

# A user centered design approach to design a chatbot that answers questions about HIV for adolescents: an explorative study

## Master Thesis

For attainment of the academic degree of  
**Master of Science in Engineering (MSc)**

in the Master Program Digital Healthcare  
at St. Pölten University of Applied Sciences

by

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[Vienna, 12.05.2019]

# Declaration

I declare that I have developed and written the enclosed Master Thesis completely by myself, and have not used sources or means without declaration in the text. Any thoughts from others or literal quotations are clearly marked. This work was not used in the same or in a similar version to achieve an academic grading or is being published elsewhere.

Vienna, 12.05.2019 .....

Place, Date

S. Wiedl .....

Signature

# Acknowledgements

This Thesis is dedicated to my family  
who has supported and encouraged me throughout the whole study.

Furthermore, I wanted to thank the Aids Hilfe Upper Austria  
for their motivation and assistance during my master thesis.

Additionally, I would like to thank my first advisor Andreas Jakl  
for the teaching about new technologies  
which was partially the reason for the idea for this master thesis.

Finally, a huge thank you to all the participants of this thesis,  
and for their engagement.

# Abstract

Human immunodeficiency virus - better known as HIV - is a topic which concerns everybody. One possibility in order to prevent people from getting infected with HIV is to educate young people about the illness. Therefore, new technologies offer new possibilities. The aim of this master thesis is to design a chatbot which provides young people with verified answers to their personal questions concerning HIV. Hence, its aim is to fill knowledge gaps and educate about HIV. In order to design the chatbot, the following questions must be answered: (1) In which areas do young people have knowledge gaps? (2) What questions do they ask concerning HIV? (3) How does the information have to be presented in the context of a chatbot?

The following paper is based on a User Centered Design, with a survey in combination with a literature research. The survey was carried out by the means of eight user-interviews and two peer educators. Furthermore, in context of the conducted study, three personas were created, and evaluated by 25 users. Within the prototyping process, a first idea of a chatbot was developed by the users and through a combination of focus groups and literature knowledge, was further developed (three iterations). A combination of formative evaluations with focus groups and literature research was used. In total, 33 users and one expert were involved in the prototyping process. In the end, the resulting click-dummy was evaluated through the user experience questionnaire by 25 users and two hypotheses were created.

The outcome of the survey and the literature research was that adolescents have knowledge gaps concerning risk free interaction and question concerning HIV transmissions. The result of the prototyping process was “*Alex*-your Chatbot about HIV” which represents a prototype (click-dummy) of a chatbot which answers the users’ questions about HIV. The answers *Alex* provides are a combination of plain text and rich elements (buttons, carousel, quick replies). The click-dummy was evaluated extremely positive but the scale consistence showed inconsistency, this will be explained in detail in chapter 5.3

As a summary, the master thesis is the basis for the development of a chatbot which answers questions according to the user input about HIV. Further studies should concentrate on further developing the results of this work and, how they can be transferred to other populations, for instance for youths in the Asia- Pacific Ocean, where HIV new infection have increased.

Keywords: User Centered Design, adolescents, HIV, chatbot

# Kurzfassung

HIV (menschliche Immunschwäche-Virus) ist ein Thema, das jeden betrifft. Eine Möglichkeit, um zu verhindern, dass sich Menschen mit HIV infizieren, ist die Aufklärung junger Menschen über die Krankheit. Neue Technologien bieten hierfür Möglichkeiten. Ziel dieser Masterarbeit ist es, einen Chatbot zu entwerfen, der jungen Menschen verifizierte Antworten auf ihre persönlichen Fragen zum Thema HIV gibt. Ziel ist es daher, Wissenslücken zu schließen und über HIV aufzuklären. Um den Chatbot zu gestalten, müssen die folgenden Fragen beantwortet werden: (1) In welchen Bereichen haben junge Menschen Wissenslücken? (2) Welche Fragen stellen sie zu HIV? (3) Wie müssen die Informationen im Rahmen eines Chatbots präsentiert werden?

Die vorliegende Arbeit basiert auf einem User Centered Design Prozess, mit einer Umfrage in Kombination mit einer Literaturrecherche. Die Umfrage wurde mit Hilfe von acht Benutzerinterviews und zwei Peer Beratern durchgeführt. Darüber hinaus wurden drei Personas erstellt und von 25 Anwendern bewertet. Im Rahmen des Prototyping-Prozesses wurde von den Anwendern eine erste Idee eines Chatbots entwickelt und durch eine Kombination aus Fokusgruppen und Literaturwissen weiterentwickelt (drei Iterationen). Es wurde eine formative Evaluation mit verschiedenen Fokusgruppen verwendet. Insgesamt waren 33 Anwender und ein Experte am Prototyping-Prozess beteiligt. Am Ende wurde der resultierende Click-Dummy durch den User Experience Fragebogen von 25 Benutzern evaluiert. Daraufhin wurden zwei Hypothesen erstellt.

Das Ergebnis der Umfrage und der Literaturrecherche war, dass Jugendliche Wissenslücken in Bezug auf risikofreie Interaktion und Fragen zur HIV-Übertragung haben. Das Ergebnis des Prototyping-Prozesses war "Alex - dein Bot über HIV", der einen Prototyp (Klick-Dummy) eines Chatbots darstellt, der dem Benutzer Fragen zu HIV beantwortet. Die Antworten, die Alex liefert, sind eine Kombination aus reinem Text und rich elements (Buttons, Karussell, quick replies). Der Click-Dummy wurde sehr positiv bewertet, aber die Skalenkonsistenz zeigte Inkonsistenz, dies wird in Kapitel 5.3 ausführlich erläutert.

Die Ergebnisse der Masterarbeit stellen eine Grundlage für die Entwicklung eines Chatbots dar, der Fragen entsprechend der Benutzereingaben zu HIV beantwortet. Weitere Studien sollten sich darauf konzentrieren, die Ergebnisse dieser Arbeit weiterzuentwickeln und herausfinden in wie weit diese auf andere Populationen übertragen werden können.

Schlüsselwörter: User Centered Design, Jugendliche, HIV, Chatbot

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# 1 Introduction

Human immunodeficiency virus - better known as HIV - is a topic which concerns everybody. People who are HIV positive have a weaker immune system, which leads to a wide range of infections and some types of cancer. After a while, infected individuals become immunodeficient. One problem is that most people are unaware that they are infected with HIV because the symptoms can be compared to those of a cold [1], [2]. Health prevention interventions, such as using a condom during intercourse, are well known to the majority of people. However, in 2017, 1.8 Million people were newly diagnosed as HIV positive [2]. Currently there are 35 Million people worldwide who are living with HIV. In 2016, 9.4% of recently infected people were European youth aged 15-24. Out of those, 14.8% are living in Central Europe. In comparison, only 7.1% of HIV positive infected were youth in Eastern Europe and 10.2% in Western Europe. In Austria, 180 people became infected with HIV and of those, 100 people are living in Vienna [3].

A study of the university of Graz dealt with the topic of the HIV awareness in Austria [4]. The median age of the subject group was 21. The main outcome was that people are indeed aware what HIV is, but do not see it as a personal topic. The study showed that students of the secondary school have knowledge gaps about HIV. Furthermore, people who are sexually inactive tend to have bigger knowledge gaps compared to those being sexually active. The results also showed that the transmission of HIV is not always clear. The Scholars suggested to improve the knowledge about risk free interactions with HIV positive, in order to reduce confusion in this matter, as was shown by participants of the study. Another interesting result was that people who had same sex relationships seemed to be better educated than heterosexuals [4]. On the other hand, the Austrian cohort study about HIV from 2017 showed that HIV infections have increased over the last years between men who had sex with men as well as among women who had sex with men [3]. Which means that there is a need for more education regardless of the sexual orientation.

In 2016, the World Health Organization (WHO) published a Global Health strategy with methods to counteract the spread of HIV. The goal is to reduce the number of HIV infections below 500.000 worldwide for 2020. Part of the action plan is to adapt



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the HIV prevention to a specific target audience [5]. Therefore, new technologies offer a huge opportunity [5]–[7].

One possibility in order to prevent people from getting infected with HIV is to educate young people about the illness and how they can infect themselves with it. Nowadays, although sexual education is part of the curriculum in most western schools, young people are still looking for information about sexually transmitted infections (STI), especially HIV, on the internet. The problem here is that on one hand, they do not get enough information which would provide answers to their questions, on the other that hand some information are incorrect [8].

Since youth are also known as “digital natives”, it seems logical to use new technologies to get in touch with them. Furthermore, it was shown that some youth prefer the internet as a source for topics related to STI, because of the anonymity it provides. Yet, they also do not want to be isolated [9], hence it means that they want to talk about it in an environment where they feel safe and not judged by others.

The aim of this master thesis is to design a chatbot which provides young people with verified answers to their questions concerning HIV. Its aim is hence to fill the knowledge gaps and educate about HIV. In order to design the chatbot, the following questions must be answered:

- (1) In which areas do young people have knowledge gaps?
- (2) What questions do they ask concerning HIV?
- (3) How does the information have to be presented in the context of a chatbot?

Hence, this master thesis is based on the approach of the User Centered Design (ISO 9241-210) [10]. This included to involve the users from the very beginning and contained four steps:

**Step 1:** The first step served to understand the context of use, which in this work resulted from a combination of avalanche and systemic research and a survey. The survey was a qualitative survey (guideline-based interview).

**Step 2:** The aim of the second step was to determine the usage requirements that could be derived from the first step. Furthermore, a design workshop was carried out to concretize the usage requirements.

**Step 3:** The aim of the third step was to develop the chatbot based on the results of step one and two. Here the involvement of experts and user was important.

**Step 4:** In the last step, the chatbot was also evaluated by testers through the User Experience Questionnaire.

In every step users were actively involved, for example by providing feedback on developed materials. Those feedbacks were then integrated immediately.

In Chapter 2 the used methods will be explained. Chapter 3 contains the theoretical background and gives more insight on the following topics: Chatbots, mobile sex education and HIV. Chapter 4 will represent the results and the different stages of the prototypes. In Chapter 5, the last version of the prototype is described as well as the summative evaluation. In Chapter 6, the main findings will be discussed, and hypothesis are phrased. And lastly, in Chapter 7, the research questions will be answered.

# 2 Methodology

This master thesis is based on qualitative research and represents an explorative study, because this supports the user centered design process the best. Furthermore, it helps to find out why things are the way they are and it helps to create a real understanding of the user and the context in which the product will be used [11, p. 50]. Hence, one of the characters of qualitative research and the exploration is to be open to new developments. It is important that the same applies to the author. That requires an active involvement of the researcher with the users [12, p. 34]. The following chapter (2.1) explains first, what user centered design is and how and why the literature research (Chapter 2.2) was conducted. Chapter 2.3 gives an insight on the qualitative survey, followed by the explanation why a Persona (Chapter 2.4) was conducted. After that, a Design Workshop (Chapter 2.5) was carried out, followed by the low level prototyping of the chatbot (Chapter 2.6). The prototyping process is divided into three iterations

In November 2018 an ethics proposal has been submitted to the ethics committee of the Federal State Lower Austria, with the planned procedure of this master thesis. The ethics committee of the Federal State Lower Austria stated that there is no obligation for this study to be submitted to an ethics committee.

## 2.1 User Centered Design

As mentioned earlier, the presented work is based on the approach of the User Centered Design (UCD). This requires a holistic view of the human being in order to design an interactive system. According to ISO 9241-210, four design activities must be considered [10, p. 14]:

- Understanding and describing the usage context
- Specifying the usage requirements
- Designing the design solutions
- Testing and evaluating the design

Figure 1 shows how the methodology used can be integrated into the design process.

## 2 Methodology

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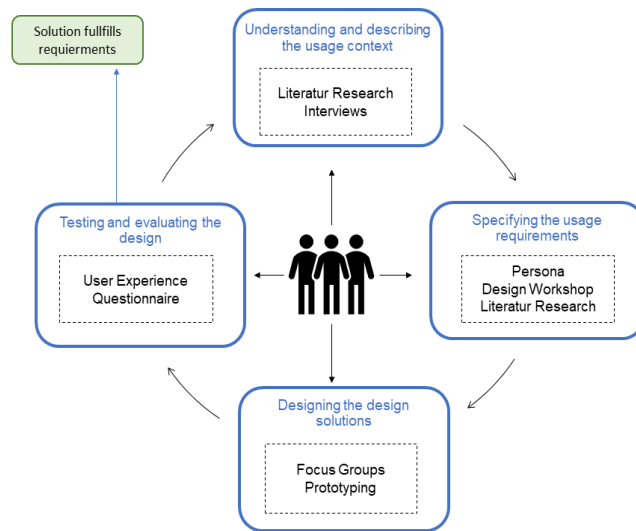


Figure 1: Used methods (written in black) included in the UCD Process

UCD, as shown in Figure 1, is an iterative process, meaning that the results are constantly being improved. By interacting with the users, it is possible to get a deep dive. This avoids developing a product, which would later not meet the usage requirements. In addition, the ideas and prototypes are tested before a final product is created [13, p. 11].

The UCD approach has many advantages. As UCD, for example, enables efficient and cost-saving development of the product or system and it furthermore reduces the risk that the product/system does not meet the needs of its users and stakeholders [10, p. 8]. Figure 2 shows a simplified representation of the design principles of the UCD which must be followed.

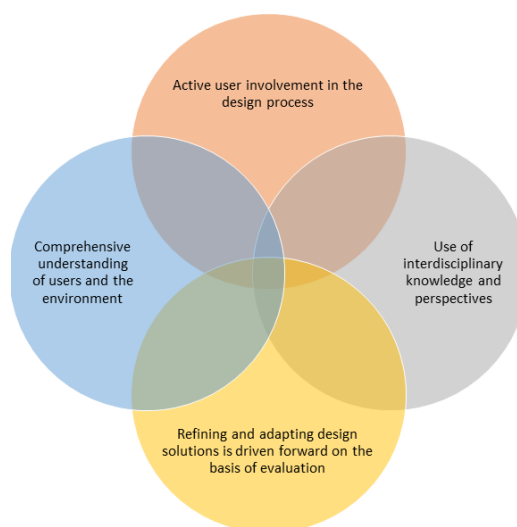


Figure 2: Underlying principle of UCD (modified after [10])

### 2.2 Literature research

As already noted, it is essential in UCD to understand the users and gain background knowledge about the connected topics and the used methods. Hence, a literature research was conducted.

In regard to the literature research, the recommendations of [14] were followed. As a result, the methodology applied is a combination of "avalanche and systematic research" [14, p. 127]. The Google Scholar search engine was used to get an initial overview of the subject area. First, a standard work was identified ([4], [15],[16]) and further relevant literature was researched. Based on the findings of this research, a systematic literature search was conducted in the areas of HIV/STI, chatbots and UCD. The main databases used were NCBIL, SpringerLink, IEEE Explore, ACM and Sage Journals. The following terms were used for the search: youths, HIV, STI, sexual health, chatbot, chat agent, conversational interfaces, social engagement, sexual education, and smartphones. In order to gain profound knowledge in the field of UCD, the above-mentioned databases were also used for finding suitable sources and material. For those, the following terms were used: user centered design, human centered design, evaluation, usability, testing, user experience, and conversational interface. During the search for suitable literature, search terms used were marked with AND, NOT, OR, and \* as required. Both, English and German literature was considered.

### 2.3 Interviews

**Goals and general Information:** Within the framework of the UCD it is necessary to understand the users and to analyze their different areas of life. The main goal of the interviews was to get a better insight in the results from [4] and as a consequence get a better understanding of the target group [11, p. 21].

Therefore, an explorative approach was chosen. Interviews are suitable for this because the interviewee can control the information in connection with the research questions. For this, it is necessary to speak directly with the users themselves, since their knowledge can be used [17, p. 163]. In addition, it is vital to be flexible within the interviews, in order to be able to respond to each respondent individually. Hence, guideline-based interviews were conducted, as those guarantee a high degree of flexibility [17, p. 180]. A guideline ensured that all relevant areas were covered.

**Population:** The sample consists of ten respondents. Eight of the respondents are young adults, aged between 17 and 20, they will be called *subjects* in this thesis.

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Table 1 contains an overview of the age structure. All the respondents are heterosexual. Two respondents are peer educators, aged 20 and 27, and they will be called *peers*. One peer educator is an active counsellor, the other one is currently not working as a counsellor. For reasons of anonymity, it is not specified from which organization they have been trained. Within the framework of the UCD, new insights and experiences can be witnessed, even with a smaller sample.

Table 1: Overview age structure from the respondents (users)

Subjects	N	Mean	Median	1.Quartil	2.Quartil	3.Quartil
Total	8	18,63	18,5	17,75	18,5	20
Male	3	19,66	20	19,5	20	20
Female	5	18	18	17	18	18

**Access and enforcement:** The target group was outlined as a convenient sampling. The search for suitable participants, who were willing to participate in the study, started in the beginning of December 2018, in order to keep the timeframe of this work. Shortly afterwards, between the middle of December and early January, the interviews were conducted. Unfortunately, a contact to a school or youth group could not be established.

Due to the latter, the respondents were reached through personal contacts and in a next step, respondents who were willing to participate, asked their friends. As a result, the respondents where from Germany, Austria, and Swiss; all with German as their mother tongue. In total, eight participants were gathered. The author of this thesis did not know the users before the interviews, this was important in order to reduce the bias, as recommended by [12, p. 337].

In the beginning of the master thesis, it was planned to interview more than two peer educators. Therefore, a large Organization in the field of sex education was contacted and an email was sent out to peer educators. Due to data protection regulation, they received the contact details of the author and could decide themselves if they wanted to take part in the study or not. Unfortunately, none of the peer educators responded. Due to the strict time limitations of this thesis, there was no time to contact them again via another contact method.

Before conducting the interviews, a consent form was developed and send out to all participants. The form was developed according to [18, p. 55], however, slight modifications were needed due to the target group. Before the interviews were conducted, the participants were once again informed about their rights and the purpose of the interview. The interviews were conducted between the 16<sup>th</sup> and 23<sup>rd</sup> of December 2018 and the 2<sup>nd</sup> and 5<sup>th</sup> of January 2019. An interview lasted in average 21 minutes and was conducted in German. Some interviews were

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conducted over the phone, others face to face. The data acquisition process was divided into four steps according to [12], to ensure that all data was captured. Step one included a short questionnaire, with questions about social demographic facts. The second step was the use of an interview guideline followed by an audio recording and lastly a postscript was used which contained information about the interviews itself and. potential conversation after the recording was stopped [12, p. 347].

**Guideline:** The Interview guideline is based on the results of the study from [4], where main findings were identified (see Chapter 3.3). Based on those findings, the interview guideline was developed. The aim was to get a deeper knowledge about the target group its knowledge about HIV and in which topics they were especially interested with regard to HIV. The structure of the guideline followed the recommendation from [18], combined with the guidelines of the example questions from the problem interview from Ruff, 1990 [18, p. 224]. The guideline is in Appendix A. For the peer educators, the guideline from Appendix A was modified and more questions were asked about their experiences. It was also based on the recommendation from [18]. Questions like “Why is that a challenge” or “Can you explain that in more detail?” were used in order to keep the conversation running.

**Evaluation of Interviews:** The interviews were evaluated based on the transcribed sound recordings. They were recorded with an iPhone SE. Non-verbal element were not used. They were transcribed according to the rules of [19] (Appendix C). In the transcript, the letter "I" stands for the interviewer and the letter "S" for the subject (the interviewee). In order to ensure pseudonymity, city and street names were replaced by an “X”, as the information otherwise would potentially allow presumptions about the person. The transcripts were structured using the *MaxQDA*<sup>1</sup> program. All transcripts were kept in German, and were not translated into English, as the translation itself would already be a form of interpretation by the author [12, p. 686].

The analysis was carried out, based on *questions (1) and (2)* posed in the present paper and is oriented towards the interview guidelines. After the interview passages were assigned to the corresponding categories, they were fed into Excel for further processing and were evaluated according to [20] (paraphrasing, reduction, and generalization) [20, p. 606].

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<sup>1</sup> Informationen about MaxQDA: <https://www.maxqda.de/>

### 2.4 Persona

**Goals and general Information:** A persona describes a fictitious user who is based on real data [21, p. 17]. Furthermore, a persona helps to create an understanding for the target group and hence is a good tool to ensure that the designer has the right picture in his head. A persona is essential for effective communication [11, pp. 21 & 144]. For this work, the focus is on the behavior of the user, which is of high importance for the development of a product.

**Creating:** The data came from the interviews, which was clustered subsequently. Using the gathered data is a common approach in the UCD [11, p. 21]. The categories for clustering were derived from [11, p. 21], in combination with [21, p. 77]. The categories are behaviors, attitudes, aptitudes, goals, and motivations. In a first step, the behavioral variables were identified for every user. This was done in *MaxQda*, followed by a reduction to keywords, in order to identify patterns [11, p. 97f.]. The reduction of the statements was done in *Excel* and was then written down on paper, so that the data could be clustered, and patterns could be identified. Afterwards, this was transferred into a table (Table 13, Appendix D). Based on that, personas have been created which represented the respondents the best. As a next step, the results were entered in a template with the categories mentioned above.

**Evaluation:** The persona was evaluated by 25 participants in the Design Workshop (Chapter 2.5). The aim was a formative evaluation, according to [22], to ensure, that the author understood the target group and hence, would develop a product which fits the user [11]. The feedback was transferred to Excel and in the process of the evaluation, inductive categories were created. The feedback of the users was then entered in the previously developed personas.

### 2.5 Design Workshop

**Goal and General Information:** The Design Workshop was integrated in the peer education of the *AIDS Hilfe Upper Austria*. Goal of the design workshop itself was to evaluate the developed personas and to get a first idea of how the information about HIV has to be presented in the chatbot, in order to be successful. To use a design Workshop, to get a first idea of a prototype is a common approach in the field of UCD [23, p. 93].

**Population:** The peer education took part between the 11<sup>th</sup> and 12<sup>th</sup> of February 2019. Goal of the peer education is that the youths develop knowledge about HIV and AIDS and can educate others about this topic. Hence, after the peer education



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they can reflect on their own risk and protection behavior. In total, 25 participants took part in the peer education and were aged between 15 and 18. All the participants are from Upper Austria.

Table 2: Age structure of the participants Design Workshop

Workshop	Mean	Median	1.Quartil	2.Quartil	3.Quartil
Total n=25	16,32	16	16	16	17

**Access and enforcement:** As the workshop was integrated in the peer education, the methods which could be used were limited and had to be decided ad-hoc. The evaluation of personas was implemented on the first day, after the talk “sexuality and language”. A quick introduction about the master thesis was given, followed by the instruction to evaluate the Persona. A short instruction for every persona was given to the participants, which led to a discussion afterwards. After that, the participants had ten minutes to evaluate the personas. At the end, all papers were collected (n=25) and then evaluated as described in Chapter 2.4.

At the second day, the idea generation for the information design was integrated. Again, an introduction about what a chatbot was and its goals were explained and questions were answered. Furthermore, they had the task to use the acquired ways of HIV transmission as the addressed topic. In groups of two to three people, they received a paper on which they were asked to do some brainstorming, based on the knowledge they already gained about HIV, and what they expected from a chatbot. They were given 25 minutes for this task and the author walked around and supported them during the creative process. Afterwards, the paper was collected once more (n=9) nine paper prototypes were created. The paper prototypes were clustered based on the developed characterization of conversational agents from [24]. Based on that a rough prototype was developed in *Botsociety*<sup>2</sup>, which will be referred to as *digital paper prototype V 0.1*.

Summarizing the above, the workshop was used to gather information about the daily life of the participants, their behavior, and how sexual health information is of interest to them. Therefore, during those two days, notes were taken. Now, after completing the peer education, all the participants were HIV peers, including the author of this master thesis.

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<sup>2</sup> <https://botsociety.io/>

### 2.6 Prototyping

**Goals and general information:** A prototype is a simplified representation of the planned final version of the product, or part of an interactive system, and is used for testing. The prototype does not necessarily have to represent "a fully functional interactive system" [10, p. 6]. It is important that the prototype is designed as realistically as possible, so that the gained knowledge can be transferred into reality and the product can be improved [22, pp. 198–201]. This is a good opportunity to test, whether the planned solution meets the user requirements or not. At the same time, to gain a deeper understanding of the users true intentions [10, p. 15]. Therefore, the cooperative design was chosen. Cooperative design is part of the UCD and also known as participatory design [22, p. 374]. Hence, the first idea of a chatbot, which was developed at the design Workshop, was transferred from a paper version to a digital prototype (*digital paper prototype V 0.1*). The described prototyping process is displayed in Figure 3 and is divided into three iterations.

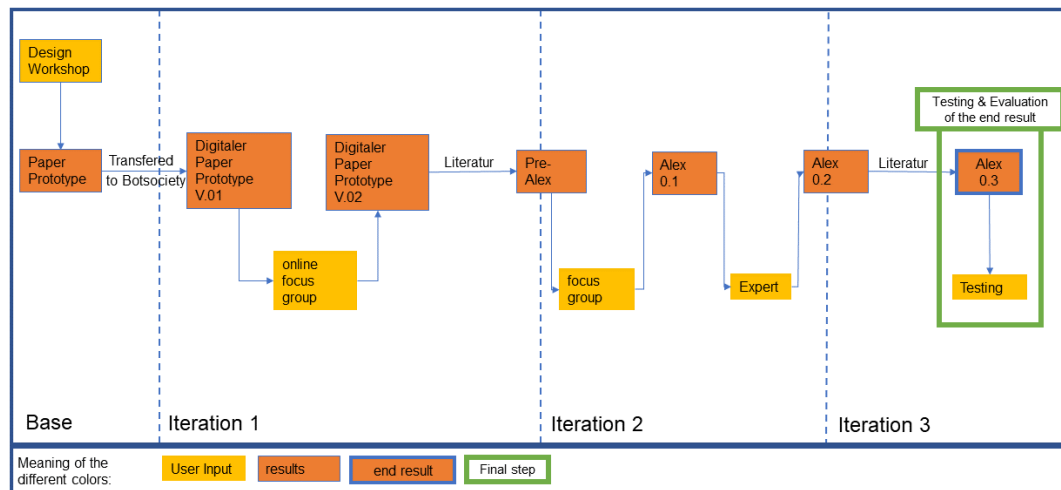


Figure 3: Visualizing of the prototyping process

**Population:** The further development of the Prototype was conducted with two female adolescents, aged 18 and 22 (online focus group). The second focus group its participants were more heterogenous, as the participants were aged 17-23, and both genders were represented. For the testing, 25 testers were recruited, aged between 18-22 and both genders were represented. Table 3 provides an overview over the age structure for each user.

Table 3: Overview participants of the prototyping process

	Participants	Gender	Age
Online focus group	N=2	Female: 2	18 and 22

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		Male: 0	
Focus group	N=6	Female: 4	17 (Median= 17)
		Male: 2	17 and 23
HIV-Expert	N=1	Male: 1	
Testing	N=25	Female: 19	18- 22 (Median= 20)
		Male: 6	20- 23 (Median= 21)

**Access and enforcement:** The participants of the *online focus group* were contacted via the contact details they provided during the interviews and again the snowballing system was used [18, p. 225]. Therefore, the users who stated that they were willing to further participate in the study, were contacted and asked, if they had time on the 3rd of March 2019. Only one of the subjects was available on that day. The subject then asked friends, if they were available on that day. The online focus group session took part via *skype*, because this was the easiest way to further develop the *digital paper prototype V0.1* and to get feedback at the same time. Furthermore, the collaboration software was pre-installed and all the participants already had a *skype* account, which made the communication for all participants easy [18, p. 251]. The “live” prototyping was done within the prototyping tool, *Botsociety*.

Afterwards, the participants were invited to a *skype* call and were presented with a short introduction which was based on the recommendation of [18, pp. 251, 255]. They were then asked to provide some feedback about the digital paper prototype. Through screen sharing, the participants were able to interact with the *digital paper prototype V0.1*. Afterwards, the two main questions were asked, namely which role the bot had and how it will use the media. This was done, in order to be able to answer research question (3) afterwards. Proceeding those steps, studies were researched and the results were added. This prototype, called *Pre-Alex*, was then shown to another *focus group* and once again feedback was collected with the focus on the dialogue design (What happens after the users’ input; How does the bot respond?) [22, p. 375]. Afterwards the feedback was implemented and sent to an HIV-Expert, who evaluated if the provided information was correct.

**Evaluation:** Since the UCD Process involved the active participation of the users, and was an interactive process at the same time, a formative evaluation according to [22, p. 228] was used. A formative evaluation is useful during the design process, in order to immediately gather feedback on the developed product. In this case about the chatbot in terms of what needed further improvement. The evaluation of the digital prototype test was based on notes, taken during the interviews, and the chat records. The suggestions of the participants were

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implemented immediately, together with the participants in the digital paper prototype. Afterwards, a short summary of the results was written.

In addition, results from studies about chatbots and the *Facebook* guidelines were implemented and once more, feedback was collected. This was evaluated in an evaluation workshop according to [25, p. 616]. The Focus group had six participants, aged 17- 23. The *Pre-Alex* was presented to them with a video (as a video prototype) and afterwards, a discussion started, discussing what they liked and what would need improvement. Additionally, feedback about the logo and the key message was gathered. Furthermore, basic dialogs were developed which were then implemented in the *Alex 0.1*. Once again, the resulting feedback was collected, analyzed, and implemented. Afterwards, the *Alex 0.1* was evaluated by an HIV-Expert, who concentrated on questions such as: were the provided information, right? Was something missing? After that, new specifications were made and in a final step, a summative evaluation was conducted, using the User Experience Questionnaire (UEQ) [26]. Chapter 5.2 contains further detailed information on the test-design.

## 3 Theoretical Background

The following chapter contains the basic knowledge of this master thesis and will be used in the implementation process. Chapter 0 will provide an overview on what a chatbot is, as well as a conversational interface. Followed by a description on how adolescents contain their information about sexual health and HIV (Chapter 3.2), as well as answers to the question, why adolescents aged between 16- 24 were chosen as the target group. Last but not least, Chapter 3.3 will contain more information about what everyone should know about HIV.

### 3.1 Basic knowledge about Chatbots

Over the last couple of years, the smartphone usage has changed. People do not like to install new applications (apps) on their smartphones, for example [27]. Due to this, it makes sense to look for new ways to reach future potential users. Especially since instant messaging, social network applications and messaging platforms are becoming more popular. Since five years, 'bots' have become more and more popular because they can be embedded in familiar messaging platforms like Facebook Messenger and Slack [28]. Over the last couple of years, conversational agents, also known as chatbots, have become more and more popular, even related to health subjects [24].

A well-known chatbot in the health sector is *HealthTap*, which helps its users to diagnose health issues based on symptoms. Another chatbot, *Stoptober*, which helps its users to quit smoking, was even developed by the National Health Services in the UK [15]. According to the systematic review of [24] several randomized control trials, chatbots have shown substantial improvement for interventions. For example, improvement of physical activity or the accessibility to online health information. These chatbots did not understand natural language. Lately, there is a huge development in the area of artificial intelligence. Hence, scholars focused on reviewed studies of conversational agents, which allowed any kind of unconstrained natural language for health-related purpose. [24] found out that half of the identified chat agents (7 out of 14) were used for education purposes and were frame based. Still, in the area of healthcare, agent based chatbots are not that common, because they need a huge amount of training. Furthermore, there is no standardized way of the evaluation methods and study designs. In

general, the overall satisfaction with the chatbot, evaluated by the users, was good [24].

Although conducting a thorough research in the area of chatbots and sexual health, only one study was found which covered the topic. [16] developed a chatbot which answers questions about sex, drugs, and alcohol. The aim of the scholars was to answer questions such as: Who are the users? Which is the most interesting topic for the adolescents? How do they like the chatbot? And how will it be used compared to information-lines and search engines. [16] found out that the users were mainly interested in topics concerning sex and had an average age of 15 years. Furthermore, the chatbot was considered to be increasingly unknown and quicker in combination with both data lines and web search tools. The conciseness and quality of data was seen to be better in comparison with web search tools. The chatbot was viewed to be easier to use compared to information-lines and search engines. The amount of information of the chatbot was viewed to be less, in comparison to both, information lines and web search tools [16].

#### 3.1.1 What is a Chatbot and how does it work?

A Chatbot is either a hard- or software that interacts with humans over a conversational interface (CI). The CI can be divided into a text based or speech-based interface. A textual interface means that the user is chatting via text message with the bot. The bot can respond to what the user is saying through artificial intelligence. Same goes for speech-based chatbots, with the difference that you speak with the chat agent instead of typing and it is based on automatic speech recognition [15]. Well known in this area are for instance Siri from Apple or Alexa from Google [29, p. 811]. Since 2016, it is also possible to develop skills for Google Home and Alexa in order to customize them. Bots are mostly used in customer services, marketing, technical support, and so on. Because as mentioned before many messaging platforms have been opened up for chatbots [15].

Figure 4 describes briefly how a chatbot works. The user basically accesses the chatbot true a channel like the Facebook Messenger App, then depending on the chatbot, either starts writing or speaking. This will be continued in the conversation manger. What the user says or types, is an input and the conversation manger controls the flow of the conversation, it decides what the response should be. The sematic representation is possible through the NLU module. To ensure the possibility that the response matters to the user input, it may be necessary to train the NLU previously. The conversation manger will also communicate with the

### 3 Theoretical Background

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integration in the background which is related to a backend data service where it gets the answer to the users' question.

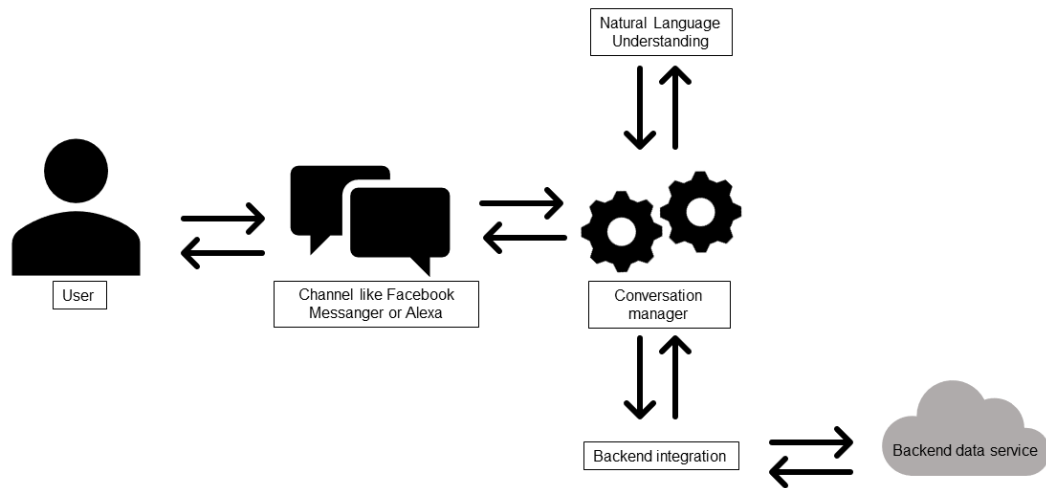


Figure 4: How does a CI work? Modified after [15, p. 39]

#### 3.1.2 Characterization of a Chatbot

Depending on the dialog management and type of technology it is difficult to develop a chatbot [24, p. 1250]. As mentioned earlier there are different types of chatbots. First you can differentiate them into text- or speech-based (a mixture is also possible) chatbots. It also depends on the purpose and the used technology. More important is the dialogue management, as it is the heart of every chatbot. Hence, there are different dialogue management styles. [30] distinguishes between three different systems:

- First, the finite state-based system, which only allows pre-defined user input like single words or phrases. The system always needs to verify the users' input, which means that the user cannot ask any questions or take advantages of the system. The chatbot always leads the conversation.
- Second, there is the frame-based system, which allows more flexible user input. For example, the user can ask questions. Hence, the dialog flow depends on the users' input. In order for this to be possible, NLU is required.
- Third, the agent-based system. This is the highest level of chatbot and allows complex communications between the user and the chatbot. This means that the response and the questions are not constrained. To make this happen, AI is used.

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Depending on the chosen dialogue management style, the knowledge source for the dialogue management may change. Knowledge sources can be for example a task record, a domain model which contains specific information like a train schedule, or a user model which comprehends the users' goals, beliefs, or intentions [30, pp. 93–95]. Furthermore, it is possible that the user takes initiative about the dialogue or the system or mixed [24, p. 1250]. In addition, one distinguishes the system whether it is task orientated or not. This means that the chatbot either helps for example in a booking process (task- oriented) or is has no purpose at all [31]. Table 4, provides an overview of the different dialogue control strategies.

Table 4: Dialogue Control Strategies [30, p. 96]

<b>Features/ Dialogue control strategy</b>	<b>State-based</b>	<b>Frame-based</b>	<b>Agent-based</b>
<b>Input</b>	Single words or phrase	Natural language with concept spotting	Unrestricted natural language
<b>Verification</b>	Explicit confirmation- either of each input or at end of transaction	Explicit and implicit confirmation	Grounding
<b>Dialogue model</b>	Information state represented implicitly in dialogue states Dialogue control represented explicitly with state diagram	Explicit representation of information states Dialogue control represented with control algorithm	Model of system's intentions, goals, and beliefs. Dialogue history, context
<b>User model</b>	Simple model of user characteristics or preferences	Simple model of user characteristics or preferences	Model of user's intentions, goals, and beliefs



## 3.2 Adolescents and mobile sexual health education

Nowadays, 2.78 billion people use smartphones worldwide and in 2021 it will approximately rise to 3.08 billion people [32]. In 2018, according to the JIM Study, nearly every teenager owns a smartphone in Germany (97%). The study collected data from 1200 youths aged 12-19, about information and media. The older the youths are, the more likely they own a smartphone (aged 12-13: 95%, aged 14-15: 97%, aged 16-17: 97%, aged 18-19: 99%) [33, pp. 8–10]. Additionally, almost all youths are using their smartphone and the internet on a daily basis (smartphone usage 94%, Internet 91%) [33, p. 13]. Popular activities on the internet are, for example, the use of search engines like *Google* (87%) or watch videos on *YouTube* (60%), to gain information about a certain topic [33, p. 52]. During the week, in average, youths spend 214 minutes online per day, most of the time communicating (35%) using by WhatsApp [33, p. 31].

A similar study was conducted in Upper Austria, with 500 youths aged 11-18, 94 % owned a smartphone [34, p. 7] and 21% wanted to spend more time on their smartphone [35, p. 11]. They mostly used their smartphone to access the internet (91%) [35, p. 41]. The most popular activities for the youths aged 15 - 18 years are using *YouTube* (60%), instant messaging (44%), and searching information (32%) [34, p. 45].

Furthermore, as adolescents seem to have their phones always with them, having a smartphone also changed the way they interact with each other [36]. Additionally, they use search engines like *google* to and access information [33, p. 79] . It comes by no surprise that the market reacted and hence, nowadays, there is an app for everything, even for sexual health. Yet, they are at high risk for STDs and STIs. According to the Center of Disease Control and Prevention, half of the reported STD accounts for people aged 15-24 [37, p. 21]. Furthermore, adolescents also have a high risk for STIs [8].

As mentioned earlier, adolescents use search engines like *Google* as a knowledge source ([38] in [8]) , but they are concerned about credibility [39, p. 9]. One problem with *google* is that the information listed at the beginning is not necessarily the most trustworthy but depends on the SEO optimizing of the websites. Despite that, not all teens use search engines as they still ask friends, their family, or doctors [8]. While searching for STI they were mostly interested in information such as: where to get tested, how you know if you have been infected, and how they are transmitted. Furthermore, they want to know more about every aspect of sexuality, particularly sexual pleasure. [8] found out that the wanted information, had to be

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accessible, no matter where the youths were at that moment (home, school). Using a mobile device allows accessing information 24/7.

The review of [40] has shown that sexual health education via smartphones is more accurate than through websites, and hence may improve knowledge about this topic. In 2013, according to a review of [41], they found 1937 apps in the Google Play app stores and Apple store, which are HIV/STD related. In the end, they include 55 unique apps in their review, but the downloads are infrequent [41]. [40] suggests that working together with dating apps, by integrating information about the risks of getting infected, should be done in order to reduce negative consequences. Another finding was that women are interested in birth control and period tracker using apps, hence, information about STI could be included in such apps as well. Whereas, men were primarily interested in STI and pregnancy symptom checkers, or alternatives to physical sex [42].

The systematic review from [43] had a closer look about how STI information was delivered via smartphones. Based on that, a smartphone seems to be useful in terms of increasing safer sex behaviors, particularly as people are more likely to do STI testing and have increased clinical attendances. Hence, face- to face interventions include more behavior change techniques (up to 19) compared to smartphone delivered interventions. Although there is a lack of significant findings, one study showed promising increase in condom use. One study had a closer look about how messages about STI had to be conducted [39]. The participants (n=676) reviewed SMS with information about STI especially promoting to get tested. 43 participants aged between 16 and 24 had been recruited to provide feedback on the received text messages. The scholars found out, that the messages should be short and were more memorable when rhymed or tied to special events, like concerts. If the messages were too long, or the participants did not understand them, they just ignored them. Important was to find a balance between humor and informative content. Another finding was that the credibility about the source of the information was important for the participants. Furthermore, the timing when they were supposed to receive the message was also important. The right time therefore was Friday afternoon, because some of the participants went to parties later that day.

[44] found out that youths between 16-29 (N=620) are comfortable with getting sexual health information through social media, no matter of the age, gender, or other influence factors. The only factor which influenced how comfortable youth feel was the sexual experience. As subjects who already had sexual experience were more comfortable with receiving sexual health information through social media (AOR 1.51, 95% CI: 1.02–2.23). Additionally, for 98%, receiving information

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about sexual health would be an additional knowledge source as only 2% would accept social media as the only source of knowledge.

To sum up, all the mentioned reviews and studies mentioned above, delivering sexual health information via smartphones is appropriated, if the aim is to reach out to people between 16-24. Furthermore, delivering sexual health information through a mobile interface is still “private” and can be personalized but the amount of information should be limited as well as the text length. Hence, the youth can decide to sign off. Targeting adolescents aged 16-24 seems appropriated as for example in Austria 52% of the male and 49% of the females have sex for the first time aged 16-18 years [45]. In addition, the health behavior in School-aged Children survey found out that 21 % of the 15-year old’s have had sex. The survey was conducted in 42 countries across the WHO European Region [46]. As especially young people still have to learn and understand the correlation that unsafe sex can lead to accidental and unwanted pregnancy or STIs [46], it makes sense to target them for primary prevention.

## 3.3 Basic knowledge about HIV

The following information are based on the peer education material, provided from the *AIDS - Hilfe Upper Austria* [47], [48] and the information gained during the peer education by the author.

HIV is an abbreviation for “human immunodeficiency virus”. Without any treatment this infection can cause AIDS which stands for acquired immunodeficiency syndrome. AIDS is the most advanced stage of an HIV infection.

HIV is very potent virus that attacks the immune system directly, specifically the CD4 cells also known as “T-Cells”. Basically, the virus reduces the number of CD4 cells, effectively weakening the immune system over time. As the immune system gets weaker over time, the entire body gets weaker and becomes more vulnerable to other diseases and infections. This can be deadly, especially, if cancer or other dangerous infections attack the body. But normally, people who are HIV+ do not recognize that they have HIV because it does not affect them in their daily life.

Unlike other viruses, the body cannot get rid of HIV, even with proper treatment. HIV remains in the body for life. However, there are treatments that help keep the virus in check and can ensure a normal life without any major side effects. HIV infected people must however consume, medication for the rest of their lives to contain the virus. Therefore, they need to go to a specialist every three months to

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check the blood. Currently, there exists no treatment to completely eradicate the virus.

Important to know is that it is not possible to get HIV by shaking hands or hugging a person who has HIV. HIV cannot be spread by casual contact with body fluids like saliva, tears or sweat. The virus cannot survive for long outside the human body, unlike many other infectious diseases, it is not easy to get. Furthermore, HIV is not transmitted through dishes, toilet seats or doorknobs used by a person with HIV. Additionally, it is not transmitted through air, water, or animals like mosquitoes, even though some people may think differently.

#### **What are the symptoms and HIV stages?**

Two to four weeks after initial infection, people (not all) experience flu like symptoms, such as fever and chills. These may last from a few days up to several weeks. In this first stage, also called “Acute HIV infection stage” the virus starts to spread at very low levels. During this stage, there is a very high risk of transmission which is why it is extremely important to take necessary precaution to reduce risks of transmission. As with many diseases, starting treatment in the early stage produces the most positive impact on the body and helps manage the disease more easily.

After the early stage, the virus moves into the second stage which is also known as the “latency stage”. In this stage the virus continues to multiply at very low levels without the person showing any obvious symptoms. This stage can last for several years, depending on the person its medical condition. The final stage, known as “AIDS” usually lasts about three years, if untreated. In this stage, the immune system is severely damaged, and the body is vulnerable to infectious diseases. One way to diagnose HIV is to take a sample of blood and check the CD4 cell count. If the count is below 200 cells/mm<sup>3</sup>, a person is very likely to have an HIV infection.

Most important is to immediately get checked, if the suspicion of being affected arises. Symptoms might not show but one is still very likely to transmit the disease. Even if the virus is detected at later stages, there are many treatments available that can still ensure a long and healthy life. Nowadays it is possible with the right treatment and medication to get children who are HIV negative, even if a parent is HIV positive. Nowadays, women get automatically checked if they are HIV positive during the pregnancy and if the results are positive, they get the fitting treatment.

The most common way to prevent getting infected with HIV is to use a condom during intercourse. Therefore, it is important that youths know how to use a

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condom properly. Another important way is to know whether you have HIV or not. For Example, the AIDS-Hilfe provides cost free HIV testing. Important to add that they are done anonymously, in combination with a professional chat. People who are HIV-positive can get support in such institutions as well.

[4] found out that (N=625) of the youths in Austria have knowledge gaps about HIV, especially in the areas of oral transmission ways and the risks of anal sex. Furthermore, they were not able to make the transfer between theoretical knowledge and potential effects on their sexual activities. 81.1% knew that there is a HIV risk for an unborn child when the mother is infected, whereas only 38.9% thought that HIV can be transmitted through a mothers' milk.. Most of the subjects knew that the vaginal fluid may transfer HIV, but only half of the subjects thought that sex between two women could be dangerous [4, p. 92]. Additionally, the subjects showed knowledge gaps in the area of HIV-treatment. 39.7% thought that HIV cannot be treated thoroughly and 33.3% thought that HIV always lead to death or that HIV+ only have ten years to live. Hence, 40.8% could not really image to be together with a HIV infected person and 30.6% could not image to be together with someone who is HIV+. Furthermore, 50.7% of the subjects would keep it as a secret when they have HIV. In the area of risk-free situations, only 86.4% knew that HIV could not be transmitted by kissing, and only 79.5% knew that sanitation could be used without the risk of getting HIV infected [4, p. 68]. This shows that although some are somewhat informed in this area, there is also a need for further and thorough education.

## 4 Implementation and Evaluation Results

As shown in Figure 2, one of the principles in the UCD process is to get a comprehensive understanding of the users. This understanding was made by conducting interviews (Chapter 4.1) and creating personas (Chapter 4.2). Furthermore, the users were actively involved in the design process, particularly in the prototyping (Chapter 4.3). Therefore, the different prototypes were evaluated by the users and were combined with interdisciplinary knowledge. The resulting click-dummy of the prototyping process will be described in Chapter 5 and evaluated with the UEQ.

Since this explorative study, consists of different steps, such as the qualitative survey, the prototyping, and the testing, different terminology were used in order to bring to mind that in each step different users are involved (Table 5).

Table 5: Who is who?

Terminology	Who?
User	General Term, refers to the target group (adolescents aged 16-24)
Subject	Users who took part in the interviews
Participants	Users of the Design Workshop and Prototyping
Tester	User how tested the klick-dummy

### 4.1 Analysis of the interviews

One goal of the interviews was to understand the users' behaviors better. Therefore, the interviews were analyzed accordingly, keeping in mind *research questions (2)*.

Figure 5 shows which words were most frequently used in the interviews and thus provides a good general overview of the situation as such. The more frequently a word was used, the bigger its appearance and the darker its shade of blue. The word-cloud was created with *MaxQda*, based on the most frequently used word in

the interview. Words like *I* (“ich”), *yes* (“ja”), *even* (“sogar”), and others were excluded from the word cloud. Furthermore, if the word used was used less than four times, it was not displayed in the word cloud.



Figure 5: Most frequently used words in the interviews

As mentioned in the methods, the interview was based on the study from [4]. Its goal was to get an understanding of what the respondents knew about HIV, in order to be able to answer parts of *research question (1)*. This is later the base for creating the content of the chatbot.

Therefore, the codes were built according to the interview guideline. During the process of evaluation, sub codes were developed (Table 6).

Table 6: Code tree Interviews RQ (1)

Code	Question <sup>3</sup>	Amount of coding
HIV & youth	What is the first thing that pops up in your mind when you hear the words HIV and youths?	15
Personal Topic	Does HIV affect you in your daily life? Is HIV a personal issue for you? In what way/ why not?	21

<sup>3</sup> The questions in this table are simplified here. The original question with more detail information is in Appendix A.

#### 4 Implementation and Evaluation Results

<b>HIV education</b>	How were you informed about HIV/ STI how was that for you?	17
<b>HIV Protection</b>	Are you doing something to protect yourself from HIV? What are you doing?	13
<b>HIV+ intim</b>	Can you imagine being with HIV+ people? Being intimate?	15
<b>Condom use</b>	What is your primary motivation to use a condom? Why is that?	4
<b>HIV infection</b>	How can you get HIV?	3
<b>Afraid HIV+</b>	Have you ever been afraid of identifying yourself with HIV?	14
<b>Difference HIV/AIDS</b>	What is the difference between HIV and AIDS? Is there a difference?	8

##### 4.1.1 Interviews: Knowledge about HIV

**HIV & Youth:** When the respondents were asked what they associate with HIV & Youths, the answers differ from each other. Both S6 and S7 said that HIV is a venereal disease and they mentioned that it leads to immune weakness. Furthermore, for S6, HIV is something negative, because disgusting pictures ("eklige Bilder") have been shown her in the past. S2 thinks that many people have prejudices which trigger a chain reaction because HIV "is something really horrible" ("das ist was ganz schlimmes"). In contrast S1 and S3 think about HIV and AIDS when they see advertisements, covering the topic such as posters of the *Gib Aids keine Chance* campaign. For S1 this is especially the case, when he hears the slogan "pay attention and always use a condom/protection" ("passen Sie auf, benutzen Sie ein Kondom"). Both say that HIV is something what you often hear about ("hört man immer davon").

**Personal Topic:** All respondents have in common that HIV could not be described as a topic which concerns them on a daily basis. S4 and S6 mentioned that HIV is sometimes present in their life, for example, when there is an advertisement concerning this topic (S4) or they learn something about it in school. S8 thinks that especially for youth, HIV is an important topic because other youths have a lot of sexual contacts, however, at the same time, he excluded himself from this. Only S5 mentioned she talked once to her friend about it, because she had sex for the



#### 4 Implementation and Evaluation Results

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first time. For S1 talking about HIV is a topic which is discussed in a relationship because it's personal. S7 thinks about it similar:

„Firstly, because I currently have no boyfriend, so I think because of that and then also because it was explained in that way. Not mainly, but still partly, because gays are more affected and yes, that is why I feel that for me, it is nothing that really affects me or that if of my concern.“ (S7, 13)

“zum einen, weil ich zurzeit keinen Freund habe, wahrscheinlich des und zum anderen, weil es auch so erklärt wurde. Nicht hauptsächlich aber doch schon zum Teil, weil eher die Schwulen davon betroffen sind und ja, deswegen finde ich für mich deswegen ist es für mich zurzeit nicht etwas, was mich wirklich betrifft oder dass ich mich beschäftige.“ (S7, 13)

By asking for the reason why HIV does not concern them, S1, S2, S3 and S5 stated that none of their friends are HIV+ and hence it is not present for them. S3 described this very well, saying „for me, this is just a topic which is far away, from my current life“ („für mich ist das einfach ein Thema, dass voll weit weg ist, eigentlich von meinem jetzigen Leben“). S4 stated that it “only happens in third world countries anyways“ (“passiert sowieso nur in Entwicklungsländern”). HIV could become more present for S3 if she knew someone who was HIV+ infected.

**HIV education:** Every respondent was educated about HIV in school, especially in biology. S2 mentioned that in addition to their regular biology lessons, the biology lesson they had on World AIDS day, provided them with further information in regard to the topic. In addition to the school lectures, S7 was educated in a workshop. In her opinion, workshops are important in making HIV a topic more reachable and less of a taboo to talk about. S5 reflects that she would have liked a workshop. Even though, S8 was educated about HIV in school, it was not that big of a topic and he said that he mostly gets the information from different sources: “if, then mostly on the internet” (“wenn dann hauptsächlich über das internet”). The problem S8 sees is the following:

„and because often it is the case then that you just start to google it somehow and then you end up with some web doctors who then tell you something and [...] that leads from one thing to another and you end up with random information being thrown at you from everywhere which might not even fit the case.“ (S8, 15)

“und zwar oft Mal ist es dann so, dass man halt einfach anfängt irgendwie rum zu googeln und dann kommt man wieder auf irgendwelche Web Doktoren die einem dann irgendwas erzählen und [...] das führt dann von

#### 4 Implementation and Evaluation Results

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einem zum andern und dann kommt man bekommt man eben überall irgendwelche Informationen an den Kopf geworfen die jetzt so vielleicht nicht zu treffen.“ (S8, 15)

S1 mentioned that he knows a lot about HIV through short clips and advertisement on TV but also added: “I usually don’t watch TV anymore” (“jetzt schau ich eigentlich kein Fernseher mehr”).

**HIV Protection:** To protect themselves from HIV the respondents said that they would use a condom during sex. S4 and S7 declared that, although they did not have sex yet, that they would use a condom as protection when starting to have sex. However, S2 and S7 would consider having sex without a condom if they knew that the person is not infected and they said that they would simply ask the person, to get the information. In contrast S4 would not trust that a person is healthy:

„I would just never trust on that and just insist that the protection is in place, just so it does not somehow, I think it is just not a thing where you can say, yes that happens based on trust or so.“ (S4, 19)

„Ich würde halt auch nie darauf vertrauen, und halt darauf bestehen das der Schutz vorhanden ist, nicht das es irgendwie, ich glaube, das ist auch keine Sache wo man sagen kann, jaaa das ist natürlich auf Vertrauensbasis oder so.“ (S4, 19)

Only S6 mentioned that she would use gloves if she would help someone who is bleeding and in case S6 would ever use drugs, S6 will only use clean syringes. S5 pointed out that nowadays, having sex with a condom is not highly regarded, primarily when the person is in a relationship:

„no, without [condom] it’s way better – I am taking the pill anyways and I think that many let themselves be fooled to say, well okay I am taking the pill that’s enough.“ (S5, 27)

„nee ohne [Kondom] ist viel besser- nehme doch die Pille und ich glaube, da lassen sich total viele auch immer verleiten, zusagen, ja ok ich nehme die Pille, das reicht.“ (S5, 27)

In general, the use of a condom has different meanings. S2 can understand that many teenagers first think about using a condom when they do not want to get pregnant and for S7 it is the other way around.

**HIV+ intimacy:** The main finding was that being close with a HIV+ person was a difficult question for the respondents. Only S2, S5 and S7 could imagine to be intimate with an infected person. But for them, it is important to know that the

person is HIV+. S3 and S6 were not sure and could not answer the question right away. Asking about the reason, S3 said, “you are simply afraid for yourself” (“man hat einfach Angst um sich”). S1 for example, cannot image having children with someone who is infected with HIV, because the risk would be too high that the children are HIV positive. According to S4, knowledge may help to improve the acceptance:

„I think it's more, that, that's the other was around, that in such situations somehow because you panic, because you are not familiar with them and then somehow says, what oh god, that you just, yes I think that is just a problem, but in general if you protect yourself, than it is no risk in theory.” (S4, 25)

“Ich glaube eher, das, dass anders rum ist, das man irgendwie mit solchen Situationen irgendwie vor Panik, weil man sich halt nicht auskennt und dann irgendwie sagt, was oh mein Gott, das man da einfach, ja ich glaube das ist einfach das Problem, aber generell also wenn man sich selbst schützt dann ist das ja eigentlich kein Risiko.“ (S4, 25)

On the other hand, friendship with an infected person would not be a problem for S8, S3, S2, because „with just a friend, you do not get as intimate” (“weil einfach so ein Freund der, mit dem wirst du ja nicht intim“) (S2, 32).

**HIV Infection:** The possibility of getting HIV due to having unprotected Sex with a HIV+ person was clear for all respondents. However, not the possibility of getting infected via blood transmission. Especially for S8 that topic was not clear:

„how is it with the, with the infecting, would it be enough [...] if you have an open wound? And it somehow gets in contact with, I don't know, with spit or blood from an HIV infected person, would that already be enough?” (S8, 53)

„wie ist denn das mit dem, mit dem anstecken würde es einfach nur reichen [...] wenn man eine offene Wunde hat? Und die irgendwie in Kontakt mit was weiß ich Speichel oder Blut von einer HIV infiziert kommt würde das schon ausreichen?“ (S8, 53)

Knowing that they themselves could get infected, was difficult for the respondents. S1 said „I have a pretty good feeling for body and soul and I think I would have some sort of feeling that I was not feeling well” (“Ich habe ein relative gutes Gefühl was Körper und Geist so angeht und ich glaube da hätte ich so ein gewisses Gefühl, das es mir nicht gut geht”) (S1, 28).

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**Afraid having HIV:** None of the respondents were afraid to be infected with HIV up until now. Only S1 had the feeling that he got infected once at a party, because he had blood on his elbow:

„Well, sometimes I do have the fear, because I have this open wound and then it gets right in – oh my god, you just think about it the whole time then if you could be infected with it [HIV] now.” (S1, 20)

“Also manchmal habe ich da schon Angst, weil da habe ich eine offenen Wunde und dann kommt es direkt rein - oh mein Gott, man macht sich halt tausend Gedanken darüber ob man jetzt es [HIV] haben könnte.” (S1, 20)

S4 and S5 had no intercourse so far and hence they did not think that they could be infected:

„well, I have never been intimate with somebody in that sense, that’s why I really did not think that there could be problems” (S4, 35)

“also ich bin auch noch nie mit jemanden intim geworden in der Richtung, deswegen habe ich echt nicht gedacht, dass es Probleme geben könnte.” (S4, 35).

If they were afraid of having HIV, all respondents except S6, would go to a doctor and make a test. If S6 would be afraid of being infected with HIV, S6 would not know what to do:

„I wouldn’t know what I had to do, therefore I would google what I had to do.” (S6, 41).

“Ich wüsste nicht was ich machen muss, drum würde ich Googlen was ich machen muss.” (S6, 41).

Once, a friend of S5 made a test because she was afraid that she might got infected after a one-night stand:

“She [the friend of S5] then asked again: hey, last night we had sex and I asked you if you were healthy and you did not respond to that – are you, yes or no? And then the whole situation was weird, he did not respond and then said, what she was thinking of him and then in the end, before having to discuss it with him here, rather went to the doctor.” (S5, 25)

„dann hat sie [die Freundin von S5] halt danach nochmal gefragt: hey, wir hatten in der vergangen Nacht Geschlechtsverkehr und ich habe dich gefragt ob du gesund bist und du hast nicht geantwortet- bist du es, ja oder nein? Sind dann war das alles voll komisch, der hat dann nicht geantwortet und dann gesagt, eh was denkst du

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denn von mir und hat dann halt schlussendlich bevor ich hier rumdiskutiere mit ihm gehe ich lieber zum Arzt.“ (S5, 25)

**Difference AIDS/HIV:** Five of the respondents knew that there is a difference between AIDS and HIV and how they are connected to each other. S3, S7 and S4 did not know that they are connected. In Addition, S3 thought that there is no connection between HIV and AIDS. S7 and S4 knew that there is a difference between them but were not sure what it was, S4 said that “it is always named in the same context” (“das wird immer in einem Zusammenhang genannt”) (S4, 41).

### 4.1.2 Evaluation of the Peer Interviews

S9 had similar experiences during the peer lessons, namely that, in general, the knowledge among young adults about STD and STIs is low:

“The fewest knew, [...] what other deceases there are, which are transmittable. Everybody knew that “AIDS” and that was more or less it [...] everybody knows HIV, so far everybody was informed, nobody knew however what it actually is.” (S9, 42)

„Die wenigstens wussten, [...] was es noch für Krankheiten gibt, die noch übertragbar sind. Es kannten alle diesen „AIDS“ und waren dann auch schon relativ zu ende [...] also eigentlich HIV kennt jeder, soweit waren alle aufgeklärt, was es war wusste aber keiner.“ (S9, 42)

In the experience of S9 many youths do not know what HIV is “HIV is HIV, that’s it” (“HIV ist HIV, fertig aus” S9, 27). Depending on the age of the youths, the interest for the topic changes. For example, S10 had the feeling that youths aged 16-18 are more interested in sexual health than youths aged 13- 14 (S10, 35-37). Despite of the age, according to S9, they paid attention “when it’s about fucking” (“wenn es ums bumsen ging”) (S9, 40).

The main educational task S9 and S10 had, was to teach the youth about HIV in combination with sexual health. Both mentioned that talking about STD/ STIs also includes talking about sexuality and relationships in general. According to S9, the most important thing was to keep in mind:

„you should not take away the fun part of sex for them, but you should prepare them to do it the right way.” (S9, 29)

„Du sollst den nicht den Spaß am Sex verderben, sondern du sollst sie drauf vorbereiten, das richtig zu machen.“ (S9, 29)

„Doing it right“, also included knowing how to use a condom, how to store it, and why that is important (S9, 41). One of the main challenges is „to teach people that

condoms do not only prevent pregnancies” (“den Leuten beizubringen dass Kondome nicht nur Schwangerschaft verhindern”) (S9, 41). Having sex without a condom involves trusting the other person. For S10 “that is something serious” (“das ist wirklich was gravierendes”) (S10, 44) but at the same time it is not a “rational decision” (rationale Entscheidung).

The challenge is that young people think they know it all, because everyone heard about it before somewhere (“die meinten sie wüssten eigentlich schon alles, jeder hat eigentlich schon was davon gehört” S9, 23). According to S9, it is not about telling them how uninformed they are, it is more about asking question and let them speak freely. The best way to show them their lack of knowledge, is by asking them questions and let them speak freely. As they will then realize by themselves that they do not know as much as they think. By telling them directly that they know only little or nothing they will be in a “defensive attitude” (S9 11- 35). It is important to show that unprotected sex can be dangerous, as one can get infected with HIV. HIV is a serious illness, as once one is infected, cannot just get rid of it.

Based on the experience of S9, talking in the class about these topics can be challenging for the youths because:

„Because in your class, there are always, homies, friends of people, in front of whom you do not want to lose your face by asking some questions.” (S9, 29)

“Wenn deine Klasse immer deine Kumpels, Freunde irgendwelche Leute hast vor denen du nicht das Gesicht verlieren möchtest, indem du irgendwelche Fragen stellst.“ (S9, 29)

Therefore, S9 said that it is only possible in a private setting. One way to solve this challenge could be that the teacher asks the youths to write down their questions individually and collect them before discussing them, as this will provide them with a feeling of anonymity (S10, 13).

#### 4.1.3 Interviews: Interesting Topics

In order to answer *research question (2)* all interviews were analyzed one more time. The first step was to look at what users asked concerning HIV and the next step to look up where users asked questions and used words like *I think* (“glaube ich”) and *isn't it* (“oder”). This is based on the assumption that users did not know, whether what they said was true or not, and hence, expected a reaction from the interviewer.

As mentioned before, all respondents had a basic knowledge about HIV, but some had further questions. Table 7 provides an overview of the subject areas and how

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many users asked question about it. To get a better understanding, example questions are provided as well. Most questions and requests were about HIV infection (n=18). More specifically, the respondents have shown an interested in further transmission routes (n=8), for example the respondents mentioned the HIV transmission through blood and during intercourse but asked if there are other transmissions routes than the ones they knew of already. Another area, where questions were asked a few times (n=4), was concerning families. For example, if children will be healthy when one parent has HIV? How long will the other person live? Apart from this, risk free interactions were not that clear either. During the interviews, S3 and S4 realized that they did not know as much as they thought they knew and that they needed more information about this topic. Three questions about the connection between HIV and AIDS and four question about the treatment of HIV came up. Finally, some of the respondents wanted to know in which countries people are HIV+ (n=2), because they knew that HIV does not only occur in developing countries.

Table 7: Overview Question and topics of interest (interview)

<b>Subject Area</b>	<b>Amount of questions</b>	<b>Example Question</b>
<b>HIV Infection</b>	<b>18</b>	
Blood	3	Can I get HIV by blood contact?
mucous membranes	2	HIV is transmitted over the mucous membranes?
further transmission paths	8	Are there other infection ways to get HIV than blood and intercourse?
oral	1	That does it mean, when I have oral intercourse, can I get HIV as well?
kissing	2	When I kiss someone who is HIV positive can I get HIV?
salvia	2	Is HIV transmitted by salvia?
<b>Miscellaneous</b>	<b>19</b>	
Body reactions	3	What happens with the organs? What does HIV do in the body?
Test	2	When do I need to make the HIV fast test? How long is the timeframe?
AIDS/HIV	4	What is the difference between HIV and AIDS?
Prevalent	2	How many people have HIV currently?
Children and Family	4	Can I get children if my partner his HIV positive? Will the child be HIV positive?

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<i>treatment</i>	4	When my partner takes medication, how high is the risk when we have unprotected sex?
<i>Functionality of the Chatbot</i>	1	How does the chatbot work?
<b><i>Risk Free interactions</i></b>	3	What are risk-free intimate interaction with someone who is HIV positive?

## 4.2 Persona

In order to build a chatbot, it is important to consider who will later use the chatbot. Therefore, the interviews were analyzed according to the following variables: activities, attitudes, aptitudes, motivations, and skills [11, p. 98]. [11, p. 98]. Based on the analysis of the interviews, three different Personas were created which represent the respondents the best. In the following section, each persona will be briefly described.


One persona is *Maria*, she just graduated from school and has her first boyfriend. She does not have much sexual experience and is afraid to talk about sexual health with her boyfriend, although it is an important topic for her.

*Samuel* (Figure 6), the second persona, is a student who has a lot of sexual experience and uses the internet as a source of information. For him, using a condom is kind of normal but he admits that sometimes he does not use it especially when he is in a relationship. Talking about sexual transmitted illnesses is not an important issue for him.

In contrast, there is *Johanna*, who is aware of these topics but does not always make rational decisions. For her, having a one-night stand with someone she does not know is a difficult topic, especially when they did not use a condom.

The personas of Maria and Johanna can be found in Appendix E.





*„ I always have a condom with me, whether I use it or not is then the other thing“*

**Samuel Weber**  
Age: 20  
occupation: student  
Status: single

I think I'm well informed about sex. I already had a few girlfriends. I have acquired most of my knowledge myself - mostly via the Internet. Sometimes when I'm in town I see a billboard with "don't give AIDS a chance" or something, sometimes I think about HIV and stuff. So far I have never worried that I might have been infected with HIV. I don't really talk much about it with my friends - these are very personal conversations that only concern me and my girlfriend. And I mean, if I don't have a girlfriend, it's different again, it's about having fun.

**Motivation**

- Relationship- sex without condom
- Wants a long life

**Activities**

- Condom, always with you
- Likes to go to student parties

**Attitude**

- Trust is important
- The character of the person is important

**Skills**

- Basic knowledge about HIV
- "google"

Figure 6: Persona - Samuel Weber

### 4.2.1 Evaluation of the Personas

During the Design Workshop the three Personas were evaluated. Each participant got a paper with the Personas on it and was asked to answer the following questions:

- What did you like about the Persona?
- What can be improved?
- Is the persona realistic?

To answer the question, the participants had 15 minutes. Afterwards the papers were collected and evaluated. Appendix F, Table 14 - Table 16, present the evaluation of the personas.

Out of 25 participants, 22 thought that *Maria* was realistic. Two of the participants mentioned that many girls have a similar problem and do not know how to talk to the partner. Almost half of the participants said that it was good that she thought about HIV and her own health (N=12). Furthermore, four participants liked that she was careful (N=4) and said that she was a good example (N=4). In addition, two participants liked that she cared about protection. Almost half of the participants suggested that she should talk to her boyfriend about it (N=12). Two participants suggested that HIV, and in general STI, should be an open topic in her relationship. One participant advised her, to take a HIV-test with her boyfriend. Two people did not like the name and four participants that the spelling should be improved. Three participants mentioned that the description was not realistic because pupils do not

have the “Matura” with 16, as in Austria high school graduates are at least 18 years old.

*Samuel's* description was very popular. All participants thought that Samuel was a realistic person. Six of the participants mentioned that unfortunately a lot of boys and/or girls carelessly deal with the topic. Furthermore, they liked that he always carried a condom with him (N=8) and that he used the internet as a source of information (N=5) and was well informed (N=2). They also liked that he talked with his friends about the topic (N=3) but on the other hand did not tell them everything (N=2). According to the feedback of the participants, Samuel should be better informed about HIV and STI (N=7) and realize how serious HIV is (N=5). Hence, Samuel should always use a condom (N=3). Also, that he should not use Google as is only source of information (N=5), think more about HIV (N=3), and talk to his girlfriend (N=2).

The description of *Johanna* was a bit more difficult for the participants. Three participants thought that the description was not realistic. Two participants did not provide any information. The other twenty participants thought that she was realistic. Yet, for one participant Johanna's description was the most realistic one of all. Nearly a quarter of the participants liked the way she acted, when she was afraid of having HIV (N=6) and that she was well educated about sexual health (N=4). That Johanna thinks about HIV (N=4) and thinks about getting children or how it would affect them (N=3). Furthermore, almost a quarter did like that trust was important for her (N=6). Hence ten participants suggested that she should always use a condom, especially when she did not know the person. Johanna should take HIV more seriously (N=3) and always go to a doctor (N=4). One Participant claimed that the description of Johnna is not rational.

Summarizing the above, in general the description of the different behaviors of the persons are realistic. On one hand the feedback showed that there is awareness for the topic but on the other that the participants did not always have the same opinion. For example, some of the participants thought that it was ok to use the internet a source of information for sexual health topics and some disagreed.

### 4.3 Prototyping

The prototyping was alienated into three parts. Part one was the design of the paper prototype during the HIV-peer education (Chapter 4.3.1). The second part was the further development of the paper prototype with an online focus group, referred to as *digital paper prototype V 0.1* (Chapter 4.3.2). The last part contains

the further development of the digital prototype V 0.2 including the knowledge of the Facebook chatbot guidelines (in the following referred to as Facebook guidelines) and studies (Chapter 4.3.2.2). This Chapter is the basis for the chatbot, named *Alex*, (Chapter 5) and answers *research question (3)*.

### 4.3.1 Results of the Design Workshop

The Design Workshop was useful to get a further insight on the target group and how they talk about sexuality and other relevant topics. In general, all the participants already had an interest in this topic, since they were about to become HIV-Peers. Nevertheless, it turned out that the participants dealt differently with the topic of sexuality, especially regarding how open they were about it. For the majority of participants, HIV is a very personal topic which should be discussed with the partner in private. For other participants, it was a topic which could be spoken freely about.

#### How can HIV become more interesting for youths?

During the workshop, the participants stated that there are several series on Netflix concerning sexual health topics, which they watched. The following series were mentioned:

- Élite <sup>4</sup>
- Sex Education <sup>5</sup>
- Lovesick <sup>6</sup>

Especially *Élite* confronted them with the topic of HIV, because the main character has HIV and opens up about this in front of her classmates one day. According to the participants, this is a good way to provide information. Furthermore, they mentioned that so called influencer play an important role, because they listen to them on YouTube. Another good way to raise awareness is through public figures, like stars and newspaper articles. Both was mentioned during the interviews and three respondents used Freddy Mercury as an example.

**Idea of first Chatbot:** During the Design Workshop a first idea of the chatbot was developed by the participants. Appendix X shows the different chatbots, developed by the participants. Out of nine paper chatbots, eight started with a personal greeting on both sides and finished with a good-bye valediction. The other chatbots

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<sup>4</sup> More information about the series: <https://www.netflix.com/at/title/80200942>

<sup>5</sup> More information about the series: <https://www.netflix.com/at/title/80197526>

<sup>6</sup> More information about the series: <https://www.netflix.com/at/title/80041601>

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started the conversation right away. The chatbot had different roles. For example, in two cases, the bot was seen as a good friend, in another case the bot was seen as an Aids-peer or someone who worked at the *Aids Hilfe*. Two times, the chatbot had the role of someone famous, such as Asa Burrerfiled, who is an actress of the Netflix series “Sex education”. In one case, the chatbot was a homosexual man, who was afraid to be infected with HIV+. The messages themselves were kept mostly short, similar to a normal chat in real life. The short messages led to the feeling that there was always an exchange between the chatbot and the user. In almost all cases, the users asked the questions and the chatbot answered them. In one case it was the other way around, as the chatbot asked the user questions. This was because in that case, the user came with a concrete suspicion but did not provide any information. In addition, there was a chatbot with one very long message, which contained everything users need to know about HIV. Most of the time, the chatbot message contained more information than asked, but the information provided was always linked to the question which was asked. Table 8 contains an overview of the characterization of the developed paper chatbots. Those ideas were once again summarized and a first prototype, called *digital paper prototype V 0.1*, was created using the tool *Botsociety*.

Table 8: Characterization of the paper chatbots (1-9)

		1	2	3	4	5	6	7	8	9
Start/ End	Welcome and Farewell			x	x				x	x
	Personal			x	x				x	
Dialogue Initiative	User	x		x	x	x	x	x	x	x
	Chatbot		x							
Reason for use	Personal matter				x				x	x
	General Question	x		x		x	x	x		
Kind of Questions	Only question and answer	x	x			x	x	x	x	x
	Question Answer Query			x	x					
Input	Written	x	x	x	x	x	x	x	x	x
	Visual		x	x						
Output	Written	x		x	x	x	x	x	x	x
	visual		x							
Dialogmanagement	Frame based	x	x	x		x	x	x		
	Agent based				x				x	x

### 4.3.2 Iteration 1

The following chapter shows the first iteration of the prototyping process which includes user involvement (Chapter 4.3.2.1) and the additional information (Chapter 4.3.2.2).

#### 4.3.2.1 Prototyping with online focus group

Together with the online focus group, the digital paper prototype was discussed and further developed (digital paper prototype V.02). During the process, the focus groups' understanding of the personality of the chatbot and the use of social media was accomplished. The commented *digital paper prototype V.01* is attached in Appendix G.

Both participants liked that the chatbot, which they later referred to as “bot”, did not use formal language. This was important to them, because otherwise it would feel like talking to a doctor. With this version of the “bot”, they had the feeling to talk to a friend or big sister. One of the participants mentioned that they had to be on the same “base”. Greeting the user by name, reduced the tension at the beginning and gave them the feeling of being on the same level. They liked that the bot provided a bit more information than asked, but that the extra information was still relevant to the topic. The participants suggested that the bot should provide additional information to important topics. For example, how HIV is transmitted was important for everyone, here buttons with every transmission way should be provide. When the user clicks for example on “mothers’ milk” (“Muttermilch”) information about the transmission via “mothers’ milk” (“Muttermilch”) will be provided. If the topic is not that important, such as additional information on the medication or therapy, the information should be only provided when the users asks.

Regarding the personality of the bot, the following subjects are important: the bot should be like an older sibling, it should not use formal language and be gender neutral. Furthermore, the bot should say where the information is from, so that the user knows that the information is clarified. During the prototyping, the participants mentioned that the bot should deliver a key message at the end of every conversation, such as the slogan from the organization Youth Against Aids “do it with love, respect and condoms”. Furthermore, the bot should have no gender in order to talk to boys and girls. Yet, the idea that the bot could be a star or actor was declined, because it would have to be someone who everyone likes and is well known at the same time. Also, the bot should not be to funny but could use a bit more of humor according to the participants. On the other hand, it should not include gamification or anything similar, as the topic is to important and serious.

The use of media was also mentioned by the participants. They suggested that the bot could provide links to videos or podcasts when it fits the topic. Nevertheless, in general, the messages should be short, to provide a similar feeling as if the user would text with friends. According to one participant, young people text the whole time anyways and are hence used to switch back and forth between different tasks, such as watching a clip on *YouTube*, reading memes and simultaneously chat with other people. Videos should be used at the end of the conversation, in case the user wanted more information about HIV. In general, it could be useful to provide links for further information concerning the asked and answered question. The improvement of the digital paper prototype V 0.1 is called digital paper prototype V 0.2 and can be seen in Appendix H.

Based on the input of the focus group, the name *Alex* was given to the chatbot. *Alex* is gender-neutral name and the red ribbon (sign for AIDS) can be integrated easily in the name. Through the red ribbon, a connection to HIV/AIDS is made. Furthermore, a key message was developed. The key message is “#SAEFTYFIRST” (Figure 7). Because as one of the users said, “better safe than sorry” (“Vorsichtig ist besser als Nachsicht”). The circle is an abstract symbol for a condom. Additionally, a circle can be easily integrated in the profile picture and present the key message at the same time. The Logo is shown in Figure 8.



Figure 7: First Ideas *Alex*- slogan



Figure 8: first idea for the logo

#### 4.3.2.2 Designing of Pre- *Alex*

In order to further develop the digital prototype V 0.2 in *botsociety*, existing guidelines, such as the design guideline for chatbots from *Facebook* and other studies, were combined with the outcomes of the prototyping of the online focus group and are represented here.

The Facebook guidelines [49] recommend, to keep the messages sent by the bot as short as possible. Because it is likely that the user gets distracted and forgets about the conversation otherwise. This was already considered in the two versions

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of the prototype of *Alex*. Furthermore, [28] recommends to keep the interactions short and precise. The Facebook guidelines suggest to enrich the conversation through the use of media and interactive features, such as providing short answers in order to generate a GUI. This was already mentioned by the participants of the online focus group - due to that fact a “button” is already include as well as pictures.

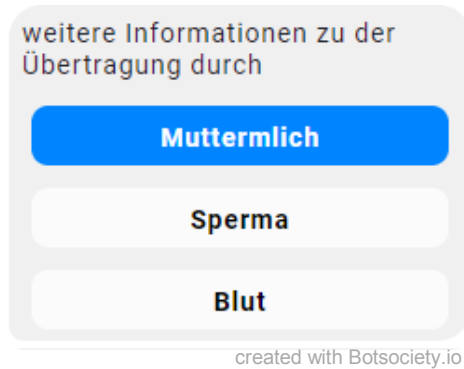


Figure 9: Button: HIV transmission (*digital paper prototype V. 0.2*)

The button allows the users to decide in which area they want to have further information. For example, in Figure 9, “mother’s milk” (“Muttermilch”) is selected. If the user clicks on the button mother’s milk, more information to this topic will be provided, without the users having to ask further questions. Through using buttons, information can be provided when it is necessary. Clicking on “mother’s milk” like in Figure 9 a “developer-defined payload” will be shown [50, p. 9].

As described in the literature research (see Chapter 3.2, [44] , [7]) the participants mentioned that they need to know that they can trust the information provided, otherwise there is no value for them. Hence, the opening text states the source of the information by including the reference “”from the Aids-Hilfe” (“von der Aids Hilfe”).

The digital paper prototype V 0.2 included only text-based input, which the participants were familiar with, but suggested at the same time, to use videos. Buhi et al. 2013 cited in [8] that teenagers would like to receive additional information about sexuality through podcasts, videos, or blogs. In the second prototyping step, this was further enhanced, and the user provided suggestions when and how to use media. Furthermore, the bot should use language which is familiar to its users while at the same time being not too informal. The participants wanted the chatbot to be in German, yet not high-German. As otherwise, they would feel like talking to a doctor or adult. Additionally, the better the user is known, the more interesting the chatbot could be for the target group. That is why the actual users are included in the design process.

By including the youths in the design process, it became apparent that they liked a personal greeting, preferably by their name. They also mentioned that the bot could include a bit of small talk, in order to make it more personal. Those two things together gave them the feeling that they were talking to a human instead of a robot or machine. On one hand, the “is typing” indicators made them feel like the bot responded personally to them, on the other hand, conferring to [28] using the “is typing” indicator can be frustrating for its users, especially when the bot does not understand the users’ input. According to the results of [51, p. 15], several studies have shown that users trust the chatbot more when they experience it as more entertaining. The participants of the focus group mentioned that it is important that there is a clear separation between an actual friend and the bot, but the bot should still be friendly. That is the reason why it is important to give the bot a personality and make clear what the bot is able to do and what not [52, p. 112].

The SMS 2008 study from [39] sent out text messages to 192 participants aged 15 to 24, containing information about sexual health. The participants of this study liked that they used humor and rhythm while providing information, for example, that they should always use a condom. The participants of the focus group mentioned that as well and suggested that humor could be used after a while when the chatbot approaches them. This was implemented in *Pre-Alex* afterwards (Appendix I).

### 4.3.3 Iteration 2

The following chapter shows the second iteration of the prototyping process which includes the results of the evaluation of *Pre-Alex* with a focus group (Chapter 4.3.3.1) and the additional information (Chapter 4.3.3.2). As well as the evaluation with the HIV-Expert (Chapter 4.3.3.3).

#### 4.3.3.1 Results of the Evaluation of Pre-Alex: Focus Group

As mentioned in the section before, the feedback of the users and several studies was considered in *Pre-Alex*. Once again, an evaluation workshop was held, and feedback was collected. During the workshops, notes were taken (Appendix J).

All participants liked the introduction question “How is HIV transmitted?” (“Wie wird HIV übertragen?”) of the bot, because in their point of view it is the most important thing to know. Furthermore, it was important for them that the user is the one who is leading the conversation, because they want to be in control since it is not the most interesting topic. One of the participants mentioned that the bot should not start by asking a question like “Do you know what HIV is?” (“Weißt du was HIV ist?”) because the users could just say yes and skip the conversation. All the other



participants agreed on that. That is why they suggest that when the users have no questions the bot should send an informative graphic, presenting the most important facts about HIV, and then the users can decide if they have questions (The path “tell me something” was added later on in *Alex 0.2*).

During the interviews with the users, the most frequently asked question was about the transmission of HIV. After gaining more knowledge about that, further questions can be asked by the users depending on their personal interested.

The overall message style was “good”. All the participants mentioned that they liked the use of emojis, because the chat seemed more natural, as they usually use emojis when they chat with friends. Furthermore, the “is typing” indicator gave them the feeling that the bot took the time to responded individually to their questions. Two users liked the idea of including pictures, because they, in their point of view, encourage them to think about certain topic because it confronted them with them. On the other hand, two participants thought that the pictures are unnecessary, because they did not provide any information.

Out of six, three participants suggested not to use the logo because it seemed like they would talk to their parents. Furthermore, none of the participants saw the circle as a simplified condom and as a result, they did not like the color. One participant mentioned that the color was to girly and should be gender-neutral. Four of the six participants liked the name because it was gender-neutral. One participant suggested to use a female name, because men like to talk more to women than to men.

During the evaluation workshop the question came up, how the chatbot should respond if the chatbot did not understands the users’ questions. All the participants agreed that the bot should not say something like, “I’m sorry I don’t understand your question” because they perceived it as rude and unpolite. Therefore, they suggested that the bot should say nicely that it cannot help but, at the same time, provide a solution, for example to suggest contacting the AIDS-Hilfe.

### 4.3.3.2 Designing Alex 0.1

In order to design more messages, the responses made by the users in *Further topics*, which indicated the areas they were further interested in, were collected. Those were:

- Risk free interaction
- HIV risks - when yes when no?
- Oral intercourse
- Living with HIV

- Medicine

Furthermore, it was discussed what else they wanted to know when they, for example, clicked on “Mother’s milk” (“Muttermilch”). In that case, they said that they would like to get more information about whether it is possible to have a family when the mother is HIV positive, and what exactly HIV is.

One result of the prototyping with the online focus group was that buttons should be used for topics which are important, like the transmission of HIV and risk-free interactions with HIV+ person. This user case coincide with the general use of buttons – buttons are normally used, to provide information about certain topics or allow the user to decide in which direction the conversation should go [50, p. 9].

As a result, in this context, buttons were used for topics which are defined as important by the participants, in combination with the previously gathered knowledge about HIV. The buttons allow the users to gather knowledge without “actively” asking and in case they do not know about some aspects, they may click on it because they wonder what it means. Based on that, the button “Transmission ways” (Figure 9) was changed to “vaginal fluid” (“Scheidenflüssigkeit”), “sperm” (“Sperma”), “mother’s milk” (“Muttermilch”). The button „vaginal fluid“ was chosen, because as descried earlier, many users show insecurities in this area. However, many subjects and participants knew that “sperm” can transmit HIV. It is important to have more knowledge about it, because it has the highest transmission rate. The button “mother’s milk” may help to reduce prejudice about HIV. As, for example, three of the subjects had questions concerning that topic. Furthermore, another button was created, namely “transmission rates by oral sex” („Ansteckungsrisiko bei Orlaverkehr“). The study from [4] has shown that there are uncertainties in the area of oral transmission of HIV. Some of the subjects had also a lack of knowledge in this area. Depending on the question, this button may be changed. Hence, there is another button called “transmission rates by oral sex” („Ansteckungsrisiko bei Orlaverkehr“) with the button “active” and “passive”, since the transmission risk changes depending on the part the user has during the oral intercourse.

[4] suggested to provide information about risk-free interaction, rather than HIV-transmission, based on that and the view of the participants, another button “Risk free interaction” was created. To change the ways the information is provided a new button “no HIV risk/HIV risk” (“kein HIV-Risiko/HIV Risiko”) was created, to provide an answer to the questions about HIV-risk.

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During this iteration Figure 10 was designed<sup>7</sup>. The first statement is based on the results of the interviews, but also on the interaction with the participants. The participants told the author that they still know people who think that the anti-birth pill protects them for a HIV infection. There are no studies to proof this but still, it is wrong, hence, it is important to put the rightful information there. For example, every subject and participant knew that a properly used condom will protect someone from getting HIV. The second fact is an outcome of the peer workshop, since the participants did not know about the medication and, furthermore, it is currently the campaign slogan from the AIDS-Hilfe in order to reduce stigma. For this work, the English version was chosen, in hope that it increases the interests of possible users. Fact four and five are based on the outcomes of the interviews as well as the results from [4]. The interviews showed that there are some insecurities about risk free interactions with HIV+ infected people. Summarizing the above, when looking at Figure 10, the users will immediately know important facts about HIV.

These results were included in *Alex 0.1* in combination with the results of the interviews described in Chapter 4.1. *Alex 0.1* can be accessed the link provided in Appendix K.

- WHAT YOU ALREADY  
KNEW ABOUT HIV
1. Die **Anti-Baby-Pille schützt nicht** vor einer HIV Infektion
  2. **Undetectable** viral load = **Untransmittable** HIV
  3. **Jeder Mensch kann sich mit HIV infizieren** – egal ob arm oder reich
  4. HIV gelangt über **offene Wunden und Schleimhäute** in dein Körper.
  5. HIV wird über **Körperflüssigkeiten wie Blut und Sperma** übertragen.
  6. **Bei sozialen Interaktionen** wie Händeschütteln oder küssen besteht **keine Gefahr einer HIV Infektion.**

Figure 10: What you already knew about HIV

### 4.3.3.3 Evaluation Alex 0.1 with HIV expert

Furthermore, one last round of evaluation was conducted with an HIV- Expert to assure that the provided information contained the right knowledge and to ensure

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<sup>7</sup> The shown figure is already the evaluated version of the primary infographic. The information is the same, only the wording changed.

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that no one will be upset by the answers (gender sensitive language, right order of the contained information and teenagers' language). The Flowchart was sent to the expert in the field of HIV and young adults, and comments were added. For example, instead of using words like anal and oral sex, the verbs "blow" ("blasen") and "lick" ("lecken") will be used. Because according to the expertise of the expert, the target group is sometimes confused by the meaning of anal and oral. Furthermore, the card "Ansteckungsrisiko bei Oralverkehr" from *Alex 0.1* presented in Figure 11 was modified to be more age appropriate (*Alex 0.2*). In the field of sex education, the terms an active and a passive person are well known, but those phrasings are not as familiar to the youths, hence they are explained in the chatbot. In addition to some messages, more facts were added or rewritten. For example, in the beginning, the answer to the question „So it is possible to get a child, who is not HIV infected, even if the mother has HIV?“ („Also ist es möglich ein Kind zu bekommen, das nicht HIV+ ist, selbst wenn die Mutter HIV hat?“) was answered with „exactly, under the condition that the pregnant women is taking HIV medication“ („genau, unter der Voraussetzung, dass die Schwangere die HIV Medikamente nimmt“). After the evaluation, the following information was added to the original answer „Otherwise, one speaks of a 40% chance of a transimssion from the mother to the child (approx. 10% whil it is still in the womb, 15% during labour, and 15% while nursing“ („Sonst spricht man von einem 40%igem Risiko der Übertragung von Mutter auf Kind (ca. 10% schon im Mutterleib, 15 % beim Geburtsvorgang und 15% über das Stillen)“).

Based on that, some messages became very long and were hard to read, however, as mentioned earlier the *Facebook guidelines* suggest keeping messages short an simple [49].

The feedback was then integrated into *Alex 0.2*. *Alex 0.2* can be accessed via the link provided in Appendix K.

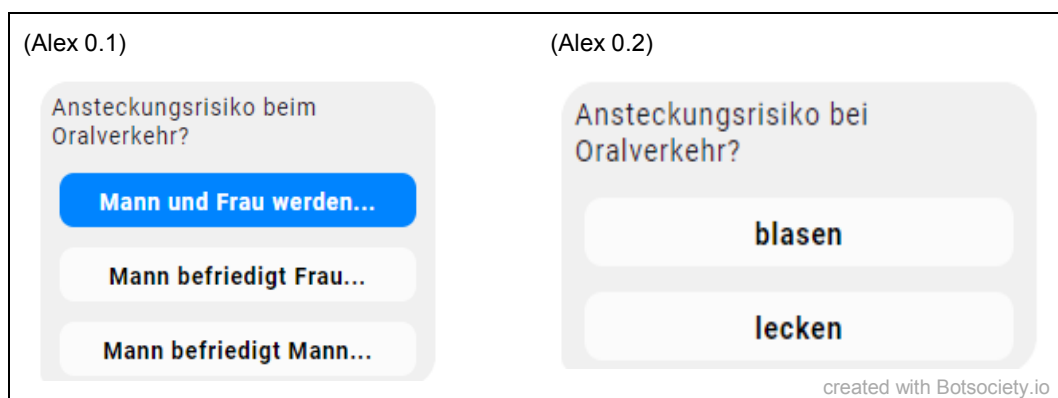


Figure 11: Adaption to the youths

### 4.3.4 Iteration 3

The third iteration is split into two chapters as in the following chapter, more literature will be added, for instance the answers of *Alex 0.2* will be structured. The resulting Version (*Alex 0.3*) is the end results and will be evaluated and tested in Chapter 5.

#### 4.3.4.1 Designing of Alex 0.3

An important part of the chatbot was to provide information, according to the needs of the target group. As presented in Figure 11, input from experts is important, but at same time, due to the added information, the sentences got longer and contained more information. As a result, the question of understandability was risen again. Due to that, new research was conducted, in regard to the understandability of information. Keeping in mind that the idea of the chatbot in this work is to be used on a smartphone or a Facebook-messenger. A Smartphone screen has limited space due to the screen size. Furthermore, the Facebook Messenger has a character limit of 320 characters [50, p. 54]. Twitter, for example has a character limit of 280 per message since 2018- bevor that it was 140 [53].

The author could not find any additional information about the content usability of chatbots, except what has been mentioned before, like the Facebook guidelines. Problem here is that many chatbots are used in the field of marketing and not for educational purposes. In regard to websites, content usability is quite common. For example, [54] was looking into further depths, what influenced the user experience for teenagers (aged 13-17). One of the most significant findings was that teenagers had poor reading skills and were impatient. The best online encounters for youngsters are those, which show them something new or keep them concentrated on an objective. Still, teenagers like to interact with things rather than just reading about them. Therefore, it is important that the provided information is age appropriate, which includes the use of the right language. According to [54], teens identify with substance made by peers. A common tool to check the understandability of websites are reading ease indexes. For the German language the Felsch-reading-index is used.

#### Four dimensions of understandability

According to [55, p. 142] understandability can be split into four dimensions:

- simplicity,
- structure,
- short-concise,
- additional stimulation.

Most people think about simplicity first, when talking about understandability. Simplicity means that the sentences should not contain too many foreign words and that the sentences should be short at the same time. [56, p. 57] suggest that the sentences should contain between 9 to 13 words. The term structure stands for the structure of the answers as well as the representation. The structure of the answer means that, in order to answer a question, the most important information should come first, and additional information may be provided afterwards if needed. The term representation means that it is useful to highlight certain words, use paragraphs and, depending on the length of the text, use headlines in between. Short- concise means that the aim should be to provide as much as possible information with less words. The last dimension, additional stimulation, can be achieved by using pictures and/ or addressing the reader directly [55, pp. 142–146].

Additionally, [55] conducted a study where he had a closer look on how the understandability was influenced by the four dimension of understandability. They found out that no matter of the school background, all pupils benefited from the comprehensibly prepared text. Another outcome was that 65% of the reader, who read the comprehensibly prepared text, also wanted to read further material about the topic. [55, pp. 151–155].

Based on the findings above, every answer *Alex 0.2* provides, was again checked by the author according to the four dimensions of understandability and were restructured if needed. Additionally, the use of emojis was reviewed. The use of emojis is nowadays quite common, especially in plain-text messages [57]. In addition, during the prototyping, all participants mentioned that they liked the use of emojis since they use it as well. Due to that fact, emojis were only used in plain-text messages, for instance, the “nerd” emoji, when there was an additional fact or the use of a “red triangle” emoji when the user should pay attention- since Botsociety does not allow bold or colored letters. Table 9 shows a selection of the used emojis. In this case combination of words and “pictures”.

For the additional stimulation buttons, carousels, quick replies, and emojis were used. The result is *Alex 0.3*, which was then referred to as *Alex- your chatbot about HIV* and will be described in the following chapter.

Table 9: Used emojis in the context of Alex

Emojie name (iOS)	When was it used?	Example
:small_red_triangle:	risk / important to know	:small_red_triangle: Das Risiko erhöht sich dann, wenn Menstruationsblut auf

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		die Mundschleimhaut gelangt!
:man:	oral satisfaction	:man: -> :man: Mann befriedigt Mann
:woman:	oral satisfaction	:woman: -> :man: Frau befriedigt Mann
:relivied:	no worries	Du musst also keine Berührungsängste haben :relivied:
:nerd:	Additional important information	Wie du dir das vielleicht merken kannst :nerd_face:: die Viruskonzentration im Sperma ist höher als in der Scheidenflüssigkeit.
:silghtly grin:	Further questions	Magst du dich noch weiter über HIV informieren? :silghtly grin:

Since the integration of the development content from Botsociety to Facebook messenger was not successful (Appendix L) *Alex 0.3* was restructured. In order for the tester being able to interact more. As *Alex 0.3* has interaction elements but the content, for instance in which area the user wants to have more information, cannot be described by the user. *Alex 0.3* can be accessed via link provided in Appendix K.

## 5 Alex - your chatbot about HIV

So far, several interactive prototypes were created with *Botsociety*. Each prototype, except the last one, was evaluated and further developed by participants who represented the users. The last prototype, *Alex 0.3* “Alex - your chatbot about HIV” was built based on the last evaluation results in combination with the results of the interviews. The provided content was then evaluated by the AIDS-Hilfe Upper Austria, which checked the content for understandability (*Alex 0.3*). “*Alex*-your chatbot about HIV” is the result of the prototype process and will be assessed with the UEQ. The following chapter will describe the final result of the prototyping process (Chapter 5.1) and the chatbot for testing (Chapter 5.1.1), the test design (Chapter 5.2) and in the end the results of the testing (Chapter 5.3).

### 5.1 Description of Alex- your chatbot about HIV

*Alex* - your Chatbot about HIV (in the following referred to as *Alex*) is the prototype of a chatbot, represented as a click-dummy which answer the users’ questions about HIV. The dialog system was developed based on the knowledge gained during the peer education and contained the most important facts about HIV. This is based on the recommendations of the AIDS-Hilfe Upper Austria which were gathered through the peer education and were collected during the prototyping process. Depending on the option choice, a possible user path, which was developed with the participants, is presented.

This prototype provides an idea, how the planned solution may look like. It represent the ideal, based on the lessons learnt of the interviews and the prototyping process with the users, including design principles [49] and [50], and studies in the area of mobile sexual health. Table 10 shows important findings for developing an actual chatbot.

*Alex* is a friendly chatbot who answers questions about HIV. Furthermore, *Alex* is a gender-neutral chatbot, so that every user can think of it as a big brother or sister according with whom they would feel more comfortable with to “talk” to. Therefore, *Alex* is solution-orientated and if *Alex* does not know an answer, a solution will be provided. For instance, it will suggest calling a Help-hotline or provide an email address to which the user can refer to. Phrases like, “I’m sorry I don’t understand



## 5 Alex - your chatbot about HIV

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what you said” are avoided, because some participants indicated in the process that this appears rude. So far, *Alex* can answer questions concerning the following areas: HIV-transmission, testing, HIV risks, risk free interactions, protection, HIV, and families. These areas have been developed with the participants.

All answers are structured according to [55] and use the users’ language. Therefore, a combination of plain text messages, text-messages with emojis, buttons, and quick replies are used. Additionally, the answers were designed in such a manner, that they first respond to the question and then provide additional information within the subject area, instead of just answering “yes” or “no”. Buttons are used to indicate, if more information are provided in that specific area. Quick replies are used when a decision is needed, or at least the user will be directed in one direction.

Table 10: Important findings for *Alex*

Chatbot	Important findings
Character	Friendly Big sister/brother – gender neutral Solution oriented – goal to answer questions
Tonality	Keep it simple Provide additional information Use “buttons” as option for things that everyone should know like HIV transmission and risk- free interactions
Media	Use emojis Biological stuff-> video Buttons, quick replies and carousel
Conversation	Input - written Question from user bots’ answers Always provide a solution Use “is typing” indicators

### 5.1.1 Alex for Testing

For the testing of *Alex*, *Alex* had to be changed in order for the tester being able to interact with it and not only read it. Therefore, *Alex* was restructured and presents only a part of the developed prototype. Besides, the use of rich elements for testing purpose were reviewed. The button “risk free interactions with a person with HIV+” (“Risikofreie Interaktionen mit HIV+ Menschen”) was changed to a carousel, because a carousel offers the opportunity to display a lot of different data in combination with pictures [50, p. 8]. Since there is more than one risk free

## 5 Alex - your chatbot about HIV

interaction, the use of a carousel seemed to be appropriate as well, as it changed the interaction with the click-dummy. Furthermore, the use of images is a good way to increase the engagement with a chatbot [50, p. 57]. Additionally, a carousel is often used when similar information is presented [50, p. 56].

In the beginning, the tester can choose between the options “I have questions” and “tell me something”. Since *Alex* is only a click-dummy, the tester could not actually ask questions, but choose from a pool of questions from different areas, which are a result of the prototyping. Additionally, the question areas needed to transfer to quick replies and the areas are displayed with numbers, otherwise the tester could not have chosen the questions which came later. Quick replies are normally used when the user should make a decision [50, p. 9]. By clicking on the quick replies, a predefined payload will be shown. Figure 12 shows the structure of the click dummy.

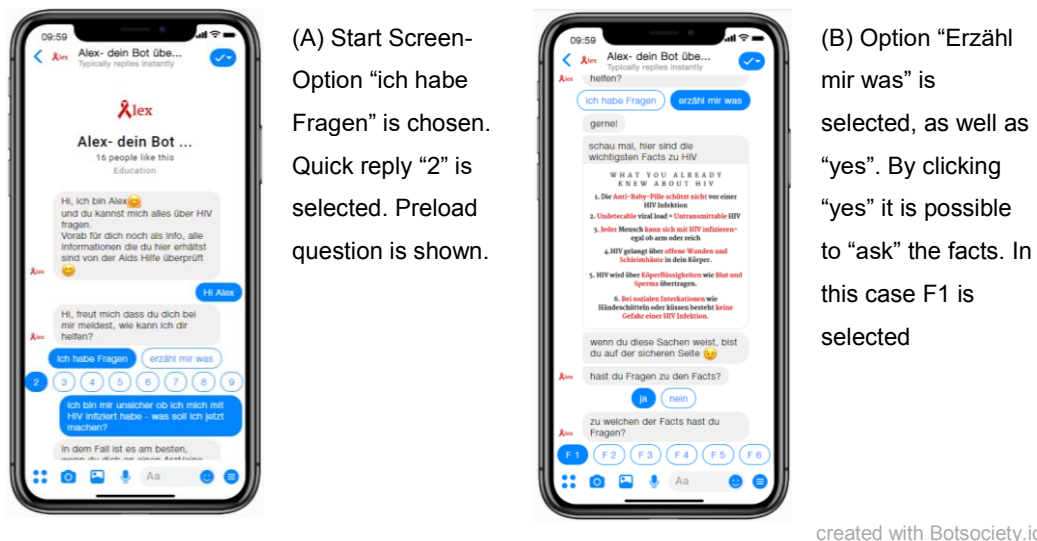


Figure 12: *Alex* for testing purpose

Table 11 provides an overview about the subjects. Each question path contained between 1-3 question according to the subject. After that the testers could decide by clicking either “yes” or “no” if they wanted more information about HIV and choose another number. Each path contained text messages with emojis and some had buttons and pictures within. In the path “tell me something” (B) the infographic (see Figure 10) was shown. Each fact was represented through an abbreviation like F1. Clicking on F1, questions, which might be ask according to this fact, were presented. After each path, the testers could decide if they wanted to “ask” more questions about the facts.

Table 11: Meaning of the numbers (quick replies) in the path “i have questions”

Quick replies: “I have questions”	Questions in following area
1	General questions about HIV
2	Afraid of having HIV?
3	Family and HIV ?
4	Information about testing?
5	Symptoms of HIV ?
6	HIV-Risk?
7	No HIV-Risk?
8	HIV and anti-birth-control?
9	Risk-free interactions?

## 5.2 Testdesign

**Goals and General Information:** In a last step the click-dummy *Alex – your Chatbot about HIV* of the prototyping process was evaluated in order to fulfill the requirements of [10] and assess the design results [22, p. 228]. Part of the UCD is the User Experience, which is why the User Experience Questionnaire (UEQ) was used to find out how the tester experienced the product. The UEQ is provided by [26] and can be downloaded from their website<sup>8</sup>. Furthermore, the aim of the testing was to find out, in which of the provided use cases they would use the chatbot and in which topics they are interested in.

**The UEQ- Questionnaire:** The UEQ is an end-user questionnaire containing 26 bipolar items which represent the User Experience. These items can be divided into following dimensions: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation, and Novelty [58]. The items are represented in a seven-stage scale ranged from -3 to +3. The former represents the most positive answer, 0 a neutral, and +3 the most positive answer. Of those six dimensions, 50% were aligned with a positive phrase at the beginning whereas the other half had a negative one. Those alignments were done in a random order. [59]. The user experience is usually interpreted by mean and standard deviations. The common understanding of each scale its mean implied that qualities between - 0.8 and 0.8 speak to a neutral assessment of the correlating scale. Values higher than 0.8 argue for a positive assessment whereas qualities lower than - 0.8 imply a negative

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<sup>8</sup> <https://www.ueq-online.org/>

assessment [58]. The scale consistency was calculated with the Cronbach's alpha. According to [60, p. 231] in [61, p. 87] provided the accompanying general guidelines: " $\alpha > .9$  – Excellent,  $\alpha > .8$  – Good,  $\alpha > .7$  – Acceptable,  $\alpha > .6$  – Questionable,  $\alpha > .5$  – Poor, and  $\alpha < .5$  – Unacceptable".

**Population:** Since no cooperation with a school or university could be built before, the presented testers were a convenient sampling. Therefore, personal contacts were used. Users who were willing to take part in the testing, asked their friends, who asked their friends. Excluding criteria were people aged under 16 and over 24, as well as students of human medicine or similar studies and professions such as nurses. Furthermore, the testers needed to live in Vienna or lower Austria, in order to make sure that they were able to meet in person.

**Access and enforcement:** In the beginning of the testing the structure of the click-dummy was explained (see Chapter 0). This was important, in order for the participants to know what they could expect. Because as mentioned previously, the tester could not ask individual questions but pre-programmed ones only, at this stage. In the beginning, every tester was asked to choose, whether they would use the chatbot for asking questions, or if they wanted that the chatbot tells them something about HIV. Depending on that decision, every tester could do as many rounds as wanted. Furthermore, they were instructed to choose topics, about which they wanted to know more or had questions. While the testers interacted with the click-dummy, the author left the room in order for the testers not feeling pressured. After the test was finished, every tester had the opportunity to ask the author more questions about HIV or if something was not clear in a message or when they had different questions than the one which were pre-programmed. After the testers had finished the testing, the recoding was ended and the testers filled out the UEQ questionnaire, immediately afterwards.

Additionally, the goal of the testing and the master thesis were explained. Furthermore, all the testers were asked for permission to collect their sociodemographic information (age, gender, school/study) and to film the interaction with the click-dummy without the use of audio. Of course, every tester had the right to say no and to refuse the saving of the contact details. All the tests were conducted in person, partly at the home of the author and partly at the home of the testers themselves.

**Evaluation:** The click-dummy was evaluated by means of a summative evaluation in order to access the design results and explore the user experience [22, p. 228]. Therefore the UEQ was used (Appendix M). For the analysis of the questionnaires the provided excel sheet by the UEQ-Company was used.

## 5.3 Results of the testing

The Results will be split into two parts. Part one describes the interaction with the click-dummy (Chapter 0) and part two the results from the UEQ (Chapter 0).

Overall, 25 testers participated in the testing of the click-dummy. The testers were aged between 18 and 23 ( $M=20.56$ ). Most of the tester were women ( $N=19$ ), aged between 17 and 23 ( $M=20.37$ ). The male testers ( $N=9$ ) were aged between 20 and 23 ( $M=21.17$ ). As mentioned before, the testing took part at the home at the author ( $N=14$ ) and when necessary, at the home of the testers ( $N=11$ ). The testing took part during the 13<sup>th</sup> till 16<sup>th</sup> of April.

### 5.3.1 Interaction with the click-dummy

All the participants could decide freely, if they had “questions” or if they wanted that the chatbots tells them something about HIV and decide as well, if they wanted to know more or not. Three testers started the test but stopped it because they had questions to the test enforcement, these attempts have not been rated. Overall 25 tests were completed.

In general, 2.7 rounds were performed by each tester. One round contained the clicking of either “I have questions” or “tell me something” and the choice between a number (1) - (9) or a fact F1-F6. Each number represent a category of questions, for example “1” contains general information about HIV. If the testers clicked on “(1)” in the click-dummy, the payload question “What exactly is HIV?” (“Was genau ist eigentlich HIV?”) appeared, as well as the corresponding answer. If the tester chose the other path, “tell me something”, and chose to get more information about the statement, a payload question appeared, and the corresponding answer was presented. For the option “I have questions” an average of 2.9 topics were clicked, whereas in the option “tell me something” and average on 2.4 topics per tester were chosen.

Out of 25 testers, 16 choose the option “I have questions” and 9 testers wanted that the bot told them something about HIV (“tell me something”).

**Results of the option “I have questions”** Two out of the 16 testers, chose that they wanted to “ask” general questions about HIV (1). All the described results are visualized in Figure 13. Six testers wanted to get more information, in regards to what they should do, if they were afraid of having HIV (2). The third category (3) (Family and HIV?) was clicked five times. Four testers wanted to “ask” questions in the area of HIV transmission (4). In the transmission way path, the testers had the opportunity to gather more information about three transmission ways vaginal

fluid, sperm, mother's milk ("Scheidenflüssigkeit, Sperma, Muttermilch") or not to click on the button at all. Out of those four testers, one tester clicked on "sperm" ("Sperma") and three on "mother's milk" ("Muttermilch"). None of the testers clicked on "vaginal fluid" "Scheidenflüssigkeit". Six testers wanted to know more about HIV-Testing and consultation (5). Nine Testers wanted to "ask" questions in the area of HIV- Risk (6). Trough clicking on (7) the tester could receive more information about the symptoms of HIV. Four Testers choose (7). Seven Testers wanted to ask about HIV and the anti-birth control pill (8). (9) contained questions to risk free interaction with HIV and was clicked three times. Within (9) the three testers could decide, if they clicked on the button" risk of infection in oral sex for the active person" and choose between "blowjob" ("blasen"), "licking" ("lecken"), or none of these options. "Blowjob" ("Blasen") was selected by two testes and "licking" ("lecken") once.

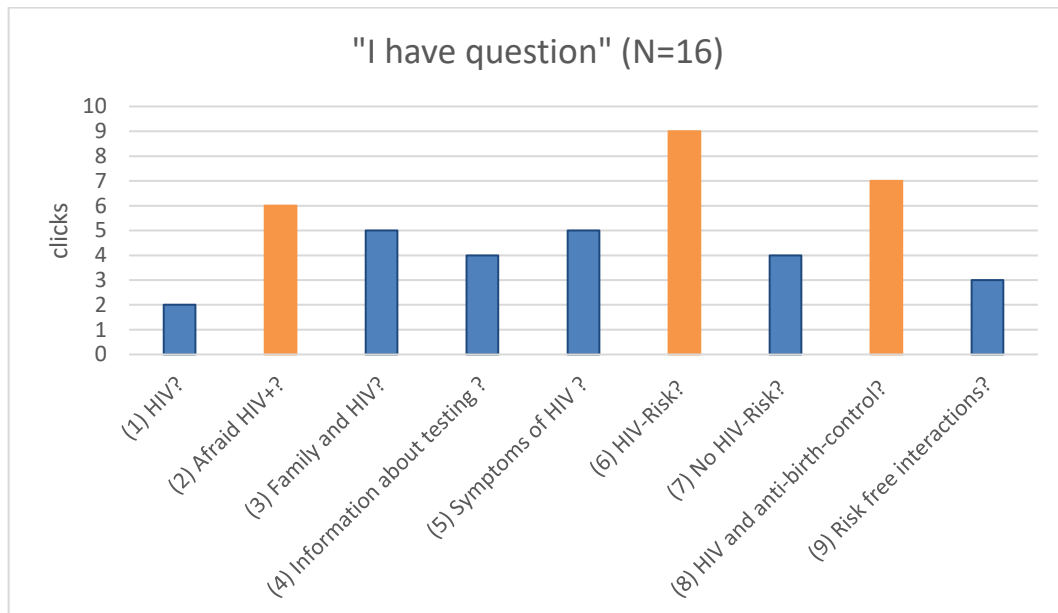


Figure 13: Clicks per chosen category within the option "I have question"

**Results of the option "tell me something":** Nine of the testers choose the option "tell me something". After the infographic was presented, the testers could decide once more if they had questions about the statement. Out of those all nine of the testers clicked that they had further questions. All the described results are visualized in Figure 14. The facts are shown in Figure 12 and Figure 10.

Three of the testers had questions to F1. Eight testers had questions about Fact number two (F2) and two testers on F3. Three clicked on F4, five on F5, and two on F6. Since F5 and F4 can be arranged within the same area, only one button "more information about HIV transmission" was presented for both paths. 4 testers

## 5 Alex - your chatbot about HIV

clicked on “vaginal fluid” (“Scheidenflüssigkeit”), one tester on “sperm” (“Sperma”) and three on “mother’s milk” (“Muttermilch”). Two of the testers clicked on F6. In F6 the button “Risk of infection in oral sex” (“Ansteckungsrisiko bei Oralverkehr”) was shown. All testers clicked on it – one choose the option “blowjob” (“blasen”) and one the option “licking” (“lecken”).

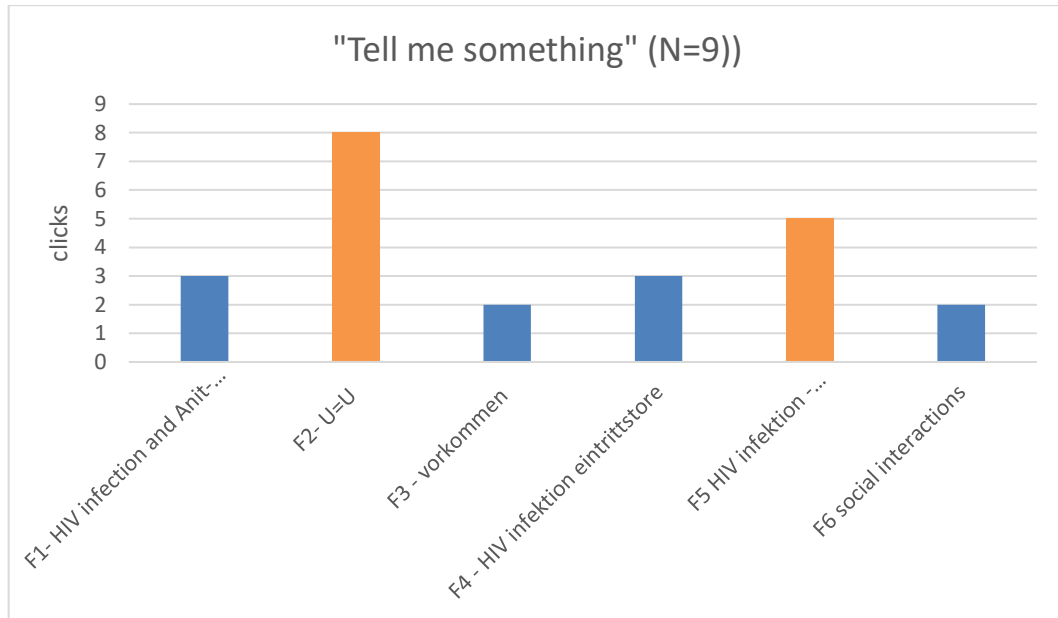


Figure 14: Clicks per chosen category within the option "Tell me something"

These results suggested that on the one hand the testers would use *Alex* for asking questions in the area of HIV and on the other hand are interested in following topics:

- HIV-Risk?
- HIV and birth control?
- Afraid of having HIV?
- Medication
- HIV Transmission -liquids

It is therefore claimed that the testers are interested in the mentioned topics, since they were asked to select topics that interested them or they had questions about.

Furthermore, the chatbot may be used from users when they have questions concerning HIV. Therefore, the chatbot should be able to allow free-text input and use rich elements like buttons and quick replies. Quick replies could be used to lead the users in one direction, for instance by offering quick replies to “testing?”, the user would receive information concerning that topic, without actively having to ask for it.

### 5.3.2 Results of the UEQ

Overall, all 25 testers completed the questionnaire directly after they had interacted with the click-dummy.

All the dimensions indicated an extremely positive evaluation, which is represented through the scale mean (see Figure 15). The overall impression of the click-dummy was evaluated as very good (Attractiveness,  $M=1.94$ ,  $s^2=0.35$ ,  $SD=0.59$ ). Furthermore, the testers agreed that, it was easy to get familiar with the click-dummy and using it (Perspicuity,  $M=2.08$ ,  $s^2=0.51$ ,  $SD=0.71$ ).

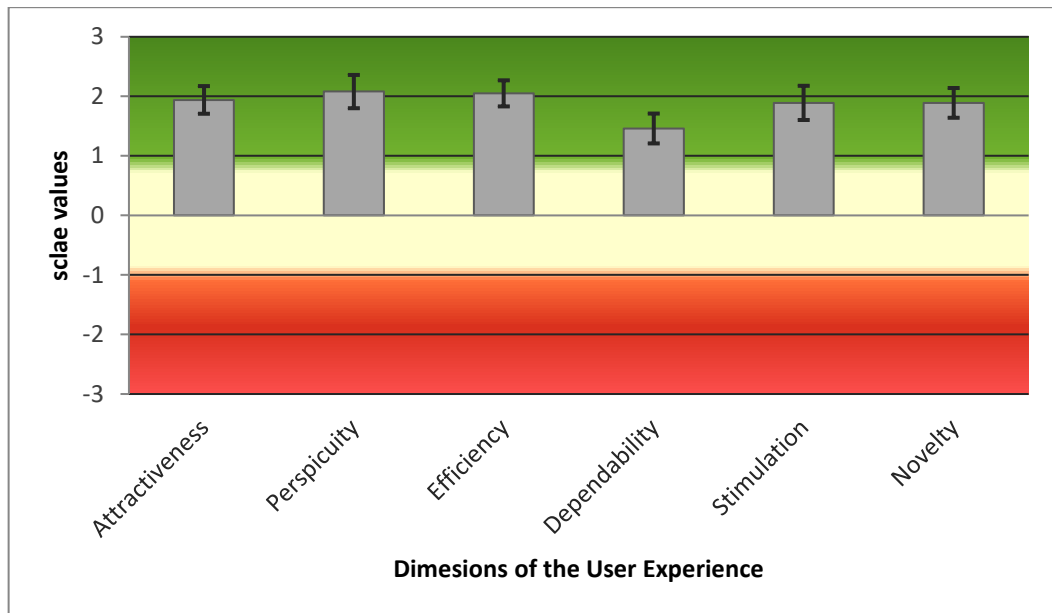


Figure 15: Results of the UEQ (Mean and Confidence Interval)

The testers agreed that no unnecessary effort was needed to gather information about HIV (Efficiency:  $M=2.05$ ,  $s^2=0.31$ ,  $SD=0.56$ ). Furthermore, the testers did feel in control with the interaction (Dependability:  $M=1.46$ ,  $s^2=0.41$ ,  $SD=0.64$ ) and they agreed that using the product was exciting and stimulating (Stimulation:  $M=1.89$ ,  $s^2=0.54$ ,  $SD=0.73$ ). Hence, the testers agreed that the click-dummy was innovative, creative, and caught the testers interest (Novelty:  $M=1.89$ ,  $s^2=0.41$ ,  $SD=0.64$ ).

In Figure 15, additional to the means of each dimension the confidence intervals are shown (error bars). Within a probability of 95% the true value of the scale means should be located within the confidence interval ( $N=25$ ). Even though the confidence is small, the answer of the tester varies within each dimension (Table 12). Only the dimension perspicuity indicated a sufficiently internal scale consistency ( $\alpha=0.8$ ) and attractiveness as acceptable ( $\alpha=0.74$ ). The consistency



of the scale stimulation is critical ( $\alpha = 0.66$ ) and the scale efficiency is questionable ( $\alpha = 0.53$ ). Dependability and novelty presented a massive derivation in each internal scale ( $\alpha = 0.44$  and  $\alpha = 0.46$ ). Having a closer look at the items of the scale stimulation, they showed that in general, the items were elevated positively (Mean between 1.8 till 2.0) but the standard division varied with the four items from 0.7 till 1.5. The scale novelty presented a similar result. The four items were evaluated extremely positive (Mean ranges from 1.7 to 2.0). Having a closer look at the standard division showed that it ranges from 0.8 till 1.4. The higher the SD, the bigger the variance. The scale dependability was evaluated less positive compared to the other scales. The four items were evaluated positive but the mean per item ranged from 0.8 to 2.1. The standard division was also high (range from 0.6 to 1.4), which was also displayed in the variance (range from 0.3 to 2.0). For more details on the mean value, the SD, and the variance per item see Appendix N.

Overall, this indicated that the testers had a good impression of the click-dummy but had different opinions and/or that some of the items were evaluated in an unexpected way.

Table 12: Confidence intervals per scale (UEQ)

Confidence intervals ( $p=0.05$ ) per scale						
Scale	Mean	Std. Dev.	N	Confidence	Confidence interval	
<b>Attractiveness</b>	1,940	0,593	25	0,232	1,708	2,172
<b>Perspicuity</b>	2,080	0,713	25	0,280	1,800	2,360
<b>Efficiency</b>	2,050	0,559	25	0,219	1,831	2,269
<b>Dependability</b>	1,460	0,640	25	0,251	1,209	1,711
<b>Stimulation</b>	1,890	0,733	25	0,287	1,603	2,177
<b>Novelty</b>	1,890	0,638	25	0,250	1,640	2,140

# 6 Discussion

The discussion is divided into two parts, once the main results are discussed, the results were already partly discussed within the iterations (see Chapter 4.3). In addition, two hypotheses will be proposed (Chapter 6.1). Then the challenges and limits of the work are being discussed (Chapter 6.2). Finally, in the last chapter further possible steps are described (Chapter 6.3).

## 6.1 Discussion of the main findings

The aim of the explorative study was to create a basis for the development of a chatbots for young people about HIV. For this reason, as a first step, it was looked into the question, where young people had knowledge gaps in regards to HIV. A combination of literature research, interviews with the target group, and experts indicated that young people had knowledge gaps in the following area: transmission of HIV. They furthermore showed uncertainties in the area of oral transmission ways. To develop a basis for the chatbot, it was also looked into the questions, in which areas young people asked questions. A re-evaluation of the interviews and the findings from the prototyping process resulted in the following areas: transmission, risk free interaction, and oral transmission. During the prototyping process, it became apparent that the way the information was designed and structured was important, in order to be relevant for adolescents. In the end, *Alex - your chatbot about HIV* was created. *Alex* is a click-dummy, which represents a chatbot, which answers the users' questions in the area of HIV and represents an additional source of information. In a nutshell, the questions must be answered briefly and concisely in everyday language, in a combination of rich elements like buttons, quick replies, and carousel and plain text. Finally, a simplified version of *Alex* was developed and evaluated for testing. It was found out that the young people used the click-dummy to ask questions and were interested in the following topics: testing, and high risk areas. In general, the click-dummy was rated very positively, indicating that young people were interested in the presented solution.

The here developed prototype of *Alex* only answers questions of the youth and depending on those questions, offers different buttons and quick replies, assuming that the user had an interest in the provide topic. The here presented solution has not the goal to lead to a behavior change. [62] found out in a pilot study that, only

## 6 Discussion

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providing information, on the one hand, increased the knowledge about STI and unintended pregnancy through a mobile application, but on the other hand, did not lead to a statistically change in reducing a sexual risk behavior or actual risk reduction. Additionally, [4] points out that an increase in knowledge about HIV does not automatically lead to a change in behavior but may contribute to the reduction of prejudices. According to the results of [63] in a pilot randomized controlled trial, messages about STI delivered via mobile phone helped to reduce prejudices about STI, increased level of rightful condom use, and talking about STI with a partner. It stays vague which conduct change methods and components of the mediation or line up techniques are related with viability [63]. So far, there is no health behavior change model for online interventions for sexual health. Some interventions may use health behavior change models, but they are not adapted to online interventions [8, p. 288]. Based on that, future studies should look into the field further, exploring what online intervention model would improve the situation and if that would work in combination with a chatbot.

One outcome of the interviews was, that the subjects did not have that many direct questions. They were more likely to ask question with “or” “that’s right or” and some had showed some signs of insecurity (see Chapter 4.1.1). In general, the subjects had some knowledge about HIV but at the same time had knowledge gaps in the area of oral transmission and risk-free interaction, same as describe in Chapter 3.3. Based on that, it seemed logical to develop a chatbot that talks about HIV with the users and finds out in which exact topics they have knowledge gaps in order to provide information about that specific topic. During the prototyping process it became apparent that the users would use the chatbot to ask questions about HIV and that they want to be in control of the conversation. The option “tell me something” was added during the process, but together with the results of the testing it may be assumed that the users would like to use the chatbot as question/answer bot. Meaning that the additional option might not have such a big impact on the users’ likeliness to use the chatbot.

Another result was that the youths did not want to talk with the chatbot and/or an avatar, they rather wanted to use it with written in- and output. One possible explanation is, that it is still too early for this technology, because only 14% of the German youths use for example Alexa. And out of those, only 1% use Alexa once a week. This, however, should be considered as an option for the future, once people are more used to avatars. Additionally, youths like to chat, especially girls. Most of the time, they use *WhatsApp* on a smartphone for chatting purposes. Furthermore, according to the JIM-Study [33], smartphones provide conversation material [33, p. 11 chart 73], which may help to talk more about HIV. One result of the systematic review of X was that digital innovations contribute to STI prevention,

## 6 Discussion

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but not all results were statistically significant [64]. A similar study found that young people accepted information about STIs from social media only as an additional source of information [44, p. 1004]. It is important to emphasize again, however, that *Alex* should be presented and used as a supplement to already existing counselling services and is not intended to replace them.

Based on the results of this master thesis and the represented studies, the following hypotheses are proposed:

H1: Developing *Alex* helped to reduce the stigma of HIV and promoted the communication about HIV.

H2: Adolescents would rather use the chatbot to ask questions and getting additionally information according to their question, then just clicking on buttons.

Furthermore, *Alex* would provide the possibilities to talk to someone without having the fear of being judged, to receive trusted information and that without time limitations, as a chatbot is available 24/7. [16] found out that the subjects of his study felt comfortable asking a chatbot question in the area of sex. Additionally, a chatbot would fulfill the need of interacting with something through using rich elements, such as buttons or pictures. According to the findings of [64], a combination of health services and phone or video calls are necessary and deliver the best results, as otherwise adolescents are bored easily [64, p. 8]. In the Prototyping process it became apparent that the integration of videos, podcasts, or the integration of well-known personalities, makes sense as it increased the level of interest. This was not explored further in the master thesis, as it only makes sense to talk about a celebrity if everyone knows him or her. Depending on which music one listens to, or which movies one watched, one knows other celebrities. In the design workshop, for example, well-known Austrian celebrities were introduced, yet, despite their age group, only a few of the participants recognized them.

Since the question how the youths will become aware of the existence of *Alex* has only partly been answered so far, the following will provide a brief suggestion. The users would need to search for *Alex*, but compared to a regular website, they could subscribe to it and hence not search for it again [44]. Additionally, [65] found out that two sexual health messages per week may already improve safer sex and testing for STD/HIV. This knowledge could also be transferred to the chatbot.

### 6.2 Further Challenges and Limitations

**Difficulties creating a chatbot:** Since youths do like to chat to the chatbot, it has to be able to understand NLU. Developing a chatbot which responds to NLU is difficult [50, p. 7], since the users' behavior cannot always be predicted. One result of the prototype process, showed that *A/ex* should not say "I don't understand your question" but always provide a solution. This solution was developed in the context of questions according to HIV and not to random questions. Therefore, it has to be explored, how *A/ex* should respond otherwise. Furthermore, the platform for which *A/ex* will be developed has to be chosen carefully, since the use of messaging platforms changes between the generations. For example, using a Facebook chatbot does not make sense for teenagers, aged 14-15 since only 10% are using Facebook. Teenagers, aged 16-17, only 15 % use Facebook but still 30% of the 18-19-year-old youths do use Facebook. In comparison, WhatsApp and Instagram are important for all age groups [33, p. 39]. As the development of a chatbot will take time, it is important to consider that it should be developed for future generations, too.

Based on the gained knowledge, it may be useful to develop a chatbot which answers question about HIV but in addition, when users subscribe to *A/ex*, it sends some messages about HIV to the users, so that the users stays up to date, including rich elements. Therefore, it has to be explored which messages are appropriate. As mentioned earlier, *A/ex* should always stay friendly and provide a solution, like offering a telephone number or email address.

**Limitation:** 66 users and three experts participated in this study. Because of this, many different opinions were included during the process. It was implemented what users wanted and suggested, especially in the prototyping process. Their suggestions where furthermore combined with findings from studies. Although many participants were involved in the development process, were involved in the development process, one should consider the following when looking at the numbers. All participants were raised in the middle class environment and hence, one could say are having good perspectives. All have attended high school and most were also studying at an university. In addition, only users who are interested in the topic and have a certain openness to talk to a stranger about HIV were reached. Furthermore, the participants were randomly selected, implying that the solution is not valid for specific target groups. In order to develop a solution for a specific target group, it is important to evolve them. For example, during the Design Workshop it was clear that the region and heritage plays an important role talking about sexual health. However, due to the limited capacity of this thesis, this point was not further investigated.

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Looking back, conducting interviews might not have been the best way to find out in which areas young people still have questions. It is better to use focus groups or a framework such as peer training, as participants talk to each other and new questions arise. However, this has the disadvantage that the documentation is very time-consuming as well as the evaluation. Yet, due to the interviews, it was possible to develop a good understanding for the users, which is essential in a UCD process.

A further limitation is that the number of testers to test the click-dummy is rather low with 25 and should be interpreted with caution, due to the Cronbach's alpha value. In this work, it is somewhat difficult to tell, if the testers have rated the click-dummy itself, or the idea behind it. In addition, it was not checked whether the testers actually asked questions similar to those which were pre-programmed. After the test, the author had a brief conversation with the testers and received no negative feedback concerning this topic. In addition, the questions and topics were worked out together with the young people and supported by literature. Therefore, the distortion should not be too great. How this influences the result, however, cannot be said. Summarizing all the above, the evaluation was still positive which strongly indicates that it makes sense to develop *A/ex*.

### 6.3 Prospect

If you look at the figures on HIV, you can see that HIV is far from being defeated. Although the number of new infections is decreasing within the EU/EEA, the WHO target for 2020 is far too little(?). In order to reach the target, the objective would require a decrease in assessed new infections of 74% by 2020 [66, p. 7]. New approaches that have been developed together with the target group are constantly being promoted [5]–[7], [66], [67]. A new approach may be *A/ex*.

However, it is important that *A/ex* will be developed in a way, that it is possible to chat with it, in order to test the created hypotheses (H1, H2). Once again, it is important that *A/ex* is not a counsellor or something similar but should be seen as an additional access to secure information. It may be possible to address specific target groups through this. For Example, in the Asia-Pacific region, 54,000,000 young people live with HIV and AIDS. In addition, there are 54,000 new infections per year. In the Philippines, there was an increase of 170% in young people aged 13-24 between 2012 and 2018 [67]. Because of this, it seems logically to implement *A/ex* for example in the Asia-Pacific region. The knowledge gained from this study can be used as a basis for this but may still have to be adapted. It is

## **6 Discussion**

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recommended to look for a youth group on site to have enough multipliers and to work together with experts.

# 7 Conclusion

In beginning of this thesis, three research questions were asked:

- (1) In which areas do young people have knowledge gaps?
- (2) What questions do they ask concerning HIV?
- (3) How does the information have to be presented in the context of a chatbot?

HIV is a topic that is relevant to every single person but at the same time is not present in the life of the users. Based on the findings of this thesis, it can be said that young people do have basic knowledge about HIV, but at the same time, they are unsure about detailed knowledge risk free interaction and the transmissions ways. As well as knowledge about where to get tested, or what it means if someone has HIV (1). Furthermore, young people ask questions concerning the following areas of HIV: transmission, risk free interaction, and oral transmission (2). The information about HIV have to be presented in an engaging way, which means the combination of rich elements like pictures, buttons, and carousel. Based on the results of this thesis, it can be said that, using buttons to provide information to important topics like, transmission of HIV, HIV-risk, oral transmission. Quick replies seem to be appropriate when there is a possibility that people may ask more about a certain topic. It is important that the pictures contain relevant information, otherwise the users do not like them. Furthermore, since the screen of a smartphone is limited, the questions of the users should be answered with messages no longer that 160 sings. If the message is longer, it should be divided. In general, it seems useful to structure the messages according to the understandability model (3). So far, the tester evaluated the click-dummy extremely positive, which shows that there is interest.

Based on the evaluation of *Alex* and the considered literature, following hypothesis have been created:

H1: Developing *Alex* helps to reduce the stigma of HIV and promotes the communication about HIV.

H2: Adolescents would rather use the chatbot to ask questions and getting additionally information according to their question, then just clicking on buttons.

The master thesis is only the basis for the development of a chatbot of which answers questions according to the user input about HIV. For further development, more experts must be involved to program the chatbot.



## **7 Conclusion**

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This Master thesis has limitation, for instance, the target group was always a convenient sampling and only high educated people took part in the study. Further studies should concentrate on further developing the results of this work and, how they can be transferred to other populations, for instance for youths in the Asia-Pacific Ocean, where HIV new infection have increased. One important question, which was only partly answered, is the questions how the youths will be aware of the chatbot and through which channel (Facebook, Twitter, WhatsApp, slack, Skype etc.) they will be able to access the chatbot.

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# Appendix

## A. Interview guidelines - user

### Einführung

- Dank für Teilnahmebereitschaft
- Vorstellung (Person und Projekt): Name, Institution, Projekt HIV und jugendliche, Durchführung von Gesprächen
- Vorgehen: Gespräch ca. 20 Minuten, Erzählungen wichtig, keine falschen Antworten; Wenn es dir unangenehm ist eine Frage zu beantworten, gib einfach Bescheid!
- Vertraulichkeit und Datenschutz: Tonbandaufnahme (Gerät zeigen!), vertrauliche Behandlung aller Daten, alle persönlichen Daten werden anonymisiert, Transkription, Einverständnis einholen bzw. überprüfen ob die Einverständniserklärung gelesen wurde.

### Aufnahme Starten

Erzählaufforderung	Aspekte die Aufgegriffen werden, wenn diese nicht von alleine angesprochen werden	Konkrete Fragen, die an geeigneter Stelle in dieser Formulierung gestellt werden	Aufrechterhaltungsfragen und Steuerungsfragen
1. Woran denkst du spontan, wenn du das Stichwort HIV und Jugendliche/ junge Erwachsene hörst?	Übertragungswege Schutz Prävention Kampagnen Ausbreitung/ Verbreitung		Fällt dir eine bestimmte Situation ein?
2. Betrifft dich HIV im täglichen Leben? Ist HIV ein persönliches Thema für dich? Inwiefern/ wieso nicht?	Ja/ nein? Gründe?	Und wieso? Inwiefern? Kannst du das mir näher erklären?	Kannst du eine Situation näher beschreiben? Woran erkennst du Schwierigkeiten Warum genau ist das eine Herausforderung? Was genau ist hart dabei? Woher <u>weist</u> du das
3. Wie wurdest du über HIV/ STI aufgeklärt wie war das für?	Schule Uni Soziale Medien	Redest du mit deinen [...] darüber?	

	Freunde Geschwister Eltern		
4. Machst du <u>etwas</u> um dich vor HIV zu schützen? Was unternimmst du?	<u>Situationsgebunden</u> ? Partnerschaft?	(Wie ist das beim feiern/ <u>one night stand</u> ?)	
5. Eine Studie hat gezeigt, dass sich 77% der Jugendlichen nicht vorstellen können mit einem HIV+ Menschen zusammen zu sein- wie stehst du dazu?		Wieso glaubst du ist so? Je nach Antwort: Wieso ist das eine Herausforderung?	
6. Das Weitern hatte sich herausgestellt das ein Kondom primär dafür eingesetzt wird, damit sie nicht schwanger wird – wie siehst du das? Was ist <u>deine primäre Motivation</u> ein Kondom zu verwenden?	„ich möchte nicht Vater/Mutter werden“  Unbekannter Sexpartner	(ja/ nein → Gründe)	
7. Wie kann ich mich HIV infizieren?	Bluttransfusion, Blut an offenen Wunden Vaginaler/Analer/oraler Geschlechtsverkehr? Flüssigkeitsübertragung: Samenflüssigkeit/Scheidenflüssigkeit/Muttermilch?	Andersherum gesagt, kennst du <u>Risikofrei</u> Interaktionen mit HIV+ Menschen?	(Was sind mögliche Übertragungswege)

8. Hastest du schon einmal Angst dich mit HIV identifiziert zu haben?		Wenn ja, was hast du gemacht? Was würdest du machen?	Kannst du mir diese <u>Situation</u> näher beschreiben?
9. Wusstest du das du es möglich ist sich bei der AIDS-Hilfe auf HIV testen zu lassen?		Anonym? Diagnostisches Fenster (muss innerhalb von drei Tagen getestet werden) Was <u>passiert</u> wenn ich HIV habe?	
10. Worin besteht der Unterschied zwischen HIV und AIDS?			
11. Welche Themen interessieren dich in Bezug auf HIV?	HIV- Übertragung Risikofreie Interaktion Schutz vor HIV Aktuelle Daten Relevanz Auswirkung		Gibt es einen Bereich, der dich besonders interessiert?
12. Kannst du folgende Bereich nach HIV Interesse ordnen?			

## Soziodemographische Daten

- Alter:
- Geschlecht:
- Wohnort:
- Schule/ Beruf/ Studium:
- Beziehungsstatus
- Sexuelle Orientierung

## Aufnahme beenden

**Weiteres Vorgehen:** hast du noch Lust weiter an der Chatbot Erstellung beteiligt zu sein?

## B. Interview guidelines - peer

### Einführung

- Dank für Teilnahmebereitschaft
- Vorstellung (Person und Projekt): Name, Institution, Projekt HIV und jugendliche, Durchführung von Gesprächen
- Vorgehen: Gespräch ca. 20 Minuten, Erzählungen wichtig, keine falschen Antworten; Wenn es dir unangenehm ist eine Frage zu beantworten, gib einfach Bescheid!
- Vertraulichkeit und Datenschutz: Tonbandaufnahme (Gerät zeigen!), vertrauliche Behandlung aller Daten, alle persönlichen Daten werden anonymisiert, Transkription, Einverständnis einholen bzw. überprüfen ob die Einverständniserklärung gelesen wurde.

Erzählaufforderung	Aspekte die Aufgegriffen werden, wenn diese nicht von alleine angesprochen werden	Konkrete Fragen, die an geeigneter Stelle in dieser Formulierung gestellt werden	Aufrechterhaltungsfragen und Steuerungsfragen
1. Wie kamst du darauf dich als Peer Berater ausbilden zu lassen? Was hat dich dazu motiviert?			
2. Inwiefern hat die Ausbildung dein Verhalten beeinflusst?	Vorher <del>nacher</del> besser aufgeklärt?	Ist das immer noch ein Thema für dich?	
3. Kannst du beschreiben wie so eine Aufklärungsstunde abläuft?			
4. Worin lag der Schwerpunkt bei der Aufklärung?	Übertragung Risikofreie Interaktionen	Und wieso? Kannst du mir das näher beschreiben?  Habt ihr viel erklärt, oder wurde viel nachgefragt?	Deine Erfahrungen im Bezug auf HIV-AIDS
5. Welche Medien habt ihr bei der Aufklärung eingesetzt?	Filme Bilder (abschreckende Bilder?)	Wie hat das auf die Jugendlichen gewirkt?	

6. Wie waren die Themenbereiche strukturiert?		Wie waren die Themenbereiche strukturiert? Z.B. Übertragungswege + Risikofreie Interaktion? Verbindungen?	
7. Gab es <u>Themenbereichen</u> bei denen die Jugendlichen besser zuhören als andere? Bzw. stillwaren		Gab es Bereiche die Jugendliche mehr interessiert haben als andere? 2 Wissenslücken? Unterschiedliche Altersgruppen/ Schulen	
8. Gab es die Möglichkeit auch „privat“ Fragen zu stellen?		Wurde das in Anspruch genommen?	
9. Was ist dir besonders leicht/ <u>schwer gefallen</u> ?			
10. Bewusstsein vorhanden, dass es HIV gibt? <u>Jeden Treffen</u> kann?			
11. Wie schützt du dich vor HIV/STI?			

### Soziodemographische Daten

- Alter:

- Geschlecht:
- Wohnort:
- Schule/ Beruf/ Studium:
- Beziehungsstatus
- Sexuelle Orientierung

**Aufnahme beenden**

## **C. Transcription rules**

Entnommen aus Kuckartz et al. (2008):

1. Es wird wörtlich transkribiert, also nicht lautsprachlich oder zusammenfassend. Auszug qualitative Inhaltsanalyse. Vorhandene Dialekte werden nicht mit transkribiert.
2. Die Sprache und Interpunktion wird leicht geglättet, d. h. an das Schriftdeutsch angenähert. Beispielsweise wird aus „Er hatte noch so'n Buch genannt“ -> „Er hatte noch so ein Buch genannt“.
3. Alle Angaben, die einen Rückschluss auf eine befragte Person erlauben, werden anonymisiert.
4. Deutliche, längere Pausen werden durch Auslassungspunkte (...) markiert.
5. Besonders betonte Begriffe werden durch Unterstreichungen gekennzeichnet.
6. Zustimmende bzw. bestätigende Lautäußerungen der Interviewer (Mhm, Aha etc.) werden nicht mit transkribiert, sofern sie den Redefluss der befragten Person nicht unterbrechen.
7. Einwürfe der jeweils anderen Person werden in Klammern gesetzt.
8. Lautäußerungen der befragten Person, die die Aussage unterstützen oder verdeutlichen (etwa lachen oder seufzen), werden in Klammern notiert.
9. Die interviewende Person wird durch ein „I“, die befragte Person durch ein „B“, gefolgt von ihrer Kennnummer, gekennzeichnet (etwa „B4:“).
10. Jeder Sprecherwechsel wird durch zweimaliges Drücken der Enter-Taste, also einer Leerzeile zwischen den Sprechern, deutlich gemacht, um die Lesbarkeit zu erhöhen. [19, p. 24]

Kuckartz, Udo; Dresing, Thorsten; Rädiker, Stefan; Stefer, Claus (2008): Qualitative Evaluation. Der Einstieg in die Praxis. 2., aktualisierte Auflage. Wiesbaden: VS Verlag für Sozialwissenschaften / GWV Fachverlage GmbH Wiesbaden.

## D. Creating of Persona

The following table only serves to get an overview. The creation of a person is not an exact science in addition, further information from the interviews was used, which seemed to be important.

Table 13: behavioral variables overview

	User	1	2	3	4	5	6	7	8	Total
<i>Attitudes</i>	School	1	1	1	1	1	1	1	1	8
	Workshop	0	1	0	0	0	0	1	0	2
	Media	1	0	0	0	0	0	0	1	2
	Peers	0	0	1	0	0	0	0	0	1
<i>Skills</i>	Basic knowledge	1	0	1	1	1	0	0	1	5
	knowledge +	0	1	0	0	0	1	1	0	3
	further Questions	1	1	0	1	0	1	0	1	5
	insecure	0	0	0	1	1	1	0	1	4
	Doctor	1	1	1	0	1	0	0	1	5
<i>Activities</i>	use of condom	1	1	1	1	1	1	1	1	8
	avoid body contact	1	0	1	0	1	0	0	1	4
	ask if person has HIV	0	1	0	0	1	0	0	0	2
	party	1	0	1	1	0	0	0	1	4
	take immediate action	1	1	1	1	0	1	1	1	7
	not talk about HIV	1	0	1	1	0	0	1	0	4
	HIV not in everyday life	1	1	1	1	1	1	1	1	8
	internet as a source of knowledge	1	0	0	1	0	1	0	1	4
<i>Motivation</i>	trigger (media)	1	0	0	1	1	0	0	1	4
	Tigger "boys"	0	0	1	0	1	0	0	0	2
	relationship	1	0	1	1	0	0	0	0	3
	Family	1	1	0	0	1	0	1	0	4
	relationship, no condom use	1	1	1	0	1	0	1	1	6
	get to know someone with HIV	1	1	1	1	1	1	1	1	8
<i>Attitudes</i>	safety first	1	1	1	1	0	1	1	0	6

no relationship no HIV risk	0	0	0	1	1	1	1	0	4
trust is important	1	0	0	0	1	0	0	0	2
depends on the person (Character etc.)	1	1	1	1	1	0	0	0	5
being intimate with some HIV (no)	0	0	0	1	1	1	1	1	5
friend with HIV+ (yes)	1	1	1	1	1	0	1	1	7
zu spät gedanken	1	1	0	0	1	0	0	0	3
aufklärung hilft	0	1	0	1	1	0	1	0	4
Angst davor HIV zu haben	1	0	1	0	0	0	1	0	3

## E.Personas

The used images are from the *Pixabay* and under the "*Pixabay License*". The used images are not protected and can be used without marking. <sup>9</sup>



*„often it's just that you just start to google around somehow and then you get back to some web doctors who tell you something“*

### Johanna Steiner

Alter: 18  
occupation: student  
Status: single

The most important thing in a relationship for me is trust, no matter what it is. I definitely want to have children later and therefore I need to know if the person is HIV+ or has any other disease. If I am correctly informed, then there are drugs against HIV but how well do they really protect? I've googled that before but if it's true what I found out is the other question. My child should be healthy in any case! After a party I once had a latent fear that I was infected with HIV because I slept with someone I didn't actually know - without a condom. I don't think that was that smart. But it was uncomfortable for me to go to the doctor, then I googled what I should do and then I went to donate blood. In the end everything was fine.

### Motivation

- Freddy Mercury
- Improve knowledge about sexual health
- Wants a family one day

### Activities

- Always using protection
- rarely talks to friends about venereal diseases

### Attitudes

- Trust is very important
- The character of the person is crucial

### Skills

- Very well-educated
- Inquisitive

Figure 16: Persona - Johanna Steiner

<sup>9</sup> <https://pixabay.com/de/service/license/>



„What happened happened, you can't undo it “

### Maria Hofstädter

Age: 18  
 occupation: schoolgirl,  
 waiter in leisure time  
 Status: in a relationship

I'm just about to graduate from high school and I don't know what to do next. Maybe I will do an apprenticeship or study - there are so many possibilities. Recently I have a boyfriend, Max, and we want to sleep together. My friends told me that Max already had a girlfriend before me and they always slept together without a condom. Since I don't have so much experience in this area, I'm unsure how to address it. I don't think that the pill provides sufficient protection. I mean, what if Max has a STI? For example, I don't see that anyone has HIV. Now I don't know how to address that.

#### Motivation

- Not much experience with boys yet

#### Activities

- Likes to go to parties
- Talk to her friends about sex

#### Attitude

- Trust is very important
- Caution is better than indulgence

#### Skills

- Basic knowledge about HIV
- Sex education at school

Figure 17: Persona - Maria Hofstädter

## F. Evaluation of the personas

Simplified representation of the evolution of the three personas. The following results are represented in German language. In case you have any question, please contact the author of this thesis or one of the super advisors.

Table 14: Maria Evaluation

Maria	Yes	No	Total
Realistic	22	3	25
<b>Liked</b>	25	<b>To be improved</b>	26
Gedanken über HIV/ Sicherheit	12	mit Freund reden	12
vorsichtig ist	4	offeneres Thema HIV	2
gutes Beispiel	4	mehr Erfahrungen	4
spricht mit Freund offene darüber	2	testen lassen	1
Verhütung	2	Rechtschreibung	4
		Name	2

keine Angabe	1	keine Angabe	1
--------------	---	--------------	---

Table 15: Samuel Evaluation

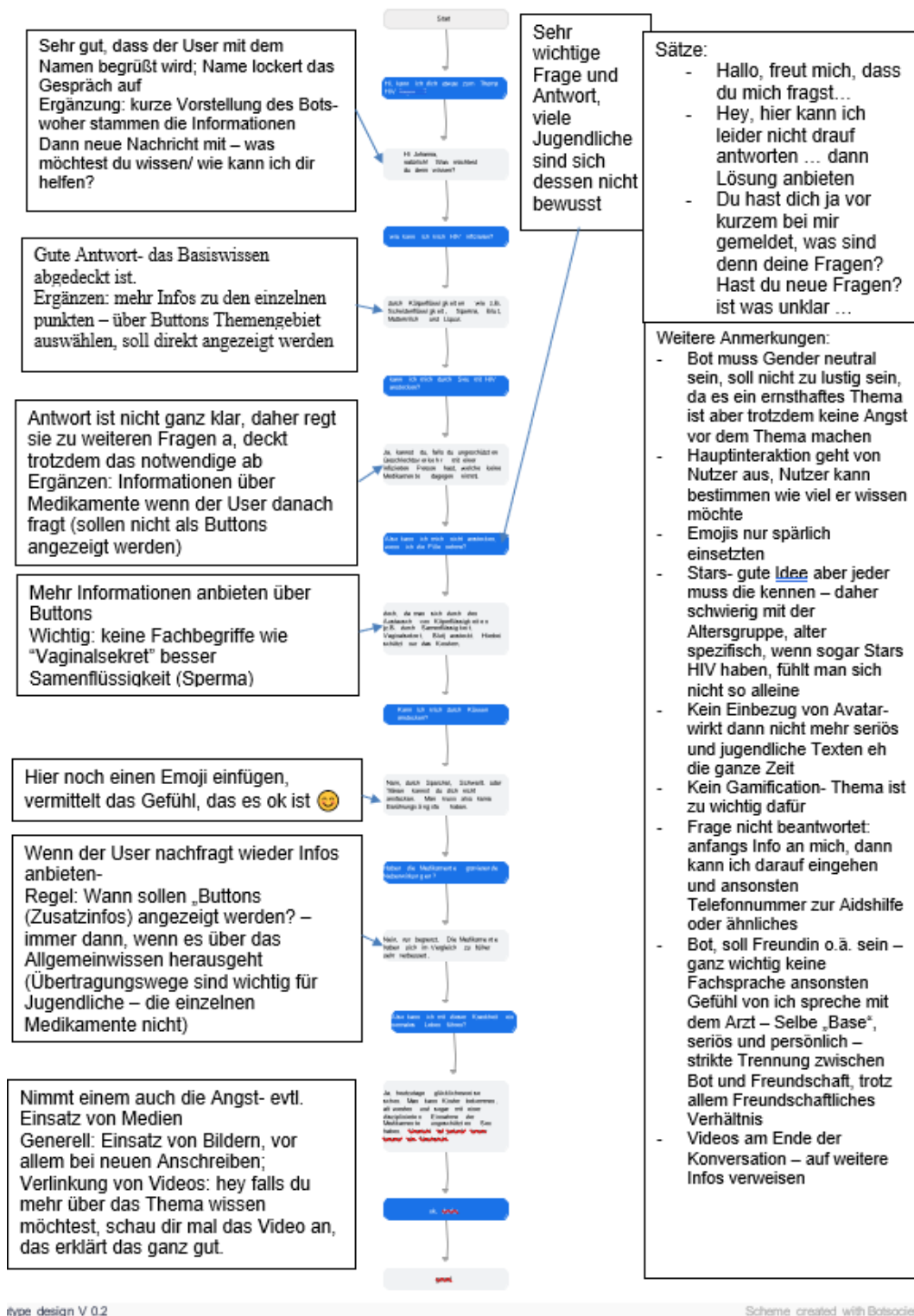
Samuel	Yes	No	Total
Realistic	25	0	25
<b>Liked</b>	25	<b>To be improved</b>	25
Kondom mit dabei	8	bewusst werden, wie erst HIV ist	5
vertrauen	3	soll sich mehr informieren	7
Googlen	5	sollte nicht Googlen	5
mit Freunden offen reden	3	Kondom auch verwenden	3
nicht alles mit Freunden besprochen	2	mit Freundin reden	2
gut informiert ist	2	mehr Gedanken	3
keine Angabe	2		

Table 16: Johanna Evaluation

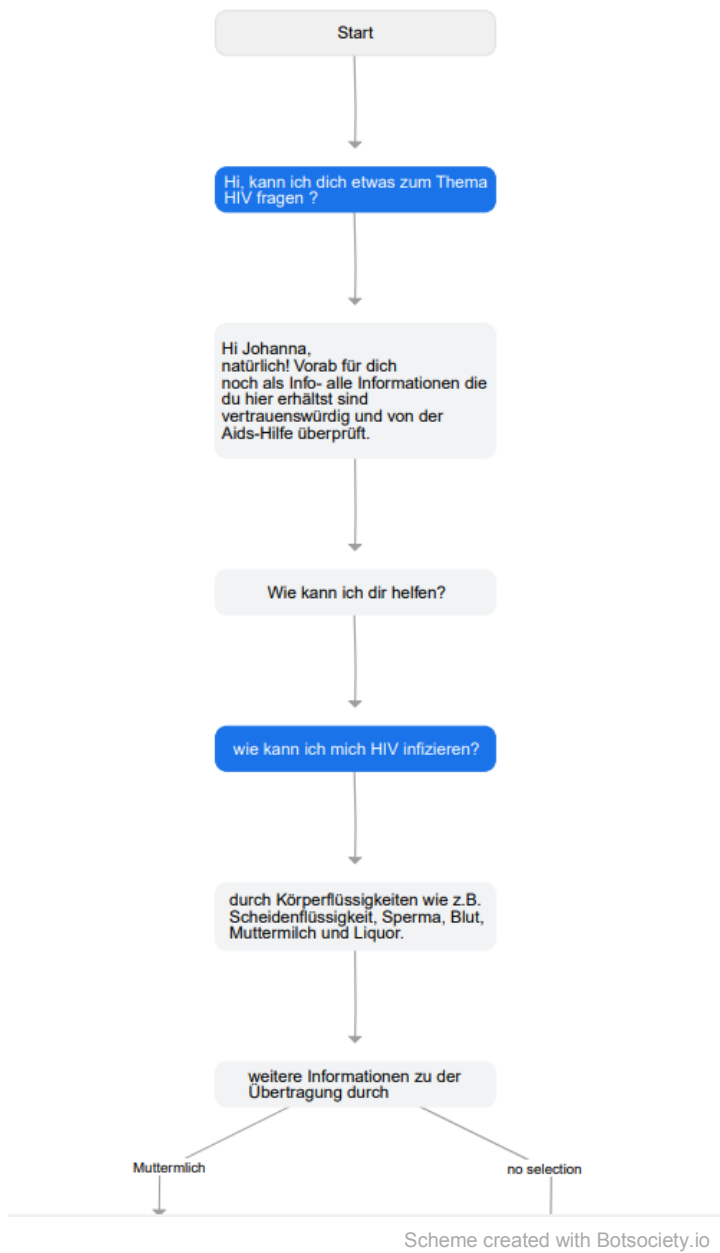
Johanna	Yes	No	Keine Angabe	Total
Realistic	20	3	2	25
<b>Liked</b>	25	<b>To be improved</b>		26
Gedanken über HIV/ Sicherheit	12	mit Freund reden		12
vorsichtig ist	4	offeneres Thema HIV		2
gutes Beispiel	4	mehr Erfahrungen		4
spricht mit Freund offene darüber	2	testen lassen		1
Verhütung	2	Rechtschreibung		4
		Name		2
keine Angabe	1	keine Angabe		1

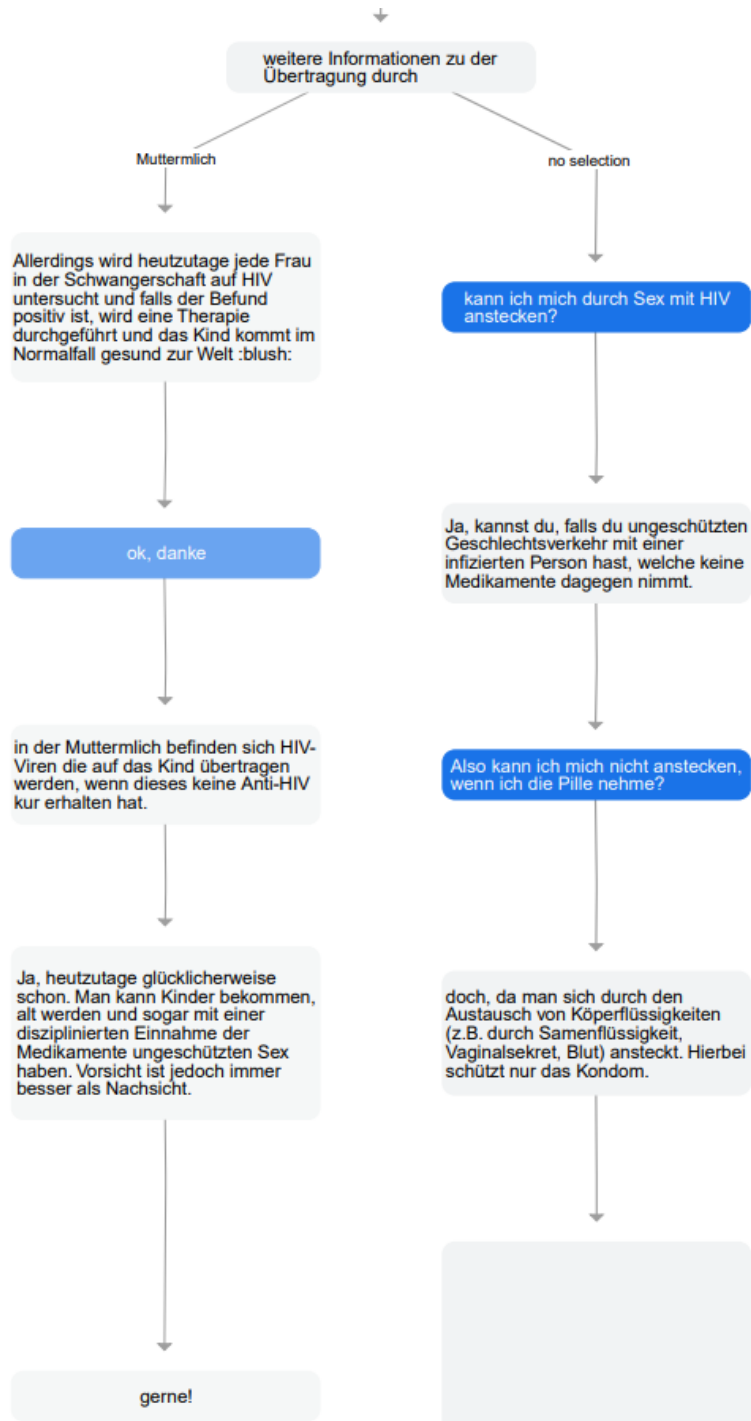


## G. Digital Paper Prototype V 0.1 commented



## H. Digitaler Paper Prototype V 0.2





Scheme created with Botsociety.io



Scheme created with Botsociety.io

gerne! Bei Fragen kannst du dich  
gerne wieder bei mir melden :blush:

und vergess nicht - "safety first"

## I. Pre-Alex

Hi, ich bin Alex 😊  
und du kannst mich alles über  
HIV fragen. Vorab für dich noch  
als Info, alle Informationen die  
du hier erhältst sind von der Aids  
Hilfe ;)

wie heißt du?

Hi Alex, mein Name ist Johanna.

wie geht es dir?

Danke der Nachfrage mir geht es  
gut.

Hi Johanna, schön dass es dir  
gut geht. Freut mich dass du  
dich bei mir meldest, wie kann  
ich dir helfen?

wie kann ich mich mit HIV  
anstecken?

durch Körperflüssigkeiten wie  
z.B. Scheidenflüssigkeit, Sperma,  
Blut, Muttermilch und Liquor.

weitere Information zur  
Übertragung von HIV mittels:

- Speichel
- Sperma
- Muttermilch

Fakt ist, dass das HIV Virus auch  
über die Muttermilch während  
dem Stillvorgang auf das Baby  
übertragen werden kann.  
Heutzutage wird allerdings bei  
Schwangeren getestet ob die  
Mutter HIV+ ist und falls ja  
erhalten sie Medikamente.  
Dadurch ist es möglich, dass  
sich das Kind nicht mit HIV  
infiziert 😊

Also kann ich mich durch Sex mit  
HIV anstecken?

Ja, kannst du, falls du  
ungeschützten  
Geschlechtsverkehr mit einer  
infizierten Person hast, welche  
keine Medikamente dagegen  
einnimmt.


Also kann ich mich nicht anstecken,  
wenn ich die Pille nehme?

doch, da man sich durch den  
Austausch von  
Körperflüssigkeiten (z.B.  
Samenflüssigkeit,  
Scheidensekret, Blut). Hierbei  
schützt nur das Kondom.

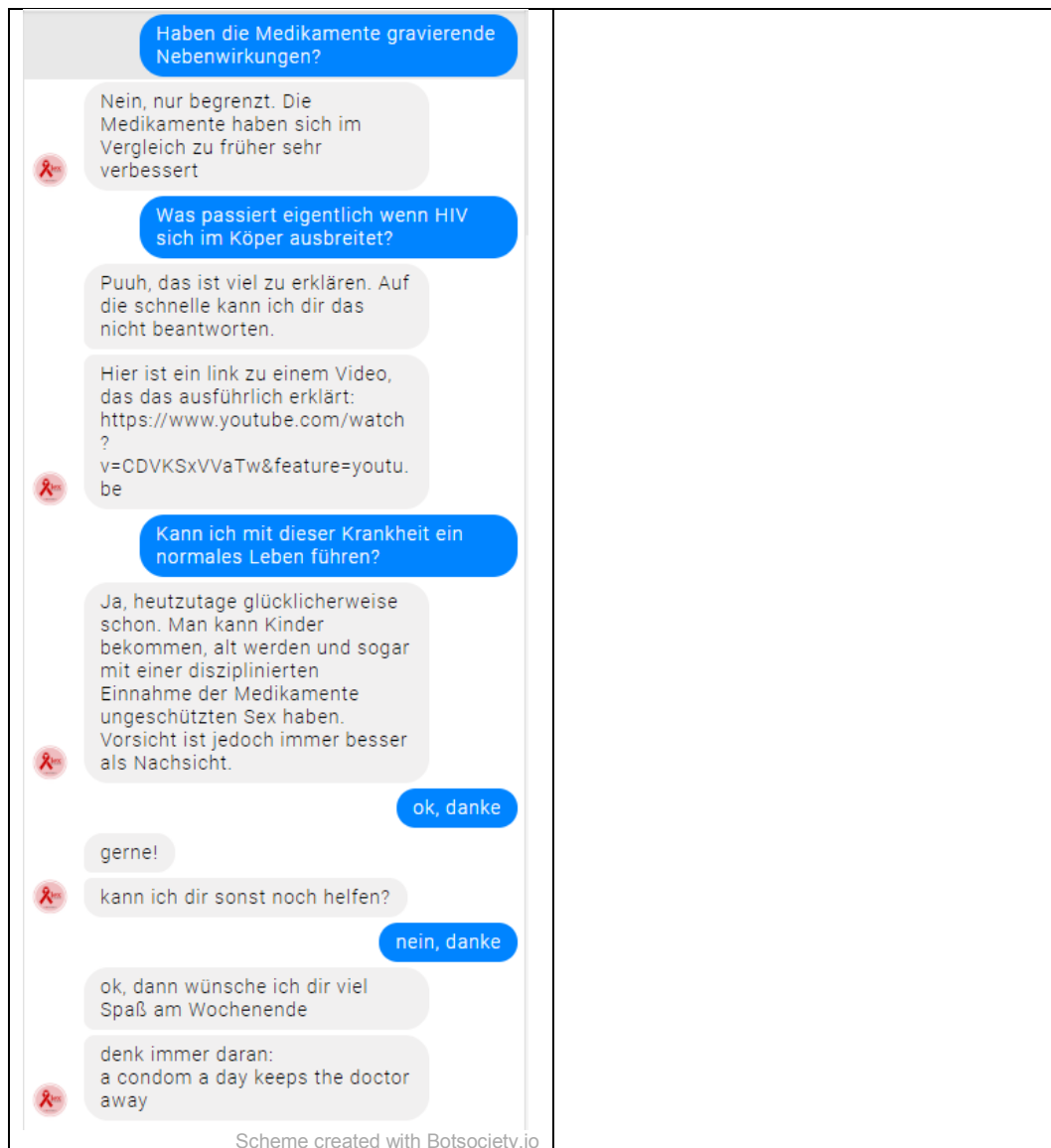
Kann ich mich durch Küssen  
anstecken?

Kurz gesagt, nein- durch  
Speichel, Schweiß oder Tränen  
kannst du dich nicht anstecken.  
Du musst also keine  
Berührungsängste haben 😊

schau mal, die AIDS Hilfe hatte zu  
diesen Themen eine Kampagne



Scheme created with Botsociety.io



## J. Pre-Alex – Feedback

Participant	Positiv	Negativ
P1	Smileys sind gut, wirkt jünger und nicht steif, mehr persönlicher	Beim Laptop ist der Ausschnitt von der App zu klein (wenn man über den Laptop schreibt)
P1	Punkte vom schreiben des Bots sind gut, zeigt das der Bot sich „Zeit“ nimmt	Nicht fragen wie man heißt, zu persönlich
P1	Name ist gut und Emojis	Vielleicht bestimmte Schlagwörter besser erklären mit einer kleinen Definition wie z.B. Geschlechtsverkehr oder bestimmte Krankheiten
P1	Kombination von Text und Bildern Auswahlmöglichkeiten	Bilder sind nicht wichtig, nur für den Zweck geeignet

P1	Zusätzliche Informationen zu HIV-Übertragungswege, kann wissen überprüfen	Bei biologischen Fragen einfach auf bestimmte Seiten verlinken
	Vorstellung des bots	logo am Ende weglassen

Participant	Positiv	Negativ
P2	Besser ein Frauen Name, da Männer eher mit einer Frau drüber sprechen würden (Vergleich Siri)	Logo am Schluss weglassen, Farbgestaltung?
P2	Schöne Idee mit dem Handy, da es die Generation von heute anspricht	small talk, interessiert mich nicht - was macht der Bot wenn es mir nicht gut geht?
P2	Länge der Nachrichten	
P2	Punkte vom schreiben des Bots sind gut, zeigt das das Bot sich „Zeit“ nimmt	
P2	Kategorien welche z.B. bei den Krankheitsübertragungswege vorhanden sind, sind gut auserwählt sollte auch für risikofreie Übertragung gegeben werden	
P2	fragen stellen = bot ist nur für einen persönlich da	

Participant	Positiv	Negativ
P3		Name ändern, ist zu männlich
P3	Punkte des Schreibens vom Bot sind eine coole Idee	Im Anfangstext noch sagen das die Nachrichten alle anonym bleiben
P3	Gut der das Bot sich vorstellt	Beim Ende eher so ein Text wie: Hoffe ich konnte dir helfen, bei Fragen einfach nochmal nachfragen (Logo am Schluss weglassen, das führt eher zu so einem mütterlichen Rat, Jugendliche sind alt genug, um das zu verstehen
P3	Anfangstext ist auch eine gute Hinführung	
P3	Kombination von Fragen stellen und bot bietet zusätzliche Informationen an	Farbe des Logos
P3	Nachrichten Gestaltung	

Participant	Positiv	Negativ
P4	Kategorien welche z.B. bei den Krankheitsübertragungswege vorhanden sind, sind gut auserwählt sollte auch für	Geschlechtsneutrale Farbe bei Logo wählen

	risikofreie Übertragung gegeben werden	
P4	Bilder sind ne gute Idee, da man eine leichte Konfrontation hat und sich mehr Gedanken drüber mach	Es sollten keine Redewendungen, wie Puhh dastehen, zeigt ein gewisse Desinteresse
P4	Nicht zu viel und nicht zu wenig Informationen	Small Talk eher kritisch
P4	Endtext ist gut, nur vielleicht eine Nummer oder E-Mail-Adresse hinterlassen	
P4	Punkte vom schreiben des Bots sind gut, zeigt das das Bot sich „Zeit“ nimmt	
P4	freie Text Eingabe - ist wie beim chatten	
Participant	Positiv	Negativ
P5	Name geschlechtsneutral	Farbe des Logos, vor allem für Jungs
P5	Links zu Videos sind gut, vor allem wenn es um was Biologisches geht	Bilder sind nicht notwendig
P5	Gefühl mit einer Schwester zu reden	Small talk, nur dann wenn ich nochmal mit dem Bot schreibe
P5	Wichtig zu wissen woher die Informationen sind	
P5	Einsatz von Emojis	
	dass ich chatten kann	
Participant	Positiv	Negativ
P6	Länge der Informationen	Puuh-> nicht gut
P6	Anfangstext, dann weis ich woher die Informationen sind	Muss meinen Namen nicht wissen
P6	Einsatz von Bildern und Emojis	logo? Kodom? Erkenne ich nicht
P6	Punkte vom schreiben des Bots sind gut, zeigt das das Bot sich „Zeit“ nimmt	
P6	Schnell Auswahl	
P6	cool dass ich fragen stellen kann und nicht nur dinge anklicke	

## K. Versions of Alex (0.1-0.3)

Since *Alex* is now too complex the different versions can be accessed through following links:

- *Alex 0.1*: <https://app.botsociety.io/s/5c8bc08dacb28d3da8370b7a>
- *Alex 0.2*: <https://app.botsociety.io/s/5ca4c55bfef6a2bb94e517e6>
- *Alex 0.3 (Alex your Chatbot about HIV)*:  
<https://app.botsociety.io/s/5ca5f715fef6a2f9bee62ffb>



- *Alex for Testing purpose:*  
<https://app.botsociety.io/s/5cb1df618633f6dfa29dfaa0>

Please note, that it is forbidden to share or forward these links without the permission of the author. Or to use them in any other sense than to have a look at the different versions.

## L. Integration Dialogflow

An attempt was made to integrate the contents and user paths of *Botsociety* into *Dialogflow*<sup>10</sup> from Google. *Dialogflow*, former know as *api.ai*, is a free to use framework which allows its users to build a chatbot without the need of coding.

Besides, Dialogflow features integrations in several messaging channels like Facebook messenger, Slack and others. Furthermore, the agent built in Dialogflow can be easily ex- or imported to other NLU- platforms like Amazons' Alexa. This seems useful, especially for future works. Based on the results in Chapter 3.2, it seemed best not to create a new application, which the users have to download but rather to include the chatbot in an application which they already use. Since the author has limited programming expertise, the Facebook messenger was chosen because all the participants (n=41), despite their age, mentioned that they have a Facebook profile. Integrating the chatbot in Facebook has the advantage that the Facebook messenger provides the advantages that both Android and iOS users may use the chatbot without the need to create two applications.

*Botsociety* offers the integration to *Dialogflow*. This seemed useful but was not that easy to implement. In the end, the developed content was transferred to *Dialogflow*, once the content was changed in *Botsociety* and was supposed to automatically update the content in *Dialogflow* as well, the content within in *Dialogflow* was not updated. Due to that fact the double amount of intents were in *Dialogflow* because the changes within one intent have not been updated. Furthermore, in *Botsociety* the users have to select intents and define the contexts for each message before the integration is possible. But in *Dialogflow* the context did not work at all and needed to be removed. Despite that, a Facebook Account and Page for *Alex* was created. Furthermore, the developer access was activated, and *Alex* was brought to "life" in the *Facebook Messenger*. The problem was, that the used emojis were not displayed as well, as *Alex* only understood exactly the questions from the *Dialogflow*. Due to that fact, an attempt to train *Alex* in *Dialogflow* was made, but still, in *Facebook Messenger*, *Alex* only understood the trained questions. As soon as there was a typo, *Alex* could not answer

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<sup>10</sup> <https://dialogflow.com/>

anymore. Furthermore, the replies *Alex* provided were divided into several individual messages,

Additionally, in order to access *Alex* publicly, *Alex* had to be checked by Facebook. Chatbots in Facebook Messenger bring a big challenge due to the DSGVO. Unfortunately, the author is not familiar with this area and hence, could not tell the users what exactly happened to the data *Alex* never made public. Due to the legal basis and the fact, that the integration of *Botsociety* content into *Dialogflow* was only partially successful, and no emojis were displayed on Facebook Messenger, it was decided, in agreement with the first advisor, not to pursue this area for the master thesis any further.

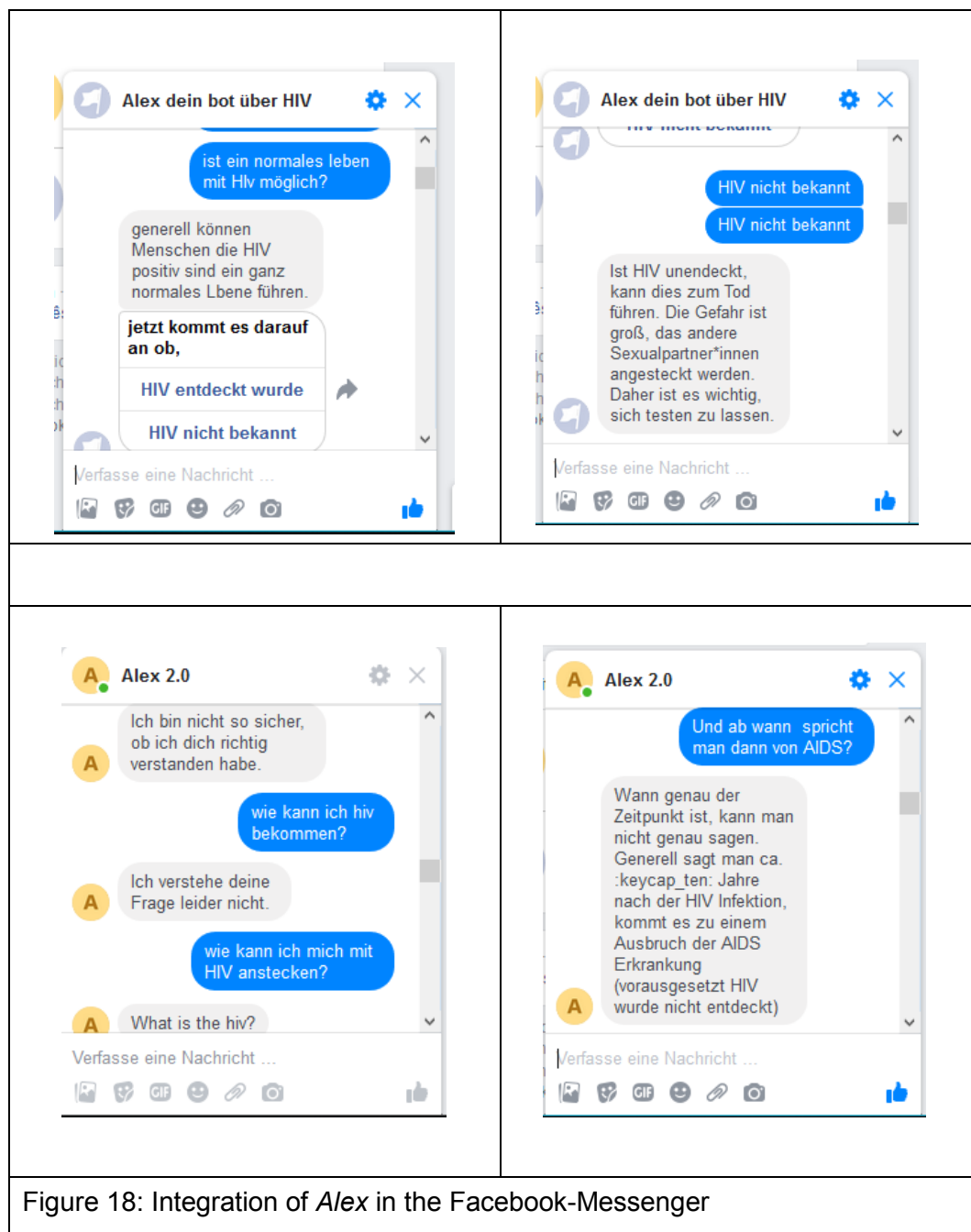


Figure 18: Integration of *Alex* in the Facebook-Messenger

## M. User Experience Questionnaire

The used UEQ is provided by Martin Schrepp, Andreas Hinderks and Jörg Thomaschewski the website: <https://www.ueq-online.org/> and can be downloaded there [26].

Bitte gebe nur eine Einschätzung des Produkts ab. Kreuze bitte nur einen Kreis pro Zeile an.

	1	2	3	4	5	6	7		
unerfreulich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	erfreulich	1
unverständlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	verständlich	2
kreativ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	phantasielos	3
leicht zu lernen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	schwer zu lernen	4
wertvoll	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	minderwertig	5
langweilig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	spannend	6
uninteressant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	interessant	7
unberechenbar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	voraussagbar	8
schnell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	langsam	9
originell	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	konventionell	10
behindernd	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unterstützend	11
gut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	schlecht	12
kompliziert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	einfach	13
abstoßend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	anziehend	14
herkömmlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	neuartig	15
unangenehm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	angenehm	16
sicher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unsicher	17
aktivierend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	einschläfernd	18
erwartungskonform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	nicht erwartungskonform	19
ineffizient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	effizient	20
übersichtlich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	verwirrend	21
<del>unpragmatisch</del>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	pragmatisch	22
aufgeräumt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	überladen	23
attraktiv	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unattraktiv	24
sympathisch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unsympathisch	25
konservativ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	innovativ	26

## N. Results of the UEQ

Item	Mean	Variance	Std. Dev.	No.	Left	Right	Scale	
1	1,9	0,9	1,0	25	annoying	enjoyable	Attractiveness	
2	2,1	0,8	0,9	25	not understandable	understandable	Perspicuity	
3	2,0	1,1	1,0	25	creative	dull	Novelty	
4	2,3	0,5	0,7	25	easy to learn	difficult to learn	Perspicuity	
5	2,0	1,1	1,1	25	valuable	inferior	Stimulation	
6	1,9	0,7	0,9	25	boring	exciting	Stimulation	
7	1,8	2,1	1,5	25	not interesting	interesting	Stimulation	
8	0,8	1,9	1,4	25	unpredictable	predictable	Dependability	
9	2,4	0,3	0,6	25	fast	slow	Efficiency	
10	2,0	0,7	0,8	25	inventive	conventional	Novelty	
11	2,1	1,0	1,0	25	obstructive	supportive	Dependability	
12	2,2	0,8	0,9	25	good	bad	Attractiveness	
13	2,1	1,2	1,1	25	complicated	easy	Perspicuity	
14	1,7	0,9	0,9	25	unlikable	pleasing	Attractiveness	
15	1,7	1,9	1,4	25	usual	leading edge	Novelty	
16	1,7	1,7	1,3	25	unpleasant	pleasant	Attractiveness	
17	1,9	0,3	0,6	25	secure	not secure	Dependability	
18	1,8	0,6	0,7	25	motivating	demotivating	Stimulation	
19	1,0	2,0	1,4	25	meets expectations	does not meet expectations	Dependability	
20	1,9	0,7	0,9	25	inefficient	efficient	Efficiency	
21	1,8	0,8	0,9	25	clear	confusing	Perspicuity	
22	2,0	0,6	0,8	25	impractical	practical	Efficiency	
23	1,8	1,2	1,1	25	organized	cluttered	Efficiency	
24	2,0	0,4	0,6	25	attractive	unattractive	Attractiveness	
25	2,2	0,4	0,6	25	friendly	unfriendly	Attractiveness	
26	1,9	0,9	1,0	25	conservative	innovative	Novelty	