or treatments on different aspects. Rogers uses 5 factors for this comparison in his Persuasion stage, where a customer forms their attitude about the innovation before deciding to accept or reject.

2.4 Hypotheses

It is expected that a person that is aware of an innovation has a higher intention to use this innovation when compared to a person that is unaware of the innovation. Simply put, if an individual has never heard of an innovation they are less likely to accept it when they first hear of this innovation. This is due to the individual's need to gather information about an innovation before he is willing to use the innovation. (Rogers, 2010)

H1: Awareness has a positive effect on intention to use the Artificial Pancreas.

The individual that has a higher intention to gather information or has already gathered information about the artificial pancreas is more likely to have a higher intention to use the artificial pancreas. Gathering knowledge about an innovation is seen as the preface of forming an attitude toward the innovation. This attitude can only be formed when relevant information is available. (Kotler & Armstrong, 2010; Rogers, 2010)

H2: Knowledge has a positive effect on intention to use the Artificial Pancreas.

All authors mention that awareness is the first phase and knowledge is the second phase toward the purchase or acceptance of an innovation. (Brennan, et al., 2010; Kotler & Armstrong, 2010; Rogers, 2010) Since at every phase of the process individuals decide if they accept or reject the innovation and thus move to the next phase (Rogers, 2010) there should be less people at every next phase, with a higher intention to use or

accept the innovation. Because individuals have learned during the previous phase their intention to use compared to the previous phase increases.

H3: When compared to Awareness,.Knowledge has a higher positive effect on intention to use the Artificial Pancreas.

2.5 Causal Model

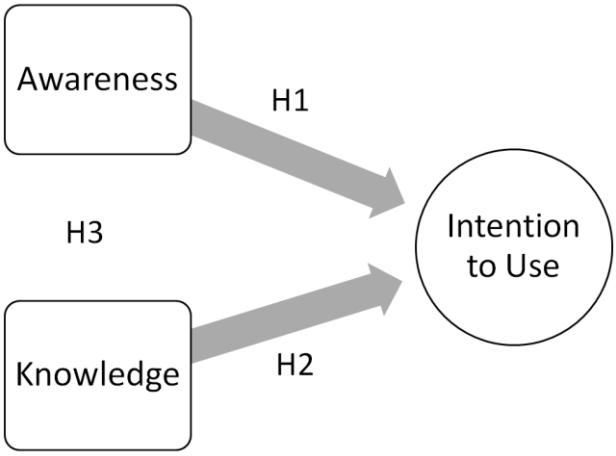

Figure 1: Intention to Use explained by Awareness and Knowledge.

3. METHODS

3.1 Research Setting

3.1.1. Subjects for study

Subjects for this study are diabetes type 1 patients since they are the diabetes mellitus patients that will be able to use an Artificial Pancreas. Since type 1 patients only amount up to 10% of the total diabetes population there is still a control question in the survey to check their diabetes type for validity of the research. The Diabetes type 1 patients were gathered from the database of Inreda B.V. Since these respondents have said they are willing to participate in research about the artificial pancreas, a high response rate was expected. The survey was sent to 601 Diabetes patients from the database of Inreda. 413 of 601 respondents filled in the survey, which is a response rate of 68.7% The survey was distributed in June 2014 among the patients. Almost all of the patients are from the Netherlands, only a few diabetes patients in the sample are living in Belgium or Germany. Initially the survey would be send to German and Austrian patients as well, but due to limited time of the research it was not possible to contact German and Austrian Diabetes patients.

3.1.2. Artificial Pancreas

The Artificial Pancreas is a device developed to treat diabetes mellitus. The development of the AP goes back to the early 1960's where continuous glucose monitoring was first used. (Hovorka, 2011) As explained to the diabetes patients participating in the study, the Artificial Pancreas consists out of two pump systems, one for insulin and one for glucagon, that both connect to a different IV. Because the system uses two sensors for continuous glucose monitoring, the sensors can be replaced without disrupting the system and the measurements are more accurate. The right amount of insulin or glucagon is chosen by the device and automatically administered to the patient. The device uses an algorithm to deliver the right amount of insulin and glucagon. Delivering two hormones instead of one ensures a better regulation of the blood glucose levels in order to maintain a normal lifestyle. The continuous monitoring does not need to be adjusted during mealtime or exercise since the device is always measuring the blood levels. (LimeSurvey, 2014).

3.2 Measurement

This research on patient acceptance is a rather explorative research and based on quantitative responses on the survey. (Babbie, 2004) The survey is constructed to support research on a few different topics that require input from the same sample of respondents, diabetes type 1 patients. The constructs measured in the survey that are relevant for this research are Awareness, Knowledge and Intention to Use. The items are adapted from Technology Acceptance literature and Buyer Readiness literature.

The variables are measured by multi-item scaling. Since the item about whether a patient has heard or read something about the AP can only be answered by yes or no, this variable is measured as a categorical variable in this research. For every other item a Likert's 7 point scale is used. The 7 point Likert scale ranges from 1: strongly disagree to 7: strongly agree. Table 1 shows which items are used to measure the variables Awareness, Knowledge and Intention to Use. In the results section of the paper the Cronbach alpha of these items, measuring the internal consistency of the questionnaire, will be discussed. See table x for the Cronbach alpha's.

3.3 Data Collection Method

The questionnaire was implemented as a web-survey using LimeSurvey, a system that not only assists in creating the survey but is also able to export the collected data to SPSS. 601 patient emails, retrieved from Inreda Diabetic B.V.'s database, were entered in the system and the participants received an invite via e-mail and a week after the invitation e-mail a reminder was sent to the respondents that had not participated. The invitation consisted of a short introduction on the goal and

Construct	Definition	Items	Source
Awareness(2)	Awareness is the knowledge that an innovation exists.	I did hear or read about the artificial pancreas before filling in this questionnaire.	(Dupagne, 1999)
		The artificial pancreas is visible in my environment.	
Knowledge (3)	Knowledge is the intention to find info or learn more about the innovation	I did search for more information after I became aware of the Artificial Pancreas.	
		I do want to know or learn more about the Artificial Pancreas.	
		I plan to compare the Artificial Pancreas to other treatments.	
Intention to Use (2)	Intention is the behavioral acceptance of an innovation by user	Assuming I have access to the Artificial Pancreas, I intend to use it.	(Venkatesh & Davis, 2000)
		Assuming I have access to the Artificial Pancreas, I predict that I would use it.	Venkatesh & Davis, 2000)

Table 1. Operationalization of the dependent and independent variables.

aim of the research the patient would participate in, as well as the partners that would benefit from the research: PCDIAB consists of the University of Twente, AMC Amsterdam, University of Graz, Profil Research, Full Group and Novo Nordisk. Participants first had to read a page about the Artificial Pancreas where it described how the system works, including pictures of the device. The explanation covered the same information as mentioned in paragraph 3.1.2, which is adapted from the information on the welcome page. This explanation about the artificial pancreas was necessary so that participants of the survey had a sufficient understanding of the AP before filling in the questionnaire about the AP.

The survey was constructed in a way every participant of the survey received a token. Since every participant receives a unique token, it enables the participant to pause the survey and continue on a more convenient time. Even though this was possible, the email requested participants to complete the survey at the time they started the survey. Respondents were able to return to previous questions and to the welcome message about the Artificial Pancreas if they needed to review the information about the Artificial Pancreas.

3.4 Data Analysis

In this section a short overview of the statistical tests is presented, which ones are used to assess the output from the questionnaire and how, through SPSS, this data is analyzed for the reliability and from validity (Raesfeld Meijer & Oukes, 2014). It enables handling the items and constructs in the questionnaire in a clear and consistent way.

The first step in the data analysis is an exploratory factor analysis. This analysis is meant to reduce the amount of data into a few factors representing meaningful constructs. (Rank, n.d.b) In this case the factors represent the variables, which are measured in the survey in three constructs. A factor analysis starts with the KMO-Bartlett (Kaiser-Meyer-Olkin) test for sampling adequacy (Field, 2009). Performing the KMO – Bartlett's test predicts a stable factor solution which is best used on a big sample of above 300. The KMO value should be higher than 0.5 for a factor analysis to be appropriate. It indicates that the correlations are in a compact pattern when the value of KMO reaches above 0.5. (Field, 2009) Bartlett's test should be significant since it indicates if a variable is resembling an identity matrix (no correlation) or not. If Bartlett's test is significant we can assume there are correlation clusters in the sample. (Field, 2009) If both KMO and Bartlett are satisfied it is allowed to do a factor analysis. In the factor analysis it was decided to keep all factors with an eigenvalue above 1. Factor loading explains how strong an item loads on one factor. When factor loading is above 0.5 (50%) an item will be retained in that variable in the further research. (Raesfeld Meijer & Oukes, 2014)

	Frequency	Percentage
Gender		
Male	177	44.5
Female	221	55.5
Education		
Elementary School	23	5.8
High school	90	22.6
MBO	109	27.4
HBO	132	33.2
University	44	11.1
Country of Residence		
Netherlands	382	96.0
Belgium	10	2.5
Germany	3	0.8
Other	3	0.8
Diabetes treatment method		
Insulin pen	154	38.7
Insulin pump	183	46.0
Ins. pump+CGM	53	13.3

Table 2. Frequencies of General Data

The next step is the reliability testing through Cronbach's alpha. SPSS calculates Cronbach alpha's to measure the internal consistency of questions within a factor or variable. This implies that a respondent should give the same value to answers within one variable. The Cronbach alpha can range between 0 and 1 and ideally has a value above 0.7 for reliability. (Rank, n.d.b) The Cronbach alpha is calculated seperately for every variable.

After the Cronbach's alpha the next test to perform on the sample is the correlation analysis. (Raesfeld Meijer & Oukes, 2014) The Pearson's correlation coefficient ranges from -1 (perfect negative relationship) through 0 (perfect independence) to +1 (perfect positive relationship). A value of .5 is seen as a strong correlation, a value of .3 is seen as a medium correlation and a value of .1 is seen as a small correlation. (Field, 2009) The correlation output is presented in a table in the results section.

To complete the analysis of the sample, a regression analysis explains the relationship between a dependent and independent variables. A few values of the regression analysis are important for this research. First the R^2, or the squared variance, explains us how much of the variance in the dependent variable is caused by the independent variables. Furthermore the B coefficient and the ß (beta) coefficient explain how strong the relationship between the independent and dependent variable is. (Field, 2009) (Raesfeld Meijer & Oukes, 2014)

All these tests are performed in SPSS and presented in the following paragraph. To check the correctness of the statistical analysis, the Syntax file is included in the Appendix; 8.2. Limesurvey, the program used for the survey, is able to transport the data to SPSS, so no manual data entering had to be done, preventing errors.

4. RESULTS

The calculation and interpretation of the results are based on the information as given by Field in his book about statistics. (Field, 2009)

4.1 SPSS outcomes

In this section the outcomes of the SPSS tests, which are performed as described in paragraph 3.4 Data Analysis, will be discussed according to their relevance and important details.

4.1.1 General Descriptives.

At the end of the survey participants were asked to fill in general descriptive data for the research in order to assess what kind of sample is used for this research.

Comparing the frequencies and descriptive, the sample consists of 177 male and 221 female respondents. Of these 398 respondents in total, we can say that their educational level seems to be normally distributed, with most respondents having a HBO degree (33.2%), followed by MBO and High school degrees. The country of residence is by far the Netherlands, 96% of the respondents currently live there. The rest of the

respondents live in Belgium, Germany or other countries. The most common treatment method among the patients is the insulin pump, followed by the insulin pen. Insulin pump + CGM is used by only 13.3% of the respondents, while it is currently the treatment that most closely resembles the Artificial Pancreas. The respondents mean age is 39 years old and the mean age these patients were diagnosed with diabetes is 21 years. For the age and diagnosed age three outliers have been removed, therefore the N is lower than 398.

	N	Min	Max	Mean	STD
Age	396	3	85	39.24	15.939
Diagnosed Age	397	1	69	21.13	13.556

Table 3. Descriptives of General Data.

Furthermore it is very important to notice the fact that on the question I have heard or read something about the Artificial Pancreas only 17 out of 398 respondents say they have never heard something about the Artificial Pancreas. Since answering no means a patient is unaware of the innovation and answering yes means the patient is aware of the innovation, our sample is biased towards being largely aware of the artificial pancreas.

4.1.2 Factor Analysis

In order to check the validity of the questions and if they measure the variables as mentioned in the model of figure 1, a factor analysis was conducted to see if the items measure the underlying variable or if they measure another variable. The assumption is that the factors are correlated, therefore the factor rotation is a direct oblimin.

The factor analysis is performed two times, the first time one of the items has been removed from the research after which the factor analysis has been repeated without that item to check if the factor loading was different. The item that has been removed is: *The artificial pancreas is visible in my environment* with a factor loading of only 0.444. It is the only awareness item that was included in the factor analysis and awareness did not have a high enough eigenvalue to be included as a factor.

	Component 1	Component 2
BR_04 I do want to know or learn more about the artificial pancreas.	.863	
BR_05 I plan to compare the artificial pancreas to alternative treatments	.811	
BR_03 I searched for more information after hearing about the artificial pancreas.	.640	-.171
ITU_01 Assuming I have access to an artificial pancreas, I intend to use it.		.934
ITU_02 Assuming I have access to the artificial pancreas, I predict that I would use it.		.934

Since the item does not fit to one of the two variables it has to be removed from the factor analysis and further research on correlation and regression.

Continuing without the item: *The artificial pancreas is visible in my environment* the following results are retrieved:

The KMO test has a value of .633, which is higher than the necessary 0.5 and gives reason enough to do a factor analysis. The Bartlett's test is significant (.000) and is reason to perform the factor analysis.

The factor analysis recognizes two factors with an eigenvalue above 1. Factor one has an eigenvalue of 2.408 and factor two has an eigenvalue of 1.204. The two factors are Knowledge and Intention to Use, as already mentioned in the research. Awareness is not a factor since the remaining item is a categorical item. According to the pattern matrix, the items of Intention to Use load on one factor and the items of Knowledge load on the other factor, so the items indeed measure the same construct as intended in the questionnaire.

4.1.3 Reliabilities

Calculating the Cronbach α resulted in two different Cronbach's α, one for Knowledge and one for Intention to Use. Since Awareness now exists of one item, there is no need for a Cronbach α analysis. For Intention to use this resulted in a high reliability, the Cronbach α = .864. However, the Knowledge scale had relatively low reliability, Cronbach's α = .620. Removing items does not largely increase the Cronbach α, it is possible to increase the value to .625 by removing the item: *I actively searched for information about the Artificial Pancreas.* Therefore, since removing the item does not largely influence the Cronbach alpha, it is better to leave the item in the analysis and leave the construct as it is. (SOURCE)

4.1.4 Correlation Analysis

The table below represents the correlation between Awareness, Knowledge and Intention to use. All three the correlations are significant at the 0.01 level. The relationship between Awareness and knowledge is weak with a value of .250. The relationship between Awareness and Intention to Use is even weaker with a value of .237. The relationship between Knowledge and Intention to Use can be considered of medium strength with a value of .345 it is the highest correlation. Still the correlation between the variables is not very strong, as a value of 0.5 or higher points out a high correlation.

	Mean	SD	1	2	3
1 Awareness	0.9573	0.20247	1		
2 Knowledge	6.0276	1.01985	.250*	1	
3 Intention to Use	6.4937	0.83339	.237*	.345*	1

*Correlation is significant at the 0.01 level (1-tailed)

Table 5. Correlation matrix for all three variables.

4.1.5 Regression Analysis

The regression analysis of the variables Awareness, Knowledge and Intention to Use is shown in the table.

When calculating Cook's distance, a maximum value of 0.426 is found. This is an acceptable value for the model, there is no case that has a particular high influence on the model. (Field, 2009) The Mahalanobis distance has a maximum value of 30.530. According to Field it is difficult to determine if to establish which values for Mahalanobis distance are reason to

be concerned. The established cut-off point for large samples is usually larger than 25. The Mahalanobis test reports a maximum value of 30.530 and this is reason to worry about the outliers in the sample. There will only be a few outliers in the sample since the mean of Mahalonobis is 1.995, which is very low. Since Cook's distance is far below 1, there should be no cases that highly influence the model, even when Mahalanobis test is high. (Field, 2009)

The values for VIF 1.067 and Tolerance .938 are both no reason for concern. According to Field (Field, 2009) the value for VIF should be lower than 10, which they are and the Tolerance should be above 0.2 which is also met. Therefore it is save to conclude that there is no collinearity within the model.

The table repeats the correlation coefficients of the previous paragraph in column R. R^2 explains a new result, the explained variance in Intention to Use by the independent variables. This means that Awareness explains 5.6% of the variance in Intention to Use and Knowledge explains 11.9% of the variance in Intention to Use. Together these two factors explain 14.3% of the variance in Intention to Use.

According to the unstandardized B coefficient Awareness (B=.663) has a stronger influence on Intention to use when compared to Knowledge (B=.249). However, in this case it is wise to look at the beta's (ß) which are standardized. Awareness is a variable that is not normally distributed because it is a categorical question (yes/no) and is very biased towards yes, a difficulty of the sample. Therefore it is better to take the standardized ß, which tells us that Awareness has an effect of .161 on Intention to Use and Knowledge has an effect of .305 on Intention to Use. This implies that Knowledge has a stronger effect on Intention to Use than Awareness has. Usually B and ß do not differ a lot but in this case it does differ in a meaningful way.

	R	R^2	B	ß	Significance
Awareness	.237	.056	.663	.161	.001
Knowledge	.345	.119	.249	.305	.000
Combined	.379	.143			

Dependent variable: Intention to Use.

Table 6. Regression analysis for all three variables.

4.2 Findings

As described in the introduction, the results section of the thesis should address the research question: To what extent does the degree of awareness and knowledge of the diabetes patient influence their intention to use the artificial pancreas? Awareness, knowledge and intention to use represent the phase model of Brennan (Brennan, et al., 2010) where a patient moves through different phases before making the purchase of an innovation. It can be seen that awareness, the first stage of this model, yields a lower result in intention to use than the next phase, knowledge. It is expected that patients in the knowledge phase are closer to the acceptance or purchase of the Artificial Pancreas. The following section will answer the hypotheses that examine these results in detail.

4.2.1 Hypothesis 1

H1 stated that when a patient is aware of the innovation, their intention to use that innovation will increase. In the SPSS output comparing the means of an unaware patient (0.00) with an aware customer (1.00) shows that the mean intention to use rose from 5.5588 (unaware) to 6.5383 (aware). This guides us to believe that patient awareness has an influence on intention to use with a positive direction. This is confirmed by the regression analysis, where the unstandardized B coefficient is significant and positive when relating awareness to intention to use. This confirms the hypothesis that awareness has a positive impact on intention to use.

4.2.2 Hypothesis 2

H2 stated that when a patient has more knowledge about an innovation, their intention to use that innovation will increase. When we look at the data of the regression analysis, it is shown that knowledge relates significantly to intention to use. The B coefficient is positive, which points to a positive relationship between knowledge and intention to use. We can assume that knowledge has an effect on intention to use and that this effect increases by .249 every time intention to use increases by 1.

4.2.3 Hypothesis 3

H3 stated that patients that are in the knowledge phase have a higher intention to use the artificial pancreas compared to patients in the awareness phase. It is even possible to argue that increasing the knowledge of a patient has a higher effect on intention to use than increasing the awareness of the artificial pancreas. When comparing the standardized beta's of the two variables, the knowledge coefficient has a higher increase in intention to use (.305) when compared to the awareness coefficient (.161). The beta is the most meaningful coefficient too analyze this hypothesis, since Awareness is expected to be non-normally distributed. If Awareness would be normally distributed, there would not be a great difference between the B coefficient and the beta coefficient. The beta coefficient is standardized and therefore

We can therefore safely say that awareness and knowledge are two distinctive phases, as they both have a significant and different effect on intention to use.

5. DISCUSSION

5.1 Outcomes

As hypothesis 1 stated, higher awareness will account for a higher intention to use the artificial pancreas. This has been researched before by Blödt et al, who also had a sample with a high degree of awareness, just as the diabetes patients showed a high degree of awareness of the artificial pancreas. (Blödt, Holmberg, Müller-Nordhorn, & Rieckmann, 2011) Their research confirms the finding that an aware sample has a high intention to use or acceptance of an innovation. Furthermore, another research on the effect of awareness-knowledge on intention to use gives the same result that a higher awareness results in a higher degree of acceptance. (Jiang & Leung, 2012) To add to these statements about awareness, Jung et al. found that the highest predictor of awareness among a sample is the demographic variable block of the sample. (Jung, et al., 2012)

As hypothesis 2 stated, a higher degree of knowledge will result in a higher intention to use the artificial pancreas. The study by Blödt et al. mentions that in their research, even though a patient has already accepted the innovation, their level of knowledge is relatively low. (Blödt, et al., 2011) That is surprising since our literature states otherwise, and the results of the regression analysis prove the existing literature. (Brennan, et al., 2010; Kotler & Armstrong, 2010; Rogers, 2010) According to Jung the most important predictor of knowledge is personal innovativeness of an individual (Jung, et al., 2012).

Hypothesis 3 assumes that knowledge will have a stronger effect on intention to use than awareness. This is supported by the models that suggest the acceptance of an innovation is a process where individuals make a decision at every phase to reject or continue with the innovation. (Brennan, et al., 2010; Kotler & Armstrong, 2010; Rogers, 2010) In these models the innovation will lose individuals who reject an innovation at an

earlier stage and therefore intention to use is higher in the knowledge stage than in the awareness stage.

5.2 Limitations

The patient sample of this research was gathered by using resources of the company Inreda. They have a database with 2 000 diabetes patients interested in the company and what they are developing. This means these patients have a more positive attitude towards the product when compared with the average patient. As discussed by Rogers in Diffusion of Innovations, these patients can be seen as early adaptors of an innovation. They are eager to receive an Artificial Pancreas, since it will greatly help them with their disease. Therefore the group is very motivated to fill in the survey, which is great for our response rate. However, the sample is very biased. These patients have registered online to receive more information about the Artificial Pancreas or to participate in tests and surveys about the Artificial Pancreas. We cannot say with any certainty that this group of patients is representative for the entire diabetes type 1 population.

Initially this research was supposed to focus on more nationalities than only Dutch patients. A German questionnaire has been developed to do research on both German and Austrian diabetes patients as well. However, since we did not have yet a respondent group in Germany or Austria, the German questionnaire has not yet been sent out. A survey sample of German and Austrian patients would have greatly increased the validity of this research for a few reasons. Mainly because Inreda is a company based in the Netherlands, Dutch patients have a greater chance to have heard or read something about the Artificial Pancreas. German or Austrian patients are more likely to be unaware of the innovation since it is Dutch and therefore be more valid sources for this research about awareness and knowledge of an Artificial Pancreas. It would make the research more interesting if it was possible to compare the Intention to Use of an aware and unaware patients base, but currently there are only 4.3% type 1 patients that have said that they have never heard or read something about the Artificial Pancreas.

This thesis was written with on a tight deadline, in a time span of 8 weeks the complete thesis had to be written. This might have had an effect on the data gathered. The dataset is still expanding since the online questionnaire has not been closed yet. Therefore patients are still filling in the questionnaire and the current version has already been filled in by 423 patients instead of the 413 analyzed in SPSS. More time might have enabled us to search for patients outside of the Netherlands through contacts of our partners, but in our timeframe that was not possible.

Knowledge scale received alpha of 0.620 which is too low to say the scale was very reliable in measuring the construct Knowledge. Still I decided to use this scale in the research, since reproducing it was not an option and data on knowledge of a patient was necessary for the research. It would be very beneficial if this scale would be adapted in future research in order to more effectively measure the knowledge stage.

6. CONCLUSIONS

As seen in the results, an aware patient scores on average 1.0 point higher on a scale of 7.0 regarding Intention to use the Artificial Pancreas. This is in line with the Innovation-decision process of Rogers'(Rogers, 2010), where knowledge is the first step in the decision process of an innovation and awareness is the first form of knowledge where a customer gains knowledge about the existence of the innovation. According to Rogers awareness knowledge does not yet have to mean that a person will search more information about the innovation or be very likely to use the innovation since they have not completed the process yet. Rogers has an advice for companies that wish to speed up the innovation decision process, as some individuals need a lot of time to move through the phase of knowledge to the persuasion phase before making the decision to accept or reject the innovation. One method is to communicate information about new ideas more rapidly or more adequately so that knowledge is created at an earlier date. Another method is to shorten the amount of time required for the innovation-decision after an individual is aware of a new idea. There are always potential adopters that are aware of the product but not yet motivated to try it. Knowledge proceeds at a more rapid rate than does adoption, which suggests that relatively later adopters have a longer average innovation decision period than earlier adopters do.

Brennan et al.(Brennan, et al., 2010) discusses the same idea, in their model awareness is the first step in some sort of funnel; the leads generated at the awareness stage will not all make the purchase decision in the end. An aware customer has the option to go the interest stage or abandon the purchase decision process. What can be seen is that in the awareness phase Brennan expects the company to play a large role in contacting the potential customers. Once these customers are contacted by the company through a mass media channel they will form their initial attitude towards the innovation and either decide to gather more knowledge about the innovation at the company by making enquiries or to disregard the innovation. As customers in the interest phase already developed a more positive attitude towards the innovation they are more likely to make the purchase decision, which is what we see in our results with a higher Intention to Use the Artificial Pancreas when a customer is in the interest phase of the purchase decision.

Kotler(Kotler & Armstrong, 2010) describes a model that combines the view of both Rogers and Brennan that closely relates to the model as described in this paper. A customer in their process moves from Awareness to Knowledge to Liking, where liking is the attitude a person has towards the innovation. This detailed and elaborate view is consistent with the results that knowledge has a higher effect on intention to use than awareness. After the knowledge stage a customer decides if he either likes the product or not, and if they do not like the product their intention to use will lower.

6.1 Future Research

The research about the Artificial Pancreas of Inreda is not nearly ready. A few things should be considered for future research: Inreda is aiming to bring their Artificial Pancreas to Europe and not only to the Netherlands. Therefore not only Dutch patients should be considered but also patients from countries like Germany and Austria, as was initially intended.

The knowledge scales of the research proved to be not a very reliable measure for the variable Knowledge. When this is the case during a pretest round, it is still possible to adjust the scales and continue the research with an improved version of the survey. Since our research had a limited time span it was necessary to send out the survey immediately and the knowledge scales have not been adapted. Future research on knowledge would be very helpful.

6.2 Practical Recommendations

For Inreda, that wishes to speed up the decision process in which a patient decides to use the Artificial Pancreas, should consider a few things:

This research has shown that patients are more likely to accept the product once they have more knowledge about the product.

Only awareness about the product does not create the highest intention to use among patients. Therefore the patients need to be able to find information about the artificial pancreas once they became aware of it. Inreda should help patients to gather this information, by for example using their website or teaching professionals (doctors/nurses) about the Artificial Pancreas. Currently the website introduces the Artificial Pancreas shortly, but a patient will search for more practical information on what an Artificial Pancreas will mean for their lifestyle. As Rogers (Rogers, 2010) describes: the rate at which current patients learn about the innovation before adopting it is something to invest in rather than in finding a lot of new leads that might be interested. It means investing in the current interested database rather than in the new interested people that are unaware of the innovation at this moment in time.

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9. APPENDIX

9.1 Surveys

Construct	Itemcode	Item in Dutch
Buyer Readiness	BR_01	Ik heb wat gehoord of gelezen over de kunstmatige alvleesklier alvorens deze enquête in te vullen.
	BR_02	De kunstmatige alvleesklier is zichtbaar in mijn omgeving (denk hierbij bijvoorbeeld aan media, nieuwsartikelen etc.)
	BR_03	Ik heb actief gezocht naar informatie over de kunstmatige alvleesklier.
	BR_04	Ik wil meer weten of leren over de kunstmatige alvleesklier
	BR_05	Ik ben van plan de kunstmatige alvleesklier te vergelijken met andere behandelingen
Optimism	OPT_01	Technologie geeft mensen meer controle over hun dagelijkse leven
	OPT_02	Producten en diensten die de nieuwst beschikbare technologie gebruiken zijn gemakkelijker om te gebruiken
	OPT_03	U heeft een voorkeur om de meest geavanceerde technologie die beschikbaar is te gebruiken
	OPT_04	Technologie maakt u efficienter in uw beroep
	OPT_05	Technologie geeft u meer bewegingsvrijheid
	OPT_06	U bent er van overtuigd dat apparaten doen wat u ze heeft geïnstrueerd
Innovativeness	INN_01	Andere mensen komen bij u advies inwinnen over nieuwe technologieën
	INN_02	In het algemeen bent u de eerste in uw vriendenkring die nieuwe technologie aanschaft wanneer het beschikbaar is
	INN_03	Normaliter begrijpt u nieuwe high-tech producten en diensten zonder de hulp van anderen
	INN_04	U blijft op de hoogte van de laatste technologische ontwikkelingen in uw dagelijksleven
	INN_05	U heeft over het algemeen minder problemen dan andere mensen om u een technologie eigen te maken
Discomfort	ONG_01	Technische instructies zijn niet behulpzaam omdat ze geen uitleg geven in voor u begrijpelijke taal
	ONG_02	Soms denkt u dat technische systemen niet ontworpen zijn voor gewone mensen
	ONG_03	Naar mijn mening, bestaat er niet zoiets als een handleiding voor een technisch product of service dat is geschreven in eenvoudig nederlands
	ONG_04	Wanneer u een technisch product of dienst koopt, heeft u liever het basis model dan een model met veel extra functies
Insecurity	ONZ_01	Revolutionaire nieuwe technologie is vaak minder veilig dan critici me doen geloven.
	ONZ_02	Een machine of een computer zal een taak minder betrouwbaar uitvoeren dan een persoon
	ONZ_03	Het kan riskant zijn om te vroeg naar een nieuwe technologie om te schakelen
	ONZ_04	Als je producten koop die erg technisch zijn, kan het gebeuren dat je geen reserve onderdelen of service kan vinden
	ONZ_05	Nieuwe technologie lijkt mensen altijd te benadelen doordat deze hun vaardigheden overbodig maken
Perceived Usefulness	VN_01	Ik verwacht dat het gebruik van de kunstmatige alvleesklier mijn prestaties in het dagelijks leven zal verbeteren
	VN_02	Ik verwacht dat het gebruik van de kunstmatige alvleesklier

		mijn productiviteit in het dagelijks leven zal verbeteren
	VN_03	Ik verwacht dat het gebruik van de kunstmatige alvleesklier mijn effectiviteit in het dagelijks leven zal verbeteren
	VN_04	Ik verwacht dat het gebruik van de kunstmatige alvleesklier nuttig zal zijn in mijn dagelijks leven
	VN_05	Ik verwacht dat het gebruik van de kunstmatige alvleesklier in mijn dagelijks leven ervoor zal zorgen dat ik taken sneller af kan ronden
	VN_06	Ik verwacht dat het gebruik van de kunstmatige alvleesklier het makkelijker zou maken voor me om mijn dagelijkse bezigheden te voltooien
Compatability	COM_01	Ik verwacht dat het gebruik van de kunstmatige alvleesklier mogelijk is in alle aspecten van mijn leven, zowel werk als vrije tijdsbesteding
	COM_02	Ik denk dat het gebruik van de kunstmatige alvleesklier goed past bij de manier waarop ik graag leef en werk
	COM_03	Ik verwacht dat het gebruik van de kunstmatige alvleesklier goed past bij de manier waarop ik mijn dagelijkse taken uitvoer
Complexity	ING_01	Ik verwacht dat het gebruik van de kunstmatige alvleesklier te veel tijd wegneemt van mijn normale dagelijkse taken
	ING_02	Ik verwacht dat het gebruik van de kunstmatige alvleesklier zo ingewikkeld is dat het moeilijk is om te begrijpen wat er precies gaande is.
	ING_03	Ik verwacht dat het gebruik van de kunstmatige alvleesklier te veel tijd kost in de vorm van de uit te voeren handelingen
	ING_04	Ik verwacht dat het te lang zal duren om te leren hoe de kunstmatige alvleesklier te gebruiken om het de moeite waard te maken
Subjective Norm	SN_01	Ik denk dat mensen die mijn gedrag beïnvloeden vinden dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SN_02	Ik denk dat mensen die belangrijk voor mij zijn vinden dat ik de kunstmatige alvleesklier zou moeten gebruiken
Social Influences	SI_01	Andere personen met diabetes vinden waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_02	Normaal gesproken wil ik graag doen wat andere diabetespatienten vinden dat ik zou moeten doen
	SI_03	Mijn vrienden vinden waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_04	Normaal gesproken wil ik graag doen wat mijn vrienden vinden dat ik moet doen
	SI_05	Mijn arts vindt waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_06	Normaal gesproken wil ik graag doen wat mijn arts vindt dat ik moet doen
	SI_07	Mijn diabetes verpleegkundige vindt waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_08	Normaal gesproken wil ik graag doen wat mijn diabetes verpleegkundige vindt dat ik moet doen
	SI_09	Mijn familie vindt waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_10	Normaal gesproken wil ik graag doen wat mijn familie vindt dat ik moet doen
	SI_11	Mijn partner vindt waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_12	Normaal gesproken wil ik graag doen wat mijn partner vindt dat ik moet doen
	SI_13	Patientenverenigingen vinden waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_14	Normaal gesproken wil ik graag doen wat de patientenvereniging vindt dat ik moet doen

	SI_15	Mijn kinderen vinden waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_16	Normaal gesproken wil ik graag doen wat mijn kinderen vinden dat ik moet doen
	SI_17	Mijn collega's vinden waarschijnlijk dat ik de kunstmatige alvleesklier zou moeten gebruiken
	SI_18	Normaal gesproken wil ik graag doen wat mijn collega's vinden dat ik moet doen
Diabetes Treatment Satisfaction	TH_01	Hoe tevreden bent u met uw huidige behandeling van diabetes?
	TH_02	Hoe vaak hebt u de afgelopen tijd het idee gehad dat uw bloedsuikers onaanvaardbaar hoog waren?
	TH_03	Hoe vaak hebt u de afgelopen tijd het idee gehad dat uw bloedsuikers onaanvaardbaar laag waren?
	TH_04	Hoe gemakkelijk vindt u op dit moment uw huidige behandeling?
	TH_05	Hoe flexibel vindt u op dit moment uw huidige behandeling?
	TH_06	Hoe tevreden bent u met uw kennis van diabetes?
	TH_07	Zou u uw huidige behandeling van diabetes aan iemand met hetzelfde type diabetes aanraden?
	TH_08	Hoe graag zou u met uw huidige vorm van behandeling verdergaan?
Intention to Use	ITU_01	Er van uitgaande dat ik toegang zou hebben tot een kunstmatige alvleesklier, ben ik van plan om het te gebruiken
	ITU_02	Er van uitgaande dat ik toegang zou hebben tot een kunstmatige alvleesklier, voorspel ik dat ik het zou gebruiken
General Descriptives	AG_01	Wat is uw leeftijd?
	AG_02	Wat is uw geslacht?
	AG_03	Wat is uw hoogstgenoten opleiding?
	AG_04	Wat voor type diabetes heeft u?
	AG_05	Hoe oud was u toen u de diagnose diabetes kreeg?
	AG_06	Welke methode gebruikt u op dit moment om diabetes te behandelen?
	AG_07	Als u een insuline pomp heeft, hoeveel jaar heeft u deze al?
	AG_08	Als u een CGM heeft, hoeveel jaar heeft u deze al?
	AG_09	Heeft u deelgenomen aan een klinische test van de kunstmatige alvleesklier?

9.2 SPSS Syntax file

```
* Recoding of Buyer Readiness 1 into awareness

DATASET ACTIVATE DataSet1.
RECODE BR_01 (1=1) (2=0) INTO Awareness.
EXECUTE.

* Factor analysis of ITU and BR_02 - BR_05

FACTOR
  /VARIABLES      BR_2_BR_02      BR_2_BR_03      BR_2_BR_04      BR_2_BR_05
ITU_00_ITU_01 ITU_00_ITU_02
  /MISSING LISTWISE
```

```
  /ANALYSIS BR_2_BR_02 BR_2_BR_03 BR_2_BR_04 BR_2_BR_05
ITU_00_ITU_01 ITU_00_ITU_02
  /PRINT UNIVARIATE INITIAL CORRELATION SIG DET KMO INV REPR AIC
EXTRACTION ROTATION
  /FORMAT SORT BLANK(.10)
  /PLOT EIGEN ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25) DELTA(0)
  /ROTATION OBLIMIN
  /METHOD=CORRELATION.

* Factor analysis of ITU and BR_03 - BR_05. Without the awareness items, only
knowledge and intention to use.

FACTOR
  /VARIABLES BR_2_BR_03 BR_2_BR_04 BR_2_BR_05 ITU_00_ITU_01
ITU_00_ITU_02
  /MISSING LISTWISE
  /ANALYSIS BR_2_BR_03 BR_2_BR_04 BR_2_BR_05 ITU_00_ITU_01
ITU_00_ITU_02
  /PRINT UNIVARIATE INITIAL CORRELATION SIG DET KMO INV REPR AIC
EXTRACTION ROTATION
  /FORMAT SORT BLANK(.10)
  /PLOT EIGEN ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25) DELTA(0)
  /ROTATION OBLIMIN
  /METHOD=CORRELATION.

* Cronbach Alpha analysis of the factor Knowledge

RELIABILITY
  /VARIABLES=BR_2_BR_03 BR_2_BR_04 BR_2_BR_05
  /SCALE('Knowledge') ALL
  /MODEL=ALPHA
  /STATISTICS=CORR
  /SUMMARY=TOTAL.

* Cronbach Alpha analysis of the factor Intention to Use

RELIABILITY
  /VARIABLES=ITU_00_ITU_01 ITU_00_ITU_02
  /SCALE('Intention to Use') ALL
  /MODEL=ALPHA
```

```
  /STATISTICS=CORR
  /SUMMARY=TOTAL.

* Creating the variable Knowledge out of the constructs BR_03-BR-05.

COMPUTE Knowledge=(BR_2_BR_03 + BR_2_BR_04 + BR_2_BR_05) /3.
VARIABLE LABELS  Knowledge 'Knowledge'.
EXECUTE.

* Creating the variable Intention to Use from the constructs ITU_01 and ITU_02

COMPUTE Intention_To_Use=(ITU_00_ITU_01 + ITU_00_ITU_02) /2.
VARIABLE LABELS  Intention_To_Use 'Intention_To_Use'.
EXECUTE.

* Multiple regression of the variables ITU, AWA, KNO

REGRESSION
  /DESCRIPTIVES MEAN STDDEV CORR SIG N
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS CI(95) R ANOVA COLLIN TOL CHANGE ZPP
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT Intention_To_Use
  /METHOD=ENTER Awareness Knowledge
  /RESIDUALS DURBIN
  /CASEWISE PLOT(ZRESID) OUTLIERS(2).

* Descriptives of general data participants.

DATASET ACTIVATE DataSet1.
DESCRIPTIVES VARIABLES=AGE DIAGAGE
  /STATISTICS=MEAN STDDEV MIN MAX.

* Frequencies of general data participants.

FREQUENCIES VARIABLES=GEN EDU NAT METHOD
  /ORDER=ANALYSIS.

* Splitting the data file into Aware and unaware patients.

SORT CASES  BY Awareness.
SPLIT FILE LAYERED BY Awareness.

* Comparing aware with unaware patients regarding intention to use
MEANS TABLES=Awareness BY Intention_To_Use
```

```
/CELLS=MEAN COUNT STDDEV.
```