

Master Thesis

Design and Evaluation of A Conversational Agent Model based on Stance and BDI providing Situated Learning for Triage-Psychologists in the Helpline of 113 Suicide Prevention

Jeffrey A. Sirocki

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Study —Data Science and Technology - Delft University of Technology, The Netherlands

Sponsor —113 Suicide Prevention Research Department, The Netherlands

Committee —

Prof. Dr. W.P. Brinkman	Prof. Dr. C.C.S. Liem	Prof. Dr. M.A. Neerincx	Dr. S. Merelle
Associate Professor	Assistant Professor	Full Professor	Senior Researcher
TU Delft	TU Delft	TU Delft	113 Suicide Prevention

Author —J.A. Sirocki, j.a.sirocki@student.tudelft.nl (jsirocki@gmail.com)

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Abstract —

Objective: This thesis aided the 113 Suicide Prevention (113), the national suicide prevention center for The Netherlands, by investigating technical solutions for the helpline, implementing an e-learning prototype housing six suicidal personas within a conversational agent model, and evaluating and analyzing an experiment on its effect, which entailed interactions with one, two, and three simultaneous chats.

Methods: The thesis conducted a participant observation with a total of seven triage-psychologists, organized three focus groups including triage-psychologists, managers, and training personnel with nearly forty participants, and administered an evaluation with thirty participants that included six triage-psychologist and twenty-four counselors regarding a prototype to assist in the training of 113's triage-psychologists.

Prototype: The system specification provided a prototype with six personas where triage-psychologists can practice against one or many chatbots, or conversational agents, in different situations that pertain to training for 113. The conversational agents design was based upon the Rose of Leary interpersonal stance and the Beliefs, Desires, and Intentions (BDI) design paradigm. The system focused on how a conversational agent must react to triage-psychologists' inputs with respect to the subtleties in interpersonal communication and negotiation as it pertains to the 113 suicide helpline.

Results: Evaluation results indicate that triage-psychologists found the learning environment motivational and the events in the environment as socially realistic. With the additional number of chats, counselors experienced an increase in three measurable areas: 1.) mental effort; 2.) situational awareness demand; and 3.) situational awareness supply; even so, counselors were positive about all learning aspects regarding the new software environment.

Conclusion: This work identified the natural language processing, the BDI reasoning model plus natural language generation, and the usability and quality of the prototype as three areas of focus for 113 as they continue to improve their management of the helpline, its training, and research on suicide.

Preface —The location of this thesis project, for the most part, occurred at the premises of 113 Suicide Prevention in Amsterdam Holendrecht. There are many people at 113 to whom I would like to convey my gratitude. To begin with, I thank the seven triage-psychologists and three counselor participant observation interviewees and the forty focus group participants. Additionally, the thirty evaluation participants, consisting of six triage-psychologists and twenty-four counselors, were extremely essential.

Special appreciation is extended to Saskia Merelle, the project liaison, for providing essential resources such as contacts, structure, beneficial insight, constructive suggestions, inspiration, and, importantly, attention to small details. Furthermore, the research group at 113 provided a wonderful small work group with their stand-ups, feedback, group outings, discussion at lunch, table tennis, and darts competition to keep progress. It was open and welcoming at 113's office space.

During the fifteen-months any inspiration for my work was most valuable, I congratulate Rupak Lamsal and Kimberly Lamsal on their wedding plus Injamamul Haque Galib and Sumaita Tahseen on their wedding, it was an honor to be part of your lovely celebrations. Many people, including Salim Salmi, Marius Pop, and Nacho Narvaez plus numerous colleagues, roommates, friends, the Obvius tennis club, ASAC climbing club, Phi Kappa Theta, I hear stories from and enjoy spending holidays together, sport events, group gatherings, Thanksgiving and numerous dinners, museums and sight seeing, fantastic art and music, for wild adventures and for constant learning.

Certainly, the advice, explanations, and points provided from the TU Delft Interactive Intelligence group has proven to be invaluable, such as the workshop on conversational agents and explainable artificial intelligence. I am grateful towards W.P. Brinkman, my advisor, for his instrumental guidance during the study. I also acknowledge the assistance provided by Navin, senior floor manager, in preparing my prototype. Finally, I thank the 113 Suicide Prevention, the Technical University of Delft, my parents, and my family for providing me with this opportunity abroad. Last, my grandmother, Erika Pinkham, whom my brothers, Alexander and Matthew, and I call Omi.

I dedicate this work to Omi and look forward to spending time with her back in Scarborough, Maine USA. At age 81, she says, "Don't do anything I wouldn't do." And when you ask her how she is doing, she says, "Not bad for an old chicken;" and, "I am going to live to be one-hundred and make everyone miserable until I get there." I hope she makes her goal.

Quote — *'You cannot train alone and expect to run a fast time. There is a formula: 100% of me is nothing compared to 1% of the whole team. And that's teamwork. That's what I value.'*
—Eliud Kipchoge

Summary —In 2013, the Sixty-sixth World Health Assembly adopted the Mental Health Action Plan 2013-2020 [57]. The World Health Assembly makes high-level decisions for the World Health Organization, and their action plan proposes global objectives and approaches for improving mental health, with suicide prevention as an important priority [57]. In 2016, suicide was the cause of close to 800,000 deaths worldwide and for every death an estimated twenty non-fatal attempts [59]. The World Health Organization encourages countries to try national, multisectoral mental health promotion and prevention programs, it is important to try to reach those in need, and it is part of spreading awareness and services [58].

In The Netherlands, suicide is the leading cause of death of ages 10 to 30 years [67, 68], even though suicide prevention strategies exist [78]. Reducing access to means of suicide [25, 77, 78]

and crisis helplines [23, 35, 66] have shown to lower risk. A helpline connects with high-risk people [60]. At the national Dutch suicide prevention center, 113 Suicide Prevention, they received 35,000 chats in 2017 of which 47 percent occurred in the evening and Figure 1a shows 79 percent of callers are between 10 to 30 years and Figure 1b shows 74 percent are female [40]. Other studies show that at-risk individuals, particularly adolescents, are turning to the internet for physical and mental health purposes [6, 20, 24, 30, 39, 51].

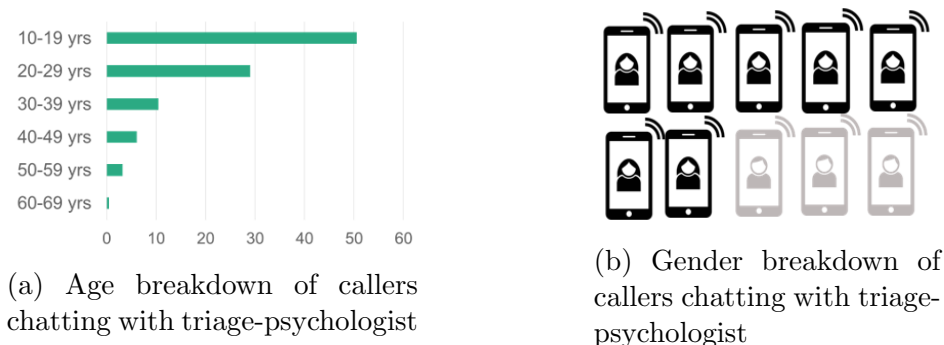


Figure 1: 113 caller age and gender statistics to triage-psychologist [40]

The 113 Suicide Prevention helpline is available 24/7 by chat or telephone and offers crisis interventions, online therapy, and self-management tools for suicidal persons; these make up about 40 conversations by phone and 100 conversations by chat each day to help people with suicidal thoughts in the Netherlands [40]. Experiencing conflict, disaster, violence, abuse, or loss and a sense of isolation are associated with suicidal behaviour [56] plus mental disorders in high-income countries; in particular, depression and alcohol use disorders [59]. In 2017, 113 implemented a triage system in the chat service whereby psychologists moved from backup position to the front line.

The 113 triage system is difficult as the triage-psychologist may be helping one to many help-seekers in a crisis at the same time, for this reason it is important the conversation is kept short, currently as shown in Figure 2 it is on average 15 minutes, and this is part of their need to keep callers going through quick and communicate with as few words as possible. This change improves 113 helpline availability of psychological counselling for visitors, efficiency of assessing each help-seeker situation to reduce the number of visitors who did not need crisis intervention, and reduce waiting times by doing multiple conversations at the same time [40].

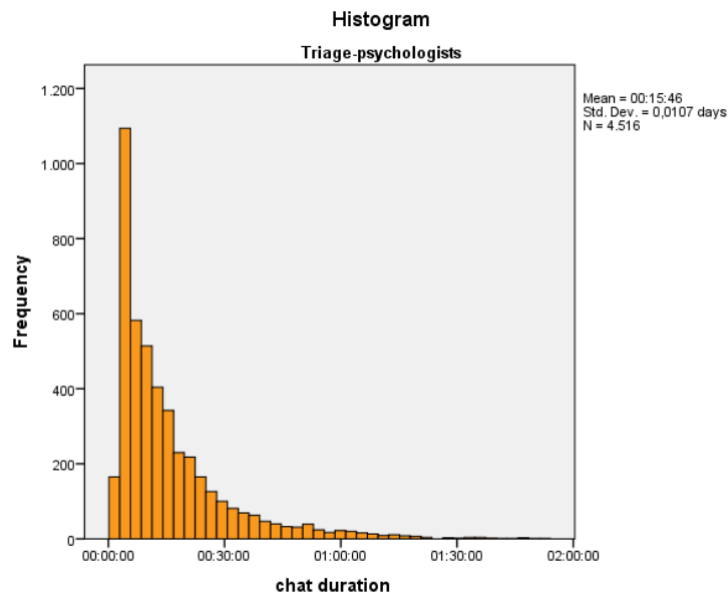


Figure 2: Histogram of triage-psychologist chat duration [40]

113 Suicide Prevention recommend other helplines implement a triage-psychologist [40]. Their role attempts to understand the emotional state of a caller while accurately detailing their safety before transitioning them to a counselor, it is part of processing callers for more specialized help in a short time. There is high turnover for triage-psychologists as many are young and work for about 6 to 12 months [40]. 113 Suicide Prevention has not explored a training system for the 113 triage-psychologist yet, this may be a possible improvement for the helpline, other helplines, and for those in crisis.

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Part I

Introduction

Chapter 1

Creating a computer training environment for the 113 triage-psychologist

1.1 Motivation

The Netherlands' suicide crisis helpline, 113 Suicide Prevention (113), has just partnered with Delft University of Technology (TU Delft). This is one of the initial projects to conduct joint research to develop smart solutions that improve the quality and outcomes of the crisis helpline in the Netherlands. Help-seekers, when they contact 113, they first chat with the 113 triage-psychologist, a trained psychologist. During this conversation, triage-psychologists offer guidance; the goal is to make contact and establish safety before transferring individuals for a longer crisis intervention [40]. For example, the triage-psychologist may convince someone to first move away from the train tracks and then recommend that the help-seeker continue the conversation to work on a goal with a 113 counselor. If they have injured themselves, they may seek direct help from a GP center, call 112, or seek different health assistance. Not always do help-seekers need immediate intervention, if they call 113, they may be in need of a personal conversation.

Since the 1960s, the standard treatment in an emergency room has involved clinical triage linked to a brief medical evaluation [75]. A triage center encounters many patients, often in life threatening situations. Since 113 triage-psychologist encounters are sometimes high stress situations, they can lead to writer's block, a form of cognitive lockup, during peak hours [52]. Air traffic controllers receive training with simulations of increasing difficulty to prevent this [14]. The benefit of practicing situations (i.e. getting flying hours) in a safe environment may be the short-run ability to handle the basic situations and the long-run development of experience to recognize and handle complex situations [36].

In 2017, 113 implemented the triage system in the chat service, where psychologists moved up to be the first in line to assist many help seekers at the same time prior to a warm transfer to an often a less experienced counselor.

There are many reasons why research on a 113 triage-psychologist training system could be useful. The triage-psychologist role is new to 113 and it has a high turnover rate; psychologists work often only 6 to 12 months. Computer based practice may be beneficial to facilitate training fundamental skills and disciplines in this role. 113 Suicide Prevention has initiated a one hour training program for the triage. Triage-psychologists and crisis line managers thought a computer based training environment could be a beneficial addition.

1.2 Research question and objectives

At the onset, the mission of this project was to improve the quality and outcomes of the 113 crisis helpline with a smart technical solution. This research adheres to this mission and initially required time to first understand the domain and situation at the helpline to propose solutions and ultimately offer the most desired technical solution. After proposing three technical options, the helpline manager selected the use of conversational agents, which are a form of artificial intelligence, commercially known as a chatbot.

This project's focus was its main research question:

If it is possible and in what way can conversational agents train 113 triage-psychologists to better assist many help-seekers by chat at once?

To answer the main research question, additional observations and background was essential, this was part of understanding the complex task environment of the helpline. To make an informed decision about training triage-psychologists, it was necessary to understand the subtleties of the job role and responsibilities plus the vision for training the role. The first sub-questions refer to how it was necessary to observe and gain understanding of the 113 environment, tasks, workflow, and issues for the triage-psychologist.

- Why is the role of the 113 triage-psychologist important?
- How do attitudes and values impact the role of the 113 triage-psychologists?
- What are the learning objectives for 113 triage-psychologists?

Next, the concept of allowing triage-psychologists to train with many conversational agents at once and utilize a system to support their fundamental training experience with complex situations needed thorough specification. From a technical standpoint, the solution required the next set of sub-questions.

- What are the requirements for such conversational agents?
- What would a prototype look like?

Finally, the design specification required an evaluation to demonstrate its quality. To test this properly, triage-psychologists and counselors had to utilize the envisioned technology.

- What is the opinion of triage-psychologists on the possible designs?
- How would trainees experience a learning environment with these conversational agents?
- Why is such a prototype beneficial?

This thesis works to satisfy the main research question, sub-questions, and the design decisions.

1.3 Approach

A triage-psychologist has both human-human interaction and human-computer interaction; their responsibility is foremost related to assessing the safety of many help-seekers and transferring help-seekers for counselling. The work is tough. Experience is important for the role. The role of a 113 triage-psychologists involves a *complex task environment* [54].

Situated cognitive engineering, by Neerincx, is an approach to build technology for complex task environments. It was useful, for example, in creating technology for space environments [53]. With the exploration of a simultaneous conversational agent system for 113 was unique, and it was unexplored, it made sense to adhere to a credible approach. This study uses Neerincx's situated cognitive engineering approach [54] adjusted to the suicide prevention domain.

Following this **introduction**, the thesis report will chronologically follow the situated cognitive engineering approach and has three phases: Foundation, Specification, and Evaluation. To answer the main questions from Section 1.2, there are five chronological parts: the 1.) introduction; 2.) foundation; 3.) specification; 4.) evaluation; and 5.) conclusion.

In chapter 2, the goal of the **foundation** was to gain a better understanding of the theories, situation, demands, human factors, and technologies that could play a role in design. The foundation involved situated cognitive engineering [53], to understand the situation and its needs through a perspective on operational demands, human factors, and technology.

Since 113 triage-psychologists operate in a complex task environment it was clear that this project develop a computer based training system for their role with a coherent design approach. Methods such as contextual inquiry, contextual analysis, and literature research [8, 9] were useful. Participant observation and interviews [49] with 113 triage-psychologists were a tool to develop an "on-the-ground" understanding of the complex task environment, and observations

led to both the task flow diagram and the work flow diagram [38] to illustrate the operational demands and human factors.

Literature on conversational agents, existing technology, suicide prevention, and theories, plus the previous insights, contributed to scenarios and claims by Carol [21] which helped illustrate specifications gathered from the current needs and perspectives of 113 triage-psychologists. From existing technology, the Rose of Leary [46, 17] was a concept used to model the behavior of help-seekers and was particularly useful in designing this project's six conversational agent personas. Broadly, it was important to determine in this phase, from multiple disciplines and existing works, what ways computer based training could help triage-psychologists.

The **specification**, in chapter 3, involved the design of the proposed system in a manner to allow reproducibility. The system faced three main design challenges that it overcame with a three-layer solution. The simulation layer, handled the user interface. The reactive layer, involved natural language processing and selecting answers. The deliberative layer, dealt with BDI and the interpersonal stance agent model. The overall solution uses a series of algorithms to update the agent. The system selects outputs based on the interpersonal stance. The interpersonal stance is calculated from the previous stance of the agent, the input stance of the message, and the BDI model of the agent.

The **evaluation**, in chapter 4 and chapter 5, involves the prototype. The prototype works in both English and Dutch and contains six different personas based on the Rose of Leary. The evaluation of the prototype included two experiments with thirty total participants. The system works via a web application that showed that it was possible to get an idea of the impact of the proposed computer based training system and opinions from triage-psychologists and counselors regarding conversational agents to answer the experiment questions and main research question.

The **conclusion**, in chapter 6, covers the recapitulation, contribution, limitations, future work, and final remarks.

Part II

Foundation

Chapter 2

An exploratory study of 113's current situation and desired technology

The foundation chapter explores the following topics related to a computer based training for the helpline of 113 Suicide Prevention (113) involved four steps. The first step was understanding how the helpline operates and the roles of the people working there. Next, was connecting the observations with literature. The third part involved the envisioned technology. Lastly, three focus groups were presented with claims, and made the baseline project requirements. As part of the situated cognitive engineering approach [53], it was important to detail three domains of background research: operational demands, human factors knowledge, and envisioned technology before a solution.

2.1 113 triage-psychologist

To understand the current situation, the study used participant observation and interviews from the contextual inquiry analysis method described in Hartson's book on user experience [38], it was important the study used an established technique [8, 9], this was part of gathering knowledge of the triage-psychologist and current situation in a clear way.

In Figure 2.1, the relationship between the help-seeker, also known as the "chatter", and the triage-psychologist is illustrated. As such, anonymous help-seekers chat with the triage-psychologist, who then transfers them to counselors, or advises the help-seeker to go to a different service, if they are not in an acute situation. This research was essential as it was necessary to talk with 113 triage-psychologists about what they do, ask questions about their past experiences in the role, plus observe them, without much discussion, while they worked.

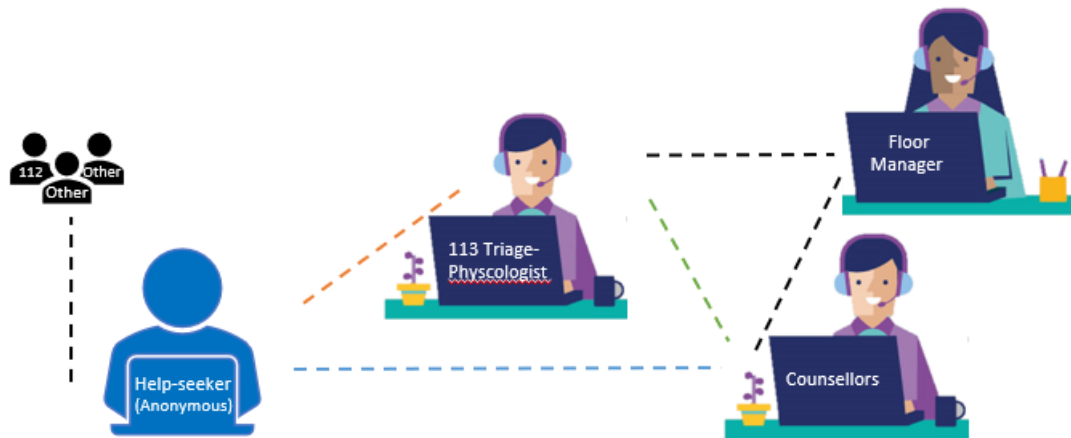


Figure 2.1: The help-seeker may contact the 113 triage-psychologist through 113's website and be transferred to a counselor or given advice to seek a service such as 112 if they need immediate care

Participant observations and interviews obtained ethical permission from TU Delft's human research ethics committee (no. 503). The findings led to the construction of diagrams from Hartson's book [38] such as the flow diagram and work activity affinity diagram, shown later in this section, this was part of using collected observations, interview responses, transcriptions, and notes to best illustrate and understand the current situation.

2.1.1 Method

PROCEDURE: Participant observations and interviews took place at three different time periods: morning, afternoon, and evening. There were 2 morning, 4 afternoon, and 4 evening sessions or ten sessions for a total of ten sessions. Some participants participated twice as the role of the triage-psychologist and the role of the counselor. Observations and interviews were between 60 to 120 minutes in length, and they were used alongside each other over four weeks to develop an on the ground understanding.

PARTICIPANTS: Seven participants with experience ranging from 1 month to 3 years were observed over the ten sessions. They represented both experienced and newly trained triage-psychologists.

A helpline manager provided the initial set of names. Next, the following types of non-probability sampling were applied: *availability*, *expert*, and *snowball sampling* [71]. Non-probability sampling methods are non-random techniques of gathering subjects for a study, these methods were appropriate for this work because it is necessary to get information from specific experts and people from multiple backgrounds.

INFORMED CONSENT: The participants were contacted while they were working with the permission of their manager. The participants were informed through a form containing all the

necessary information about the research.

Clearly, the primary task of the triage-psychologist was to focus on the chatters; situations arose where they did not have time to answer questions or provide clarification. This resulted in necessary, but time consuming delays for clarifications from the triage-psychologist.

2.1.2 Work flow

Participant observations were a valuable part of this exploration. The researcher expects a variety of information and they limit their involvement in the work environment so that it will not alter the results of the data collected [49]. Observation is a form of research for identifying many perspectives among a group through recording interaction during normal activities. It is also important to ask people to describe their job; the researcher's impression of what they do may not be accurate [10].

Interviews were used alongside observations for further developing a collection of opinions [49]. When determining which type of interviews to use, it was important to consider the experience and knowledge of the group. Open ended interviews were chosen with experts during observations; they are best suited to gather information due to their loose structure, which resembles a guided conversation. With less experienced triage-psychologists, however, the questions were semi-structured.

In Figure 2.2, the work flow model constructed a coherent picture of a triage-psychologist system and task environment. It was important to document the existing 113 triage-psychologist task environment. This was part of showing responsibilities, relationships, and existing technology.

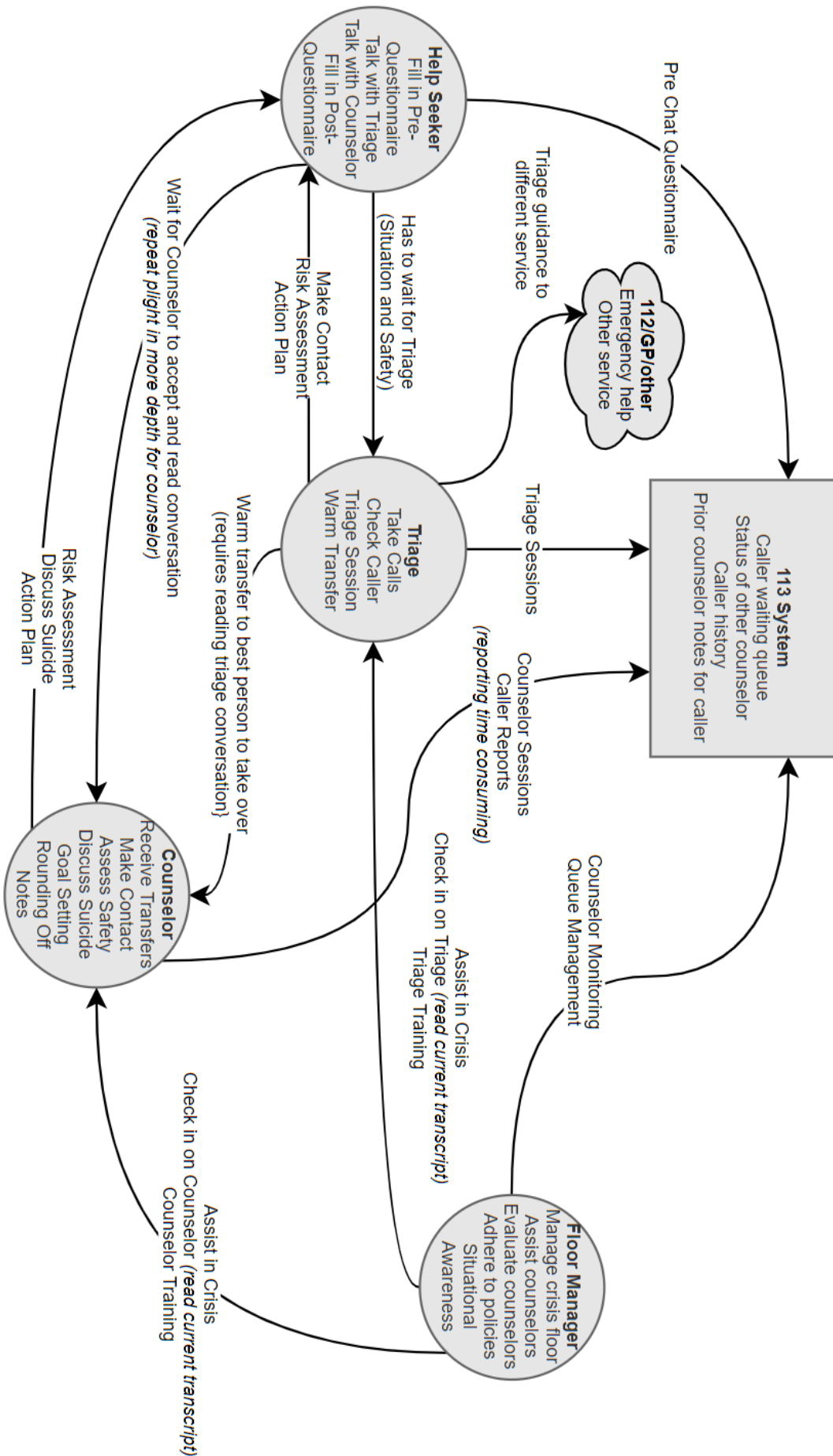


Figure 2.2: Work flow diagram showing the roles, relationships, and responsibilities essential to the Helpline at 113 Suicide Prevention.

The contextual inquiry found that 113 personnel use the Livecom software platform, a chat-based web application that allows text conversations with chatters (help-seekers), and all communication with the triage-psychologist. There are restrictions on how much personal information the 113 personnel can access. Chatters are identified by their IP address; other information is unavailable so that chatters remain anonymous. Many returning help-seekers have a profile with details and notes regarding prior conversations. Counselors use their discretion when creating their profiles. A floor manager oversees the operation. And each counselor is limited to one chatter at a time. On the other hand, at any given time, a triage-psychologist may handle one or more conversations in parallel. These are asynchronous communications through text and not voice.

The 113 triage-psychologist's responsibilities are below.

1. *Take chatter*: All incoming chats come to a triage-psychologist, they communicate with up to five chatters at any given time.

To maintain high quality, 113 restricts the triage-psychologist the number of chatters to a maximum five. Three to four chatters is most common. When a triage-psychologist stops accepting additional chats, their online status is temporarily unavailable.

2. *Pre-questionnaire and profile*: When a triage-psychologist accepts a chatter then the first thing they check is the help-seeker's pre-questionnaire. After which, they review any available chatter profile information.

It is important to determine what type of chatter is reaching out for help. If the chatter is not suicidal, but needs other assistance, the triage-psychologist may guide the individual to a GP center, 112, or other assistance.

3. *Triage session*: The triage-psychologist follows a scripted protocol in each every chat that includes three parts: 1.) make contact 2.) risk assessment 3.) goal and transfer.

- *Make contact*: Usually, the most difficult part of the triage is to quickly determine what are the main issues facing the chatter, and then respond in a chat format in a caring manner, without being able to use your tone of voice to assist you, to make the chatter feel understood about their issue and emotional state.

For example, a teen with relationship difficulties might be depressed, a triage-psychologist will listen and attempt to relate to their story. It is imperative that the triage-psychologist work with the chatter to help them to become receptive enough so that the conversation can continue with a counselor.

- *Risk assessment*: A typical triage conversation will last about fifteen minutes but some may be shorter or longer. It can take time to identify risks, this is the most important part of the triage conversation.

For example, a chatter with a history of drug abuse and depression and who is experiencing intense suicidal thoughts might be a high risk chatter. It is important to assess what crisis the chatter is facing, and if the chatter is a threat either to themselves or to others; this is part of assessing risk.

- **Goal and Transfer:** The triage-psychologist often does a quick assessment of what the chatter thinks may help. It is important to identify concrete steps the help-seeker can take to avert the immediate crisis facing them.

For example, a chatter who has recently divorced might like to talk with a counselor about how to reach out to friends and family and a therapist. A person struggling with suicidal thoughts may need a plan to stay safe for the night.

4. **Warm transfer:** At the end of the triage session, the triage-psychologist will conduct a warm transfer of the chatter to a counselor to continue their conversation. . Sometimes there are no counselors available for a warm transfer, and the triage must maintain the conversation with the chatter. It is important the help-seeker is not told to wait. The chatter should not end the chat and stays on the line until a counselor is available. The triage transfers the chatter only after the help-seeker has indicated they understand that the triage session is complete, and they also agree to being transferred for a longer conversation.

The triage-psychologists are part of a larger team. Together with counselors and floor managers, they provide suicide interventions by chat to those in despair.

2.1.3 Chat transcripts

To really understand the triage conversation, it was important to look at more conversation data. From an analysis of one hundred transcripts, it was clear that triage-psychologists receive chatters with three parts.

In Figure 2.4, the affinity diagram shows how the triage-psychologists make contact during the conversation. In the first step, the triage psychologist tries to better understand the help-seeker and begin to establish credibility with the chatter. It is important to establish a relationship and build trust.

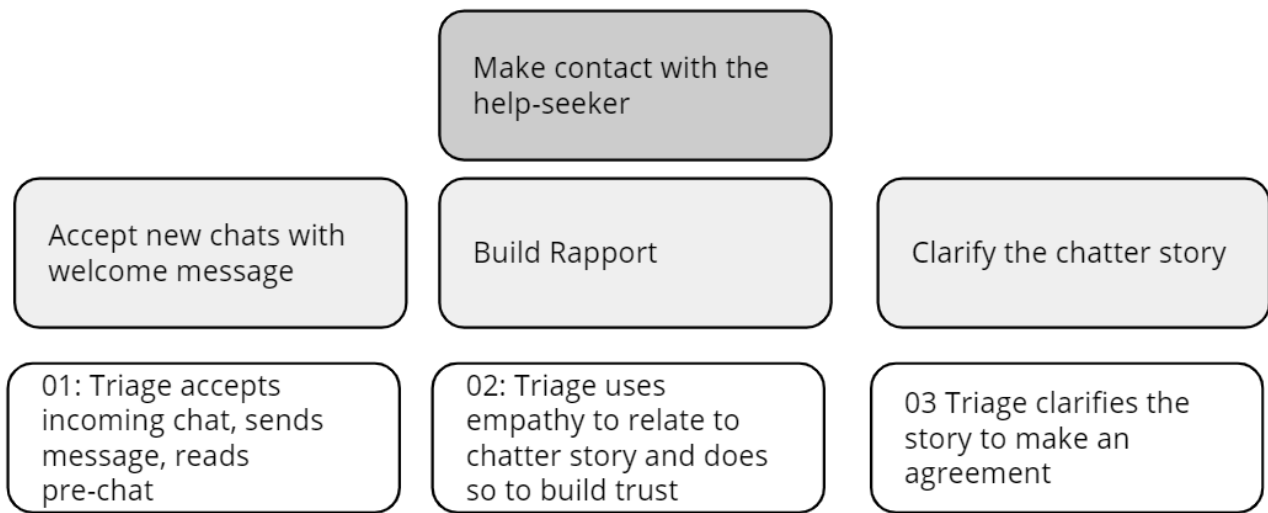


Figure 2.3: An affinity diagram showing making contact; it is an important guideline for starting a triage conversation

The diagram illustrates the flow of the incoming chat. This is how 113 processes incoming chats and how 113 tries to best use helpline resources. Without visual confirmation it can be difficult to know that the help-seeker is safe. In Figure 2.4, the second step shows how the triage-psychologist determines safety of the chatter.

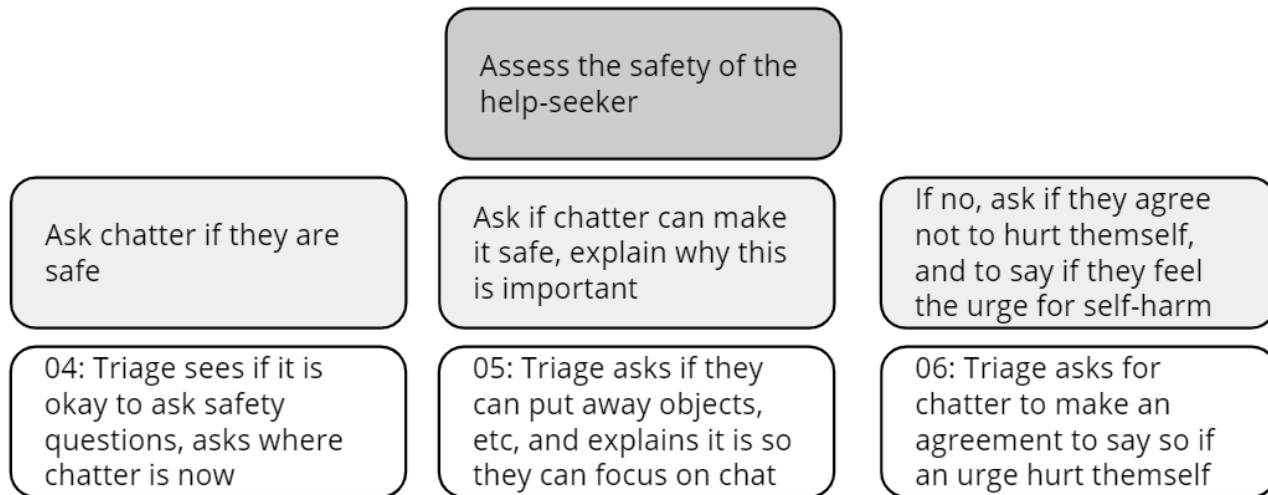


Figure 2.4: An affinity diagram showing the steps for assessing safety; agreeing upon safety is a requirement that triage-psychologists must confirm with every help-seeker

For the triage-psychologist, it is a requirement to get agreement from the help-seeker to be safe because the conversation may be emotional and the conversation with the counselor needs to occur without the potential distraction of self harm. The goal is to achieve a positive conversation outcome.

In crisis cases, a triage-psychologist may not transfer a chat to a counselor. If the helpline is unable to help the help-seeker, it is important the triage-psychologist explain to the help-seeker

how they can receive more appropriate care. Figure 2.5 , illustrates 113's protocol to conclude the triage portion of the communication.

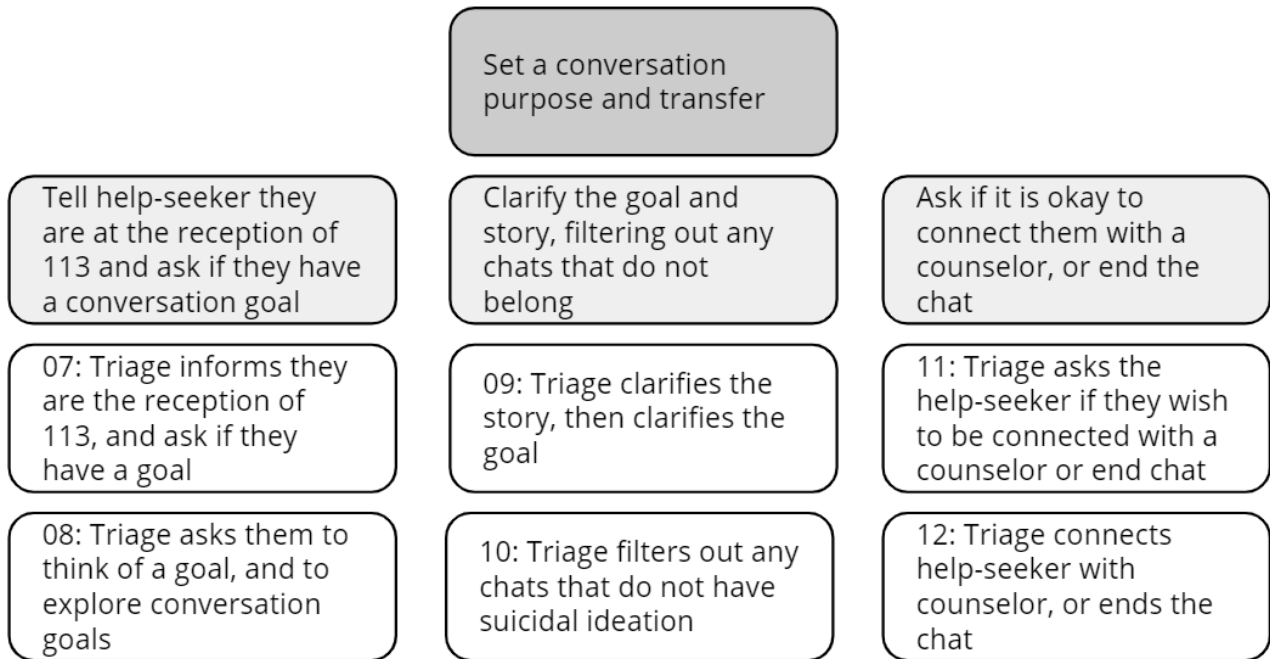


Figure 2.5: An affinity diagram showing the actions before transferring a help-seeker to a counselor; triage-psychologist set a conversation goal, if possible, and must provide any clarifications

2.2 Operational demands and human factors knowledge

To understand the triage-psychologist values and factors, it is important to follow Situated cognitive engineering. This involved detailing the *operational demands* and *human factors* regarding a training system with conversational agents.

Operational demands

Realistic training: Training with conversational agents must be realistic. If the training is not, there is less trust. A conversational agent inspired from transcripts and real experience is useful [22]. The model can not support some human like conversation qualities, thus it is important the model respond in a competent manner and respond to conversational texts. The new system requires training the triage-psychologists with the use of multiple conversational agents, one for each help-seeker. The main advantage is having multiple practice situations they can make errors in and learn from.

Learning objectives: The learning objectives are to practice the scripted protocol and form the fundamental habits when handling one to many conversations. Appropriate situations should

result in the willingness of users to utilize the conversational agent system. With a system that involves conversational agents, where triage-psychologist can successfully complete chats, this should allow for motivation to meet learning objectives.

Feedback: The conversational agent system is designed to provide feedback to the user on how the agent processed each input and overall during the conversation. This information helps the user measure how well they are doing and it helps them understand how the system works. This is part of maintaining motivation to satisfy 113 learning objectives [22].

Human factors knowledge

Mental effort: During participant observation, it was noted that the triage-psychologists experienced high mental effort, at times. Their task of handling acute situations, can be stressful. To simulate this, a training must expose triage-psychologist to difficult simulations where they adapt to many help-seeker situations with varying degrees of urgency.

Situational awareness: A well-trained triage-psychologist should be able to deftly handle time-critical problems and unexpected events. Endsley [29] describes some factors such as tunneling, memory trap, data overload, salience, complexity increases, and being out-of-the-loop can occur which decrease situational awareness. This is part of designing a realistic system for basic training. Practicing these time-critical problems beforehand helps triage-psychologist recognize when things escalate and know when to seek help from the floor manager to prevent problems before they occur.

Motivation to learn plus self-efficacy: The integrative theory on training motivation shows how both cognitive ability and motivation are necessary to meet learning objectives [76]. this leads to performance. The motivation to learn is essential for meeting learning objectives. It is important that training foster a confident attitude. Without motivation it is unlikely the trainee will develop the self-efficacy they need to meet the learning outcomes of 113. Whetten explains how factors related to personality, experience, situational, and the job/career affect the job performance.

For new 113 triage-psychologists, keep in mind that it is motivating to start with an easy situation. Colquitt describes how many human factors contribute to training outcomes [22]. At 113, many triage-psychologists have high turnover and are young these factors could make it difficult to meet training outcomes because of lower self-efficacy. It is important the training start with the introduction and fundamentals to build confidence and proficiency.

2.3 Envisioned technology

The main purpose of this project was to develop a conversational agent for 113 triage-psychologists to practice conversations with one to many chatters. The task is to design a simulation that

lasts on average fifteen minutes between a triage-psychologist and one to many conversational agents. A literature analysis in the conversational informatics field described designs that could model this type of conversational agent. The two of focus included the Belief Desires Intentions cognitive paradigm (BDI) and an overarching architecture from Nishida et al [55]. The architecture must support many agents. The interaction must allow for triage-psychologists to explore different dialogue paths with the conversational agent. Each conversational agent must have its own unique situation and goals, and it is important the conversation take shape around this. To determine what kinds of components are necessary to build an autonomous conversational agent system; it was also useful to look into existing systems alongside theories. Finding related work that matched operational demands and human factors was necessary.

2.3.1 Conversational informatics

The conversational agent needed to be realistic and give responses that take into account essential factors related to a chatter in crisis. This is more sophisticated than a basic question answering agent. For example the conversational agent had to represent a complex help-seeker in their unique situation. To do this there was a clear need to take a look at the emotions, personality, situation, and coping strategy of the chatter.

Nishida et al. on conversational informatics [55] details a few standard models for modeling human behavior, one such model is the beliefs desires intentions (BDI) model. To produce dialogue there needs to be an dialogue engine that receives text and then produces text in response using semantic analysis and either sentence selection or generation.

A BDI system with an appropriate dialogue engine has capabilities to allow for agent modeling and conversations with varying responses based on human thought, this makes it a possible candidate. In Figure 2.6, the BDI model shows the "reasoner" processes incoming signals with beliefs, desires, plans, and intentions, which result in an output.

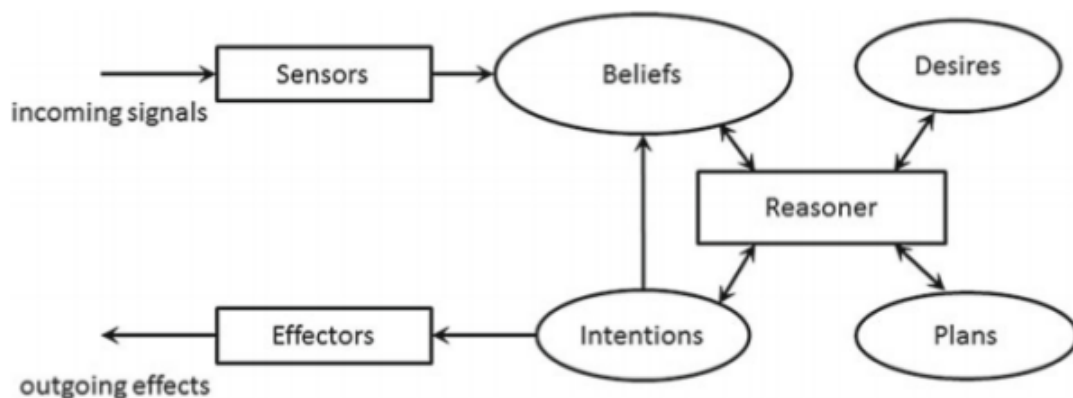


Figure 2.6: The BDI Model from Nishida et al. [55]

System Components: A training environment for the 113 triage psychologists must allow one

to many conversational agents, it is important the conversations give valuable experience and feedback that work to improve self-efficacy and the motivation to learn, this is part of designing a system that meets operational demands and human factors. The previous BDI model may be useful here to provide feedback, this would have benefits for providing which topics are in the conversation from the agent's beliefs plus which responses resulted in changes that have a positive effect and ones that have a negative effect.

Branching is another technique useful for feedback as it [61] allows each conversation path to depend on decisions made by triage-psychologists, The narrative can be used to show where the triage-psychologist in a conversation and the depth of a topic.

ARCHITECTURE: When models integrate together a more comprehensive architecture begins to take shape. Figure 2.7 illustrates the architecture for the triage-psychologist training system, which takes inputs from the real world and has two layers: 1.) reactive layer 2.) deliberative layer.

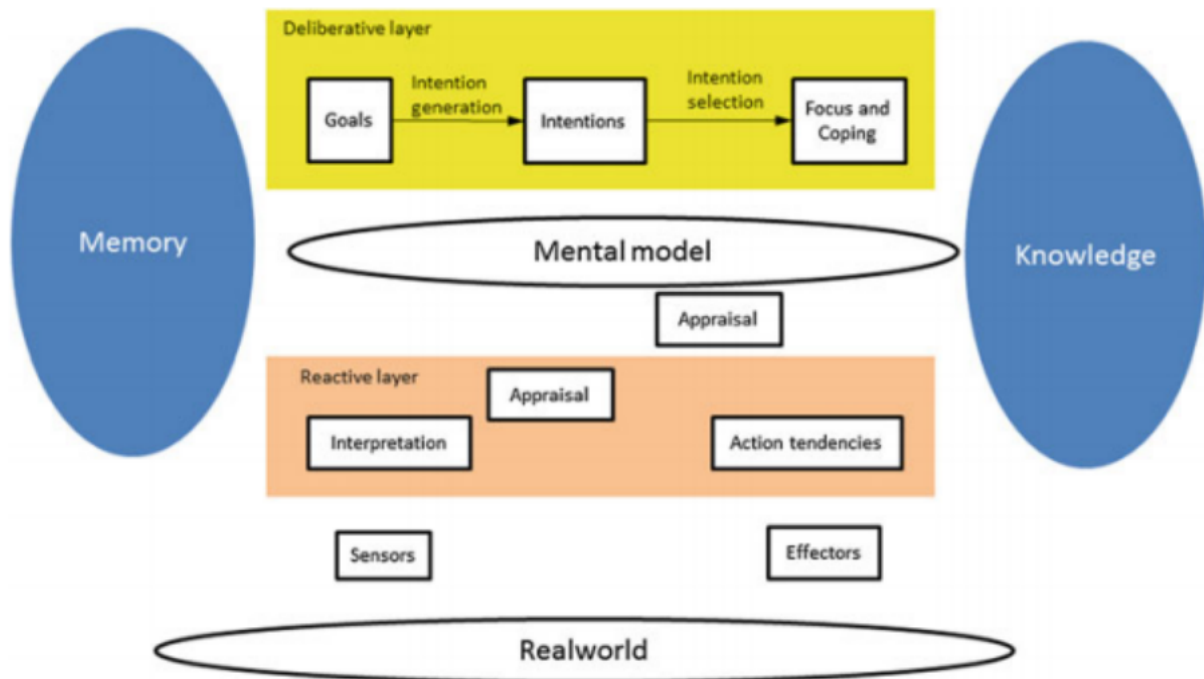


Figure 2.7: Architecture for a conversational agent from Nishida et al. [55]

The reactive layer interprets the inputs from the real world and deals with the action tendencies of the agent. The deliberative layer models the agent decision making and updates the mental model based on its memory and knowledge. These layers may provide enough cognition for a conversational agent to simulate a chatter to the 113 helpline, it is important that the design involve the mental model.

2.3.2 Design considerations

A computer training environment can either be done as a web application or desktop application. The system for each has clear advantages and disadvantages. The web application is best because the training system is to use open source technologies and be easily accessible. Recognizing this challenge, a web application may be best with its ease of accessibility, yet the prototype will sacrifice performance that a desktop application would have allowed.

Another consideration in the system design involved language; the agent was developed in English, to facilitate system verification. The second phase involved developing a system that works in both languages, Dutch and English. This is because triage-psychologists interact with both Dutch and some English chatters. Supporting the Dutch language mode will require sitting with triage-psychologists to review the translations. These limitations were useful to consider before development of prototypes and evaluation. The study aimed for a decent solution with a system that triage-psychologists tested in an evaluation setting.

A final consideration involved the number of conversational agents needed for the prototype to simulate one to many chats. The evaluation structure will depend on how many conversational agent personas can be implemented within a reasonable time for the scope of the project. In order to implement many personas, a modular and reusable model is an absolute must to implement. Especially, when considering including translations that must be accurate.

2.3.3 Related Work

To model the behavior of an agent, it was useful to take inspiration from existing systems, one such work was on Believable Subject Agents for police interrogations [17]. In police interrogation, Bruijnes used the **Rose of Leary** as a way to create a virtual agent with interpersonal stance for training social skills. The Rose of Leary is not uncommonly used in conversational agents for training interpersonal communication [72], and there are similarities between the police interrogation domain in comparison to the suicide prevention domain. In Figure 2.8, Leary's circumplex [46] shows the eight types of typical interpersonal communication styles that occur between humans. In other illustrations, they offer more ways to describe behavior, but they all fall into four quadrants: friendly (top-right), dependent (bottom-right), withdrawn (bottom-left), and aggressive (top-left).

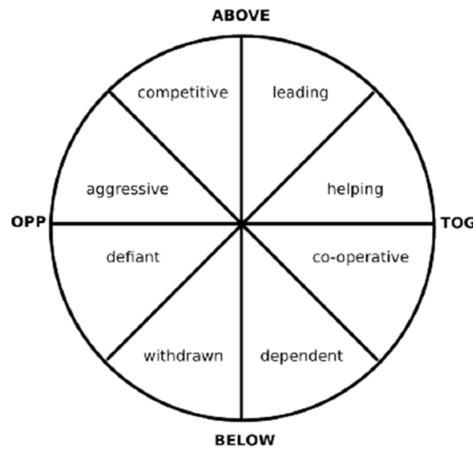


Figure 2.8: Rose of Leary [46]

Help-seekers with suicidal thoughts can be uncooperative in interaction; this is similar to getting information from police subjects. Bruijnes’s solution to modeling such behavior was the use of the Rose of Leary [16, 2]. Depending on ‘what’ and ‘how’ things were said, Bruijnes’s system would give responses based on interpersonal stance, but also negotiation strategies. With police subjects, police officers use a variety of strategies to negotiate, such as those in **Giebel’s Table of Ten** [18] in Table 2.1. Giebel’s gives ten strategies used in crisis situations [31]. By recognizing rhetorical strategies, this concept can apply to conversational agents that can change behavior via certain strategies.

#	Strategy	Principle	Description
1	Be Nice	Sympathy	Show willingness to talk, react empathetic
2	Be Equal	Equality	Emphasize commonalities, name external foes
3	Be Credible	Authority	Show trustworthiness, show expertise
4	Emotional Appeal	Self-Perception	Play on feelings (consider victims), offer to earn respect
5	Intimidation	Insecurity	Warn of consequences, personal attack
6	Impose Boundaries	Scarcity	Deny concessions, ignore opponent
7	Direct Pressure	Repetition	Repeat appeal (plant seed), accomplished fact
8	Legitimate	Legitimacy	Refer to rules and laws, refer to other opinions
9	Trade	Mutuality	Ask for something in return, concession after high commitment
10	Convince Rationally	Consistency	Bring forward arguments, confront with contradictions

Table 2.1: Giebel’s Table of Ten [32]

With help-seekers in acute situations, a negotiation occurs with the triage-psychologist and the

help-seeker; the triage-psychologist uses strategies to convince them, by changing their stance, to open up about information and move them to safety. A **Beliefs, Desires, Intentions** (BDI) conversational agent system has capabilities to allow for agent modeling of how beliefs may also change with varying responses based on human thought.

2.4 Scenario based investigation

This study used *scenario based design* and *focus groups* with people from multiple disciplines to identify the underlying issues for triage-psychologists and receive feedback on a preliminary solution. The data gathered represented ideas from several stakeholder groups through scenario based design. In Figure 2.9, the photographs exhibit the setup for the focus groups where discussions took place.



(a) View from presenter

(b) View from participant

(c) View from note taker

Figure 2.9: Focus group room setup, each participant had a questionnaire and pen to rate claims

2.4.1 Method

PROCEDURE: The research involved collecting opinions from many roles at 113 with two focus groups and one lunch talk. The discussion was important to bring current difficulties and potential solutions for triage-psychologists to the surface by listening to and gathering all concerns and rationale from group members. Each participant had a pen and a questionnaire with four claims. A questionnaire was used so each participant could rate a claim before the mediator guided a discussion. This ensured the study heard each participant's voice. The observations and interviews took place at three different time periods: afternoon of November 29, late afternoon of November 29 and a lunch talk on December 4. The length of the discussions were between 20-30 minutes for each focus group and 15 minutes for the lunch talk. TU Delft colleague Salim Salmi recorded notes as the discussions were in Dutch to be more natural for participants. .

PARTICIPANTS: The total turnout for the two focus groups plus lunch talk was approximately forty participants. The first focus group had about fifteen multidisciplinary participants and

most from management. The second group was comprised of about ten 113 triage-psychologists, counselors, plus floor managers and the last group for the lunch talk was another multidisciplinary group of about fifteen.

Non-probability sampling methods are non-random techniques of gathering subjects for a study. These methods were appropriate for focus groups because it is necessary to get information from specific experts and people from multiple backgrounds targeting 6 to 12 participants. The project sponsor liaison, helped provide an initial list of names for 113 personnel and managers. A senior helpline manager also helped organize to recruit for triage-psychologists and counselors. Then the following types of non-probability sampling were applied to gather more participants for the focus groups and lunch talk: *availability, expert, and snowball sampling* [71]. The goal of the sampling was to get the underlying issues from a broader group. It was necessary to consider many different perspectives to identify a wide range of ideas on computer training for triage-psychologists.

MATERIALS: The materials necessary for the focus groups were simply a form to rate claims and note taking material. It was important to explain the focus group procedure to each participant. As researchers, the primary goal was to understand the triage-psychologist role and to convey that training may ease and improve their performance.

MEASURES: The measures essential for the focus group were notes and observations of participant responses. Participant observation allowed development of a set of mental notes and list of concerns and rationale pairs. The discussion allowed a communal perspective of the values and characteristics needed for normal training and practice situations in the triage-psychologist role.

ANALYSIS: Upon completion, the focus group findings yielded were discussed at the lunch talk. Reviewing the opinions and underlying issues with a different group of people, helped establish the desired requirements for the conversational agent needed for the project. The following section of this report explores the thoughts and opinions of the participants and triage-psychologists on key topics and learning outcomes related to their role within the 113 helpline. The preliminary specification at the end illustrates some components for a computer training solution.

2.4.2 Scenarios

To narrow down and determine the most important aspects of the conversational agent project scenarios were used [21]. This is a popular approach to gather feedback from potential users before starting design and implementation. It allows discussion for underlying issues while comparing ideas for a solution. This helped gain collective knowledge and opinions on potential features and project requirements to make improvements to existing systems or designing new systems. The following will describe the four presented scenarios. Each scenario has an

explanation with corresponding focus group remarks. This was the first step to a preliminary specification.

Within scenario based design, researchers use focus groups as a qualitative research method to gather information on opinions and beliefs about a certain concept. It is important they consist of about six to twelve people with a moderator that directs the conversation and a note taker [37]. Overall, the research method provided this work with a more natural environment than face-to-face interviews [50] as the act of listening to others stimulated more memories, more ideas, and experiences that branched to new topics, that still related to the main idea. This work provided the opportunity to find the spread of opinions based on the interactions between members in the group [37], this was part of understanding the underlying concerns and rationale of triage-psychologist plus managers.

The foundation allows for the accumulation of research and ideas that brought about various ideas for potential solutions to improve the helpline. From this it became clear to focus on the computer training system for the triage-psychologist. This research direction was also helpful in addressing high turnover rate and the young average age of employees.

Scenario 1: Start with Difficult chatter or Many chatters

The first scenario depicts a conversation with a single conversational agent. A triage-psychologist was asked to select whether they prefer training to begin with a difficult conversational chatter or many not so difficult chatters. It described what the triage-psychologist may say and the response of the conversational agent, this scenario had three cases, one for making contact, assessing safety, and a warm transfer. This was to support the following claim:

- C1: A conversational agent can provide a reasonable conversation.

Figure 2.10 illustrates the a single chat where the help-seeker does not want to be transferred.

<p>Crisislijn Receptie:</p> <p>Als je wil kan ik je doorverbinden naar een collega zodat je hier wat langer over in gesprek kan</p> <p>Wat bedoel je?</p> <p>En toch ben je ook hier. Als je wil kan je hier met iemand nog even over praten, voor je een beslissing neemt</p> <p>Zeg het maar. Als je liever niet in gesprek gaat met iemand hier dan is dat aan jou. Dan sluiten we de chat.</p>	<p>Computer - Hulpvrager Jess: (age 21)</p> <p>Ik denk niet dat ik het kan</p> <p>Ik vecht al jaren.</p> <p>Mijn energie is op</p> <p>En ik wil het volgendr week</p> <p>ik weet het niet</p> <p>ik ga het toch eens proberen met een gesprek</p>
---	--

Figure 2.10: Scenario with one help-seeker

SCENARIO 1 REMARKS: This scenario had arguments for and against starting with multiple chatters. It is desirable to start with one difficult chatter, though, from the discussion this may yield the wrong idea of what to expect. A system needs to be able to allow users to build up confidence. It is important that the system not overwhelm the user with a difficult chatter or too many chatters. Recognizing this reality will help keep users motivated.

Scenario 2: What are the Difficult chatters or Difficult Situations

The second scenario depicts three triage sessions that may be difficult. This scenario involved cases of a forgotten chatter, keeping a chatter on the line, and two chatters in crisis. The following claim was for scenario two.

- Two or more conversational agents can simulate difficult scenarios depending on their configuration

Figure 2.11, is an example of a triage session with three help-seekers, two in a state of crisis.

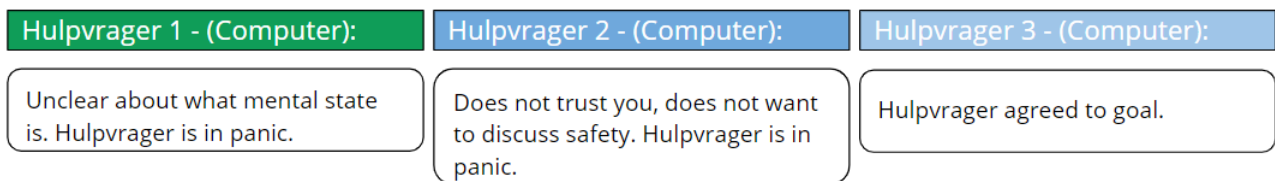


Figure 2.11: Scenario with three help-seekers

SCENARIO 2 REMARKS: The second discussion centered around what makes the triage difficult. The conversation steered to which calls are difficult to handle and why they are difficult. The comments listed below are a real brainstorming sample of comments without corrections for punctuation and grammar or reordering.

- Panic from the chatter, spams messages.
- Im here, but you cant help me. Not willing to cooperate.
- They are in a dangerous situation already, getting them out is difficult because they are afraid somebody will get notified and they lose their anonymity and control of conversation.
- A chatter that doesnt want to let them know clearly that hes safe, takes up a lot of time, manoeuvres around the topic
- A chatter that doesnt want to make agreements

- Always answering with "I dont know"
- Young people type very fast and lot of typos and shorthand formulation.
- No trust, dont want to discuss safety.
- Demanding, pressure.
- Psychotic
- Unclear what the mental state of the chatter
- Aggressiveness
- The chatter doesnt react to the messages of the triage, two distinctions: somebody doesnt understand its a triage or somebody is typing a whole lot of their own story
- Somebody who already called once, but then didnt do what they discussed in the previous chat (comes back with a different name)

Scenario 3: Summative Feedback or Formative Feedback

The third scenario involves what feedback the system should provide and focused on the main steps of the triage session. It deals with how users can learn from using the system. The following claims were about the feedback.

- Feedback can show the performance in relation to the protocol plus show time occupied

SCENARIO 3 REMARKS: From the focus group, the idea of having a transcript with feedback with specific points in the conversations was ideal. It was important to have feedback that is applicable, and this is how tough conversations are reviewed at 113. Feedback on specific points in the conversation, that could be improved, was considered most useful. The need for what steps have been followed, honest feedback, and feeling of being on the right track were brought up.

2.4.3 Preliminary specification

Following the focus groups, there was enough information to begin making informed decisions about preliminary specifications. Scenario 1 notes brought up valuable arguments why training with difficult and multiple chatters would be useful. A main point arose of starting with an easy conversation as best. Scenario 2 opinions involved which chatters and situations are most difficult. It was important to make a distinction for difficult chatters and practice situations, this was part of understanding the requirements for conversational agents. Scenario 3 discussion

agreed that formative feedback linked to the conversation transcript would be most helpful. It is important that it would give the sense of being on the right track. In general, 113 perceived the proposed scenarios of a training system as useful.

The preliminary specification was to develop a system in three phases: 1.) a basic conversational agent, 2.) adapt the model to a system that allows multiple conversational agents, 3.) then improve the conversational agent response model to account for more dimensions, performance, offer training feedback and support Dutch and English languages.

In Figure 2.12, the user interface shows an idea of a training system with a training environment where a user has some settings, a chat input and output, plus macros. Macros are pre-determined messages. Triage-psychologists use macros to send messages quickly, and to avoid typing, so they can maintain conversations with many help-seekers at once.

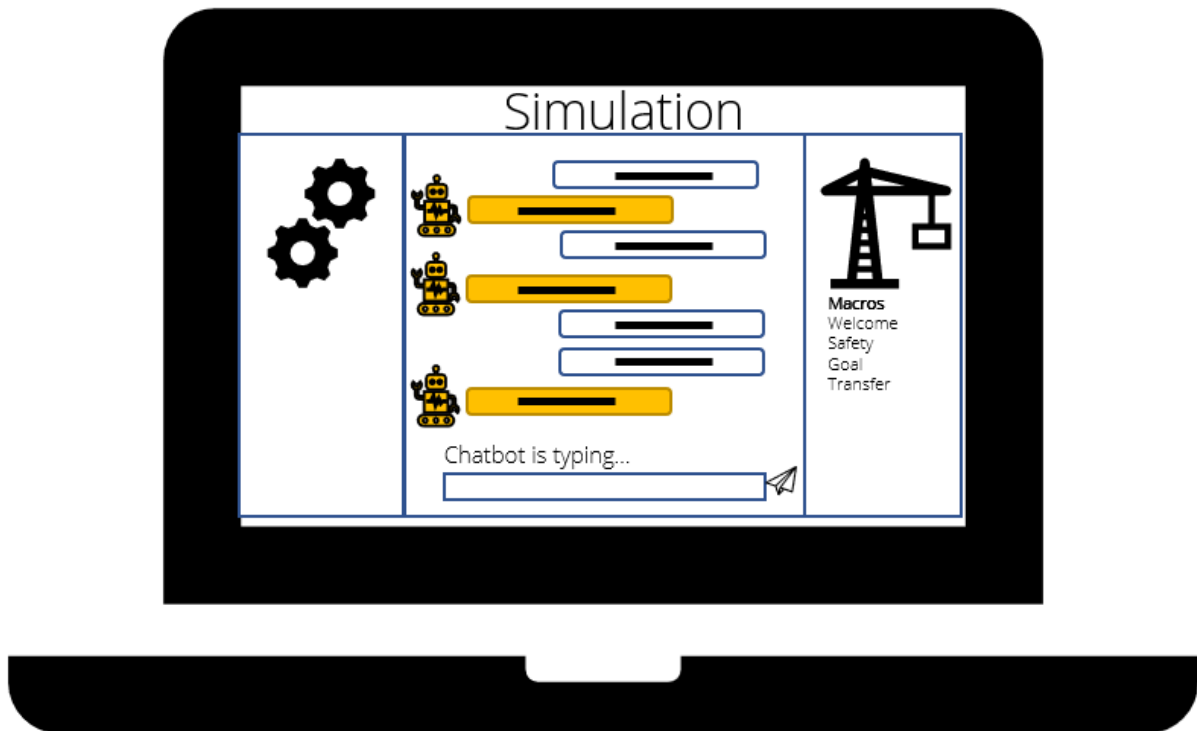


Figure 2.12: Mockup of the software interface illustrating the left column for settings, the right column for macros, and the middle column for the chat simulation.

In Figure 2.13, the user interface shows an idea of a training system with a feedback environment that merges with the transcript, and provides overall feedback. The baseline of requirements was a cognitive agent model that could handle one or more chats with feedback.

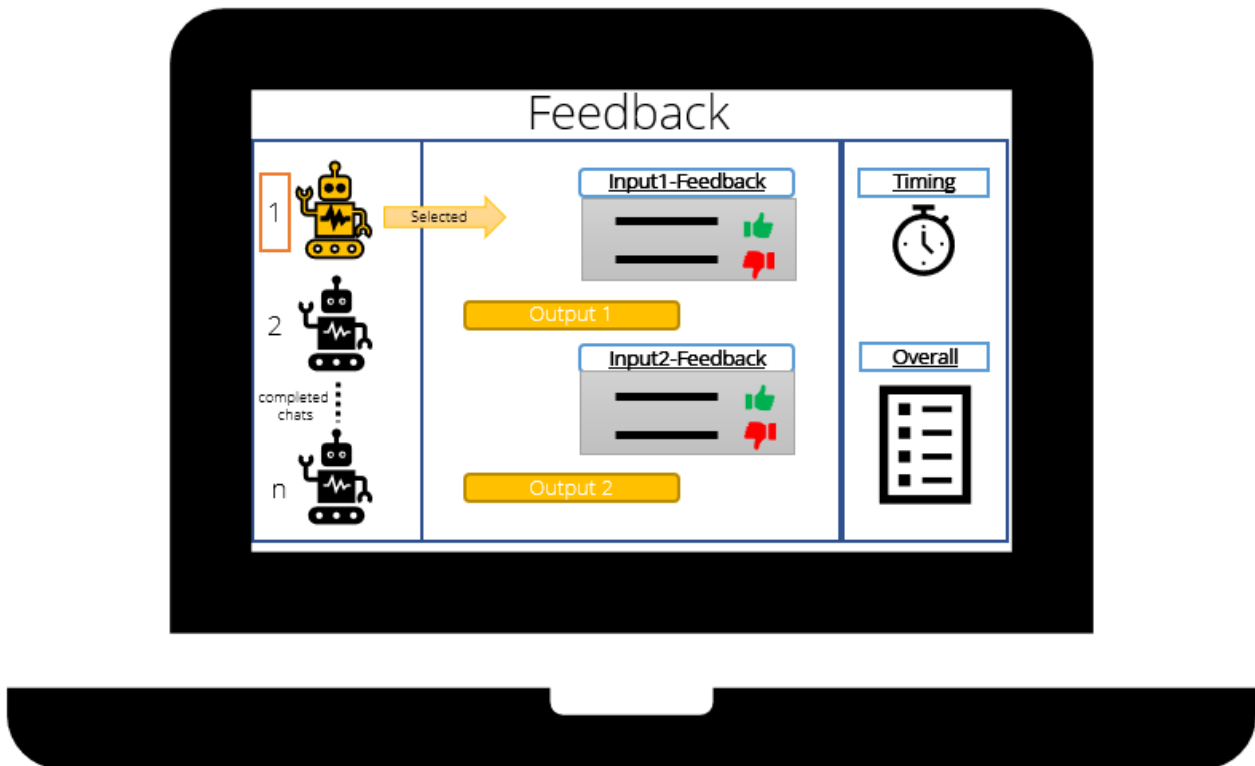


Figure 2.13: Mockup of the simulation feedback that is given after the simulation, giving an explanation of the impact of each response and some points overall from the chat.

2.4.4 Baseline requirements

The baseline requirements aim to encompass the feedback from the participant observations, focus groups, and the foundation of the situated cognitive engineering approach including operational demands, human factors, and envisioned technology. The result was an envisioned conversational agent system to meet the desired learning objectives of 113 personnel, while satisfying the human factors knowledge for such a training system and experiment. In table 2.2, the new triage-psychologist and triage-psychologist user stories are listed.

Group	User Story
New Triage-psychologist	As a new triage-psychologist, I want to be able to practice one to many chats with conversational agents in a similar environment to 113's current software environment.
New Triage-psychologist	As a new triage-psychologist, I want to be able to begin with one chat and work up to many chats with conversational agents in a way that it is not too difficult.
New Triage-psychologist	As a new triage-psychologist, I want to be able to chat with one to many chats that provide a narrative, and the conversational agent can reason about the conversation.
Triage-psychologist	As a triage-psychologist, I want to be able to practice against different personas within different situations and unique personalities, where the conversations reinforce learning objectives and experiences similar to real chats.
Triage-psychologist	As a triage-psychologist, I want to be able to use macros to automatically fill in messages I commonly send during chats with as a triage-psychologist.
Triage-psychologist	As a triage-psychologist I want to be able to receive feedback when to send someone out of the triage and receive feedback in the transcript just as in the role we would review a chat with a senior floor manager by looking at the transcript.

Table 2.2: User stories

Part III

Specification

Chapter 3

Selecting design patterns for a suicidal conversational agent model

This chapter explains how the system operates and addresses the project’s second group of sub-questions. The research explored solutions that could model human behavior. The configurations for the conversational agents and examples provide reasons for the design decisions.

3.1 Introduction

When selecting design patterns for a suicidal response model, it was important that a design consider an interface, natural language processing, and responses selected utilizing an interpersonal model. In Figure 3.1, the design shows three layers: a simulation layer, a reactive layer, and a deliberative layer.

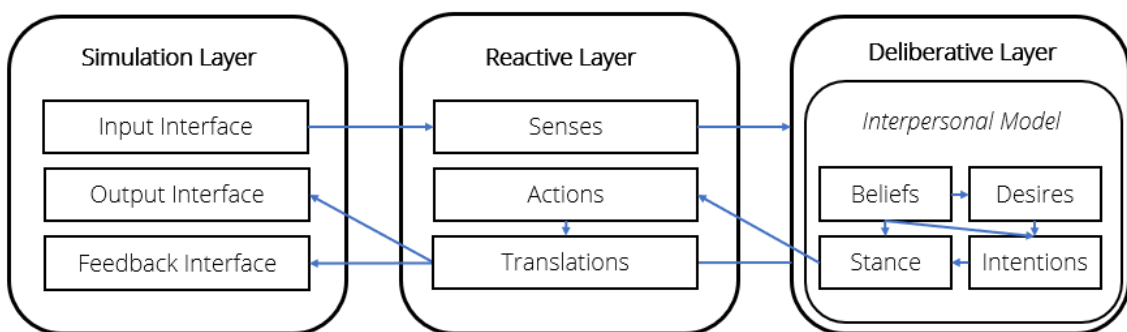


Figure 3.1: Design perspective with layers (simulation, reactive, deliberative)

Design Problems

Based on observations, transcripts, and the focus groups’ conversations, there were three core challenges to overcome: 1.) design a software layer supporting the simulation of many asyn-

chronous chats at once that provides feedback; 2.) design a system layer that recognized inputs and selected outputs in English and, more importantly, Dutch; 3.) design a deliberative layer based on interpersonal stance with BDI.

In Figure 3.2, the six personas are shown and the three design problems illustrate the specifications to utilize them for such a computer based training.

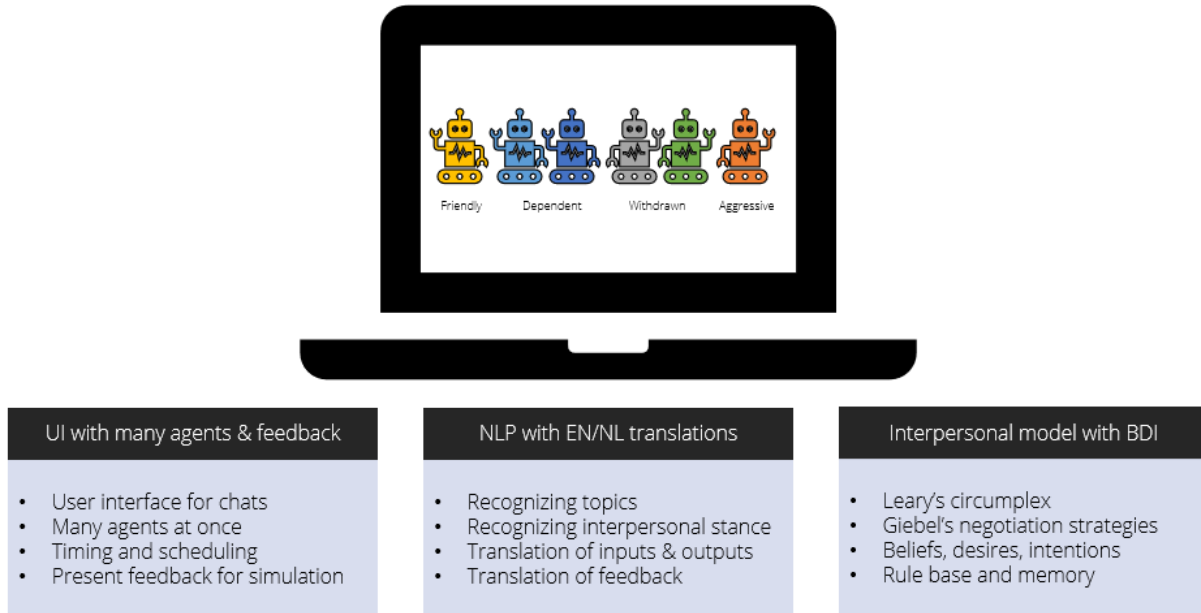


Figure 3.2: Design problems with computer training utilizing six unique personas: 1.) UI 2.) NLP and translation 3.) interpersonal model with BDI.

The system begins with an interface for chats, the triage-psychologist interacts with the interface and the system sends its inputs off to the natural language processing api. When it is time, the agents respond; this means the conversational agent has thought about the input, and the system schedules a response for output.

The next step focused on natural language processing, which, involved online open source frameworks which could offer assistance. This is done in part via segmentation to break up the inputs and machine learning to classify inputs and match translations [34]. Using a framework was helpful for decent performance and translation. On the other side, the agent needed to select outputs. The outputs originated from transcripts, and each output required four versions. The agent selected actions based on its interpersonal stance; one for each interpersonal communication style.

In the deliberative layer, the conversational agent needed to process the context, rhetoric, and interpersonal stance of inputs. To handle these three responsibilities, the prototype first required the BDI paradigm within the cognitive agent. Next, the negotiation needed to be supported by some rules such as Giebel's theories [32], and lastly, the interpersonal stance with the Rose of Leary. For this work, it is important to consider how the context and the

interpersonal stance would change the agent, this played a key role in determining the answer. This is part of how the agent processes the 'what' and 'how' of the input to produce an output in an interpersonal manner.

The last focus of the system was on the importance of feedback for the simulation. The system remembered changes to the agent model, so for each input, there was an explanation and the system could show overall progress from the conversation.

3.2 Simulation layer

User Interface

The interactions take place via the simulation layer. It encompasses a web application that is similar to the software environment that the triage-psychologist uses on the job. Depending on the software stack, different architectures can present the information in the user interface. The recommended software architecture would be Model View Controller, or MVC. In particular, this work developed a system with a component based MVC architecture.

The triage-psychologist uses an interface that allows them to communicate with one or more chatters at once, which a responsive web application best satisfied. To make the education environment the most realistic to form good habits, the assumption was a similar environment would be best for the application. This way it would resemble the way the triage-psychologist would communicate in real-life, on the job. In table 3.1, the triage-psychologist user stories explain the requirements for the user interface.

Group	User Story
Triage-psychologist	As a triage-psychologist, I want to be able to see system overview for the simulation on the left panel of the user interface.
Triage-psychologist	As a triage-psychologist, I want to be able to practice with an intuitive chat-dialog interface in the middle panel of the user interface.
Triage-psychologist	As a triage-psychologist, I want to be able to use system macros in the right panel of the user interface to automatically fill in messages that I commonly send during chats with as a triage-psychologist.
Triage-psychologist	As a triage-psychologist, I want to the chat interface to auto scroll when I send messages and when messages are output from the chat-bot.
Triage-psychologist	As a triage-psychologist, I want to use components to start and end chats with the user interface.
Triage-psychologist	As a triage-psychologist, I want to see the pre-chat information for a help-seeker when I accept the chat.
Triage-psychologist	As a triage-psychologist, I want to see an indication when the chatbot is typing a new message.

Table 3.1: User stories for the user interface components

In Figure 3.3, the main view components show the system implemented these user stories. The interface included the system-overview (left panel), chat-dialog (middle panel), and system-macros components(right panel). It allowed auto scroll, starting and ending chats, the pre-chat, and an indication when the agent is typing a new message.

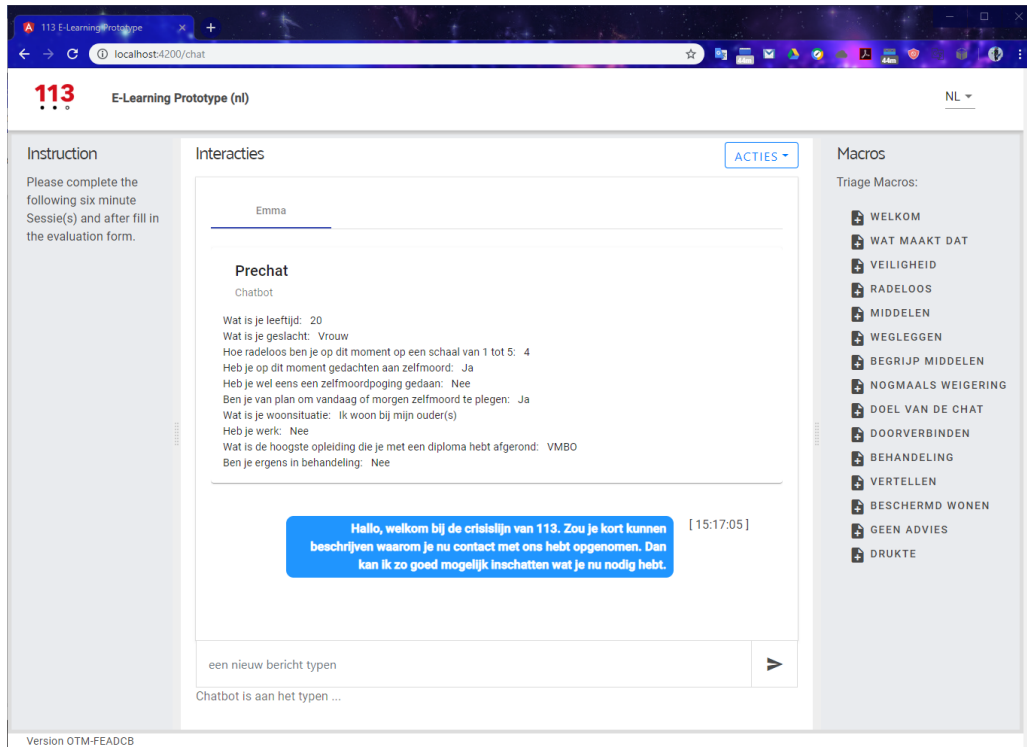


Figure 3.3: The prototype interface

The main part of the simulation layer was allowing users to input chat messages, as they normally would, in the triage-psychologist role. In particular, the triage-psychologist may use any pre-determined text, also known as a macro. These macros can be used in the interface from the right column. Triage-psychologist often construct their own messages to relate to the unique situation of the help-seeker and they may type in any input that is not available.

3.3 Reactive layer

Natural language processing

The conversational agent system is designed to segment the input text based on punctuation. These segmentations are then matched to intents through an intent recognition process. An intent is a specific user input, which can be invoked by matching against pre-defined training phrases. The system uses the intent recognition process to match intents by machine learning using keywords based on the training phrases. This method recognizes both the *topic intents*, which are specific intents related to the context of the input, or the 'what', and the *stance*

intents, which are intents related to the tone of the input, or the 'how'. Any natural language processing api can replicate this task.

In Figure 3.4, the conversational agent processes a welcome message, segments it, and recognizes intents by keyword. The agent then selects the responses, for each segmented input, based on its interpersonal model.

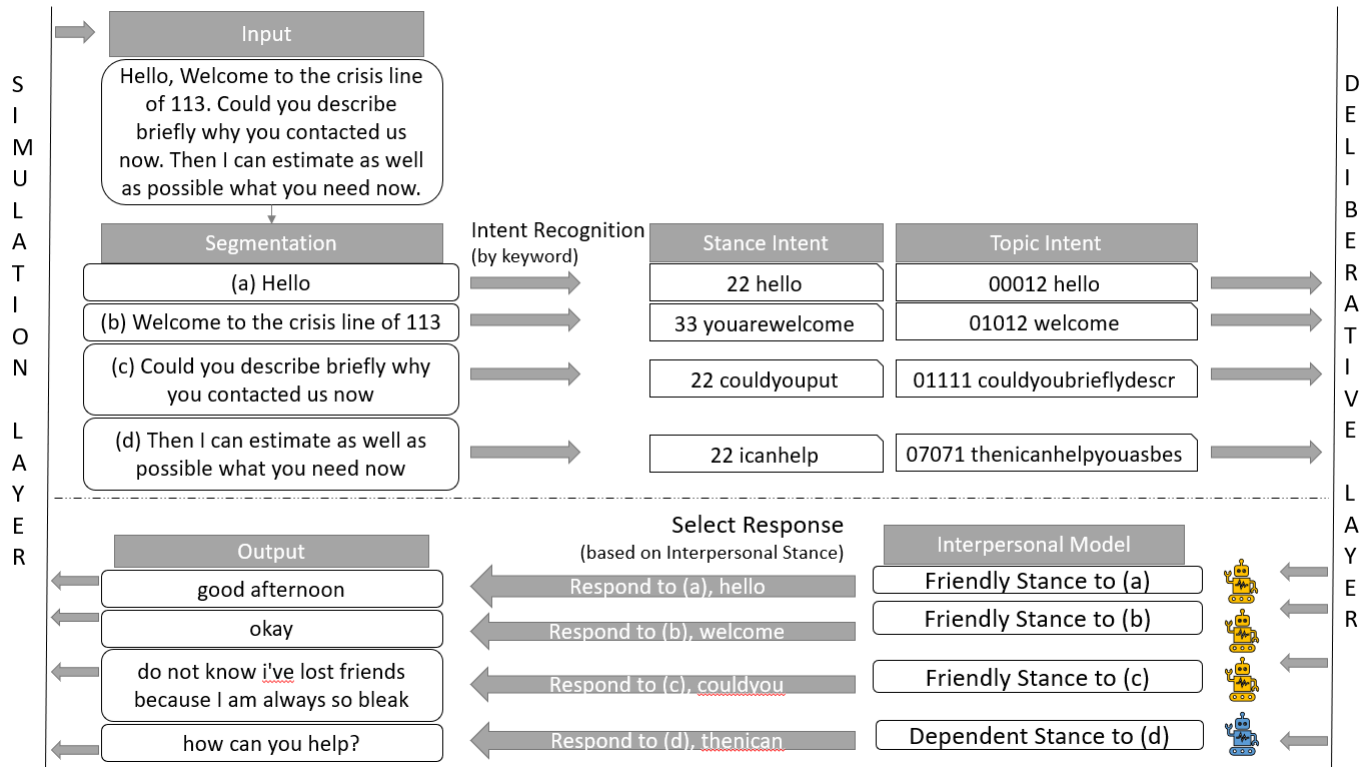


Figure 3.4: An example of the reactive layer, processing a welcome input which includes segmentation, intent recognition, and outputs selected based on the agent's interpersonal stance toward each segmented input (a), (b), (c), and (d).

By way of explanation, the numbers in this section may seem arbitrary, but in fact they are based on discussion, observations, and research. For instance, the word 'hello' is much more than the word 'hello'. The first initial step to make contact is important and numbers had to be assigned to the triage utterances to differentiate inputs. In this case, intents can be assigned a value. Each **topic intent is assigned a 5-digit code** and each **stance intent is assigned a 2-digit code**. **Unpacking the digits** shows what information the conversational agent used to update its model.

Topic Intent

In Figure 3.4, the four topic intents were assigned values (00012, 01012, 01111, and 07071). Each of the *topic intents*, the 'what', has four properties recognized by the system: topic, sentence type, strategy, and weight. In the example, the first part of the message, 'hello', is

assigned the value 00012. The first two digits are linked to the belief 'thinks 113 is friendly' and all similar utterances are assigned the value 00 which again simply means the chatter believes 113 is friendly. This 'hello' input is a statement so it has an assigned sentence type value of 0. The strategy is 'Be Equal' and assigned a value of 1. The weight of the intent is important and was assigned +2 meaning it will increase the belief 'thinks 113 is friendly' with a base change of +2; these weights were assigned to each intent not arbitrarily but inspired from Bruijnes [17] and from input and review from observation and discussion.

The first property is the *topic*, and it is based upon common human interaction. In the example, 00 for hello is linked to the assumption 'thinks 113 is friendly', 01 for welcome is linked to the assumption 'thinks 113 is respectful of them', and 07 for can help is linked to the assumption 'thinks 113 is looking to help'.

The *sentence type* is to differentiate inputs by type. There are four types: Statement (0), Open Question (1), Yes/No (2), or, Forced Choice (3). This work observed these types in the transcripts and observations and literature [17].

The *strategy* is based on the idea that triage-psychologist can use different techniques to persuade a chatter to comply. In the topic intent, the ten negotiation strategies from Giebels' [31] represent: being kind (0), being equal (1), being credible (2), emotional appeal (3), intimidation (4), imposing boundaries (5), direct pressure (6), legitimate (7), trade (8), and rational convincing (9). These do not change the stance yet in this implementation, but were a factor in the determining the weight of the topic intents.

The *weight* is determined by the need to make a positive or negative change on the agent. And depending on the importance of the change, the magnitude will result in a higher or lower weight. These encompass the semantic meaning of the intent including the negotiation strategy being utilized to reflect an appropriate weight between 0 and 3.

There are 303 topic intents, which changed the agent model differently based on their code. See appendix F for a complete list.

Stance Intent

The stance intent, the 'how', is identified with a 2-digit code. The score for the x and y values of the interpersonal stance represent the affect and the dominance. The first assigned digit is the affect and the second digit is the dominance. In this system, the values of the stance intents can be between 0 and 3. A score of 3 means a positive value, and 0 is negative.

The *affect*, or rapport, can be improved by showing: attention, positivity, and coordination. The values mean no rapport (0), low rapport (1), medium rapport (2), or high rapport (3).

The *dominance*, is related to how the assertiveness from the triage-psychologist can represent different dominance levels. It can also mitigate the face-threat of asking questions about topics

the help seeker would rather not speak about. The values mean that the agent dominance will change if direct (0), approval (1), autonomy (2) or indirect (3).

In the example, the values are 22, 33, 22, and 22. These values indicate that, for example, 22 for hello had a +2 impact on affect, and a +2 impact on dominance.

There are 59 stance intents. See appendix F for a complete list.

Selecting a response

In Figure 3.4, the codes update the conversational agent and then the agent selects a response based on the updated interpersonal model. The input from the triage-psychologist limits the types of output responses the agent can give. In Bruijnes [17], several more characteristics define the generation of answers, however, for this prototype having four types of answers, namely: truthful, questioning, avoiding, and aggressive, was sufficient for evaluation purposes.

Some of the six personas are designed to tell the truth and some are designed not to. The conversational agents designed to elicit the 'truth' do so in various ways based upon their interpersonal stance. And, if negative, the agent avoided giving details about themselves or lied. An agent wants to be credible, and thus, if the triage provided enough evidence, they will ask questions and tell the truth.

A poor interpersonal relation with the triage-psychologist will result in a conversational agent providing an aggressive response or avoiding the answer all together. When determining the safety of the conversational agent, triage-psychologists will ask the chatter questions about their safety and situation. Help-seekers typically avoid answering these types of questions by lying or not answering at all. When the dialog is very negative, the conversational agent may respond aggressively. Triggers are typically personal topics such as situation, safety, and plans.

In Figure 3.5, the flow of topic and stance inputs from the user interface to the api and back shows how a conversational agent's output is a chronological and asynchronous procedure, and the system can schedule them as events in the dialog or postpone them.

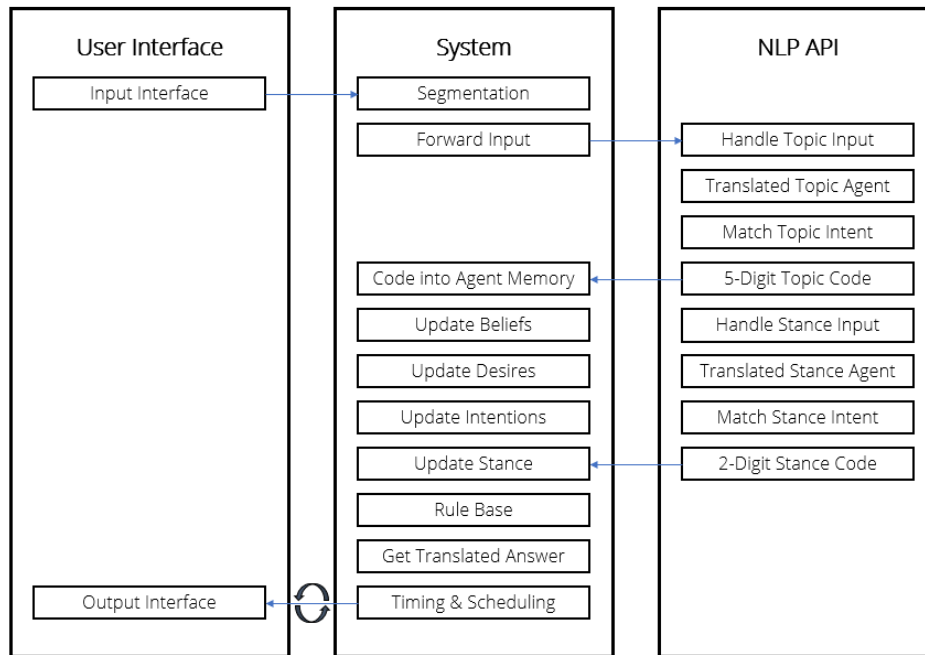


Figure 3.5: The lifecycle of an input from the user interface to the output interface

The timing largely depends on the persona, but, if an answer is longer it will take longer to type. These factors contribute to the turn-taking experience created by the conversational agent [15].

Translating an agent model and organization of data

Manual creation of the intents and training phrases is difficult to maintain, especially with two languages. This work utilized a google spreadsheet, which helped with translations, and initialized the intent recognition models via a script. This way when new intents or training phrases were added, the script would just have to be run to update the two models via an api.

The concept of offering conversations in Dutch was hard to settle on. In the end, the system was able to support the recognition of Dutch inputs via a natural language processing api, ample training phrases and additional support from volunteers and expert. Additional dialogue to fill in the gaps was necessary from English to Dutch for each persona. The only translations used from an online translation services were for training phrases. For conversational agent answers each persona went through several iterations of review before the they were coherent.

3.4 Deliberative layer

In this section, the idea with the deliberative layer is that depending on what and how the triage-psychologist types their inputs, the agent will respond differently to their questions based on an interpersonal model that used BDI.

In Figure 3.6, the overarching deliberative layer components depict beliefs (knowledge base), desires (preferences), intentions (goals), rules, and interpersonal stance, are an essential part of making interpersonal behavior.

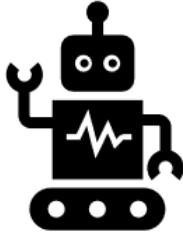
Beliefs		Desires
<ul style="list-style-type: none"> Each topic intent is related to a belief b The topic intent changes belief b with weight effect x and multiplier There are 100 beliefs 		<ul style="list-style-type: none"> Each desire d is linked to ten beliefs The effect x on belief b changes linked desire d also by effect x There are 10 desires
Interpersonal Stance	Rules	Intentions
<ul style="list-style-type: none"> Friendly, tell the truth action Dependent, cooperative action Withdrawn, lie or avoid action Aggressive, aggressive action There are 4 interpersonal stances 	<ul style="list-style-type: none"> Utility method to determine interpersonal stance 	<ul style="list-style-type: none"> Each intention i is related to a desire d and ten beliefs The intention i is always the normalized average of belief b and desire d There are 10 intentions

Figure 3.6: Components necessary to make a conversational agent model based on interpersonal stance and BDI

The *beliefs* correlate to the understanding the agent has of the situation and describe the current state of an agent. In this case, the beliefs need to represent the concepts that a real help-seeker reasons about in a chat conversation plus adapted to the educational perspective of this system. Examples can include beliefs such as: 1.) they think 113 can help 2.) they think they will move to safety; 3.) they think they want to have a longer conversation; 4.) they think they are going to end the chat. See appendix F for a complete list of the beliefs, they can have a value between -10 and +10, there are a total of 100 beliefs.

The agent defines its *desires* as what it wants to achieve. The desires are states the agent would like to reach, they correspond to beliefs and preferences. This could mean, if the agent does not have the preference to put away an item they can harm themselves. The agent could have a positive or negative desire to answer questions about topics such as safety or set a goal to get help. See appendix F for a complete list of the desires, they can have a value between -100 and +100, there are a total of 10 desires.

The *intentions* of the agent support whether the combination of the beliefs and desires support the intention that it will cooperate with certain tasks or not. If it is in line with their intentions, they will agree for the topic, otherwise they will not. See appendix F for a complete list of the intentions, they can have a value between -100 to +100, there are a total of 10 intentions.

The *interpersonal stance* represents the current agent state, stance of the the current input, and their beliefs and intentions for the conversation. The *rules* involve a utility method to

calculate the interpersonal stance per input. This calculation per input determines the type of output the agent sends.

In Figure 3.7, a second example presents what a triage-psychologist may type in the middle of the triage session where the triage-psychologist is looking to get the help-seeker to put away a dangerous item and confirm their safety. Here, the triage-psychologist must change the beliefs and desires related to safety and communicate in a style to get the agent to cooperate.

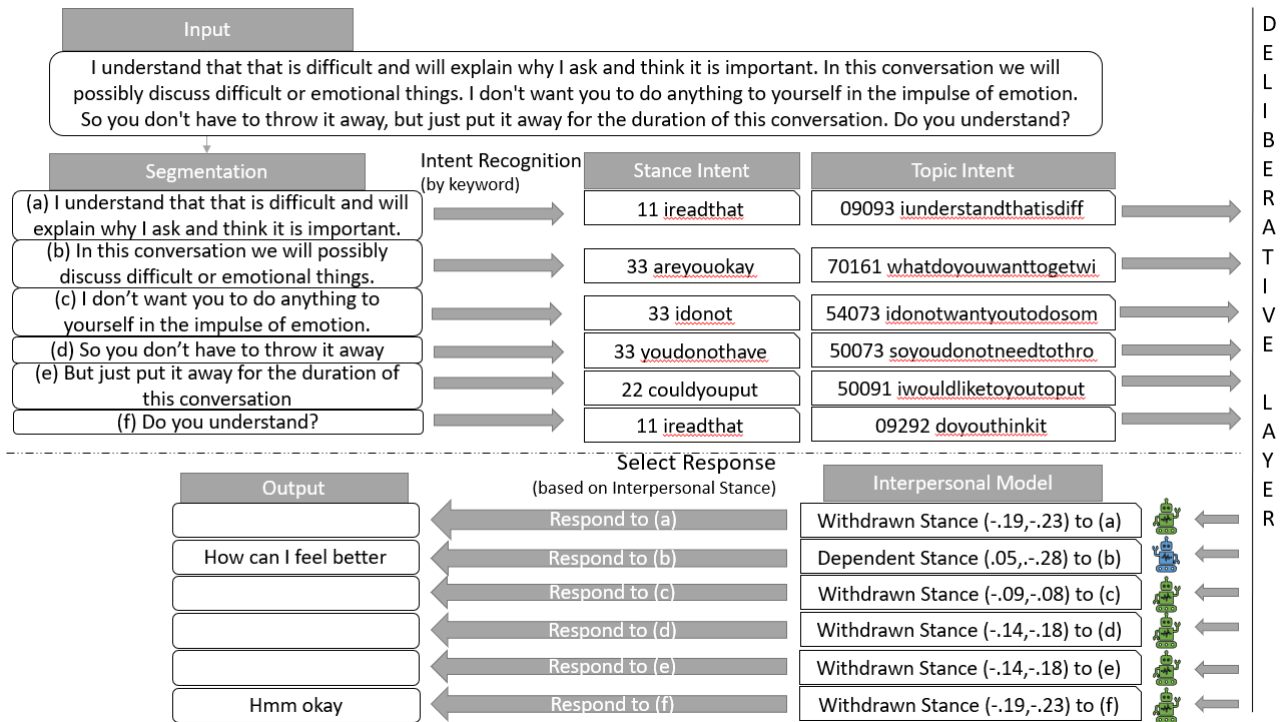


Figure 3.7: A second example input demonstrating how the reactive layer processes an input with topic intents and the stance intents that are sent to the deliberative layer and return as interpersonal stance to select outputs

The reactive layer of the system segments the input into six parts. The conversational agent uses the topic intents and the stance intents from the reactive layer to update its BDI model and interpersonal stance model. After the deliberative layer, the conversational agent ended up with five withdrawn stances and one dependent stance, which did not produce the desired cooperative behavior in the output for the triage-psychologist. Ultimately, the triage-psychologist would like to change the interpersonal stance of the conversational agent to be cooperative, and they can do so by targeting beliefs and following the triage protocol.

This second example will be used throughout this section to explain the conversational agent model. It is used instead of the first example because it is relevant to the inner working of the model and to the reproduction of this work.

3.4.1 BDI model

For this project, it was essential to factor in the reasons and the situation that a conversational agent with suicidal thoughts, often in dangerous or even life threatening situations would behave. For example, what would a real person do in the kitchen with a knife or thinking about suicide while walking near the train tracks?

Updating BDI

The Beliefs, Desires, Intentions model (BDI) allowed a way to represent this human rational. And when the conversational agent receives inputs it changes its beliefs, which result in changes to the agent's desires and intentions.

In Figure 3.8, the topic intents from the second example input from Figure 3.7 change the agent's beliefs with a formula, then the desires are changed with a formula, and, lastly, the intentions are changed with a formula.

Topic intents					
Codes	Update	Belief	Desire		Intention
09093	⇒	B09 += (3X)	D0 Desire to talk with 113 += (Δ_B)	⇒	I0 Talkative = $((10B_{new}) + D_{new})/2$
70161	⇒	B70 += (1X)	D7 Desire to make a goal for a chat with 113 += (Δ_B)	⇒	I7 In Control = $((10B_{new}) + D_{new})/2$
54073	⇒	B54 += (3X)	D5 Desire to move away from danger += (Δ_B)	⇒	I5 Cooperative = $((10B_{new}) + D_{new})/2$
50073	⇒	B50 += (3X)	D5 Desire to move away from danger += (Δ_B)	⇒	I5 Cooperative = $((10B_{new}) + D_{new})/2$
50091	⇒	B50 += (1X)	D5 Desire to move away from danger += (Δ_B)	⇒	I5 Cooperative = $((10B_{new}) + D_{new})/2$
09292	⇒	B09 += (2X)	D0 Desire to talk with 113 += (Δ_B)	⇒	I0 Talkative = $((10B_{new}) + D_{new})/2$

Figure 3.8: Formulas to update Beliefs, Desires, and Intentions utilizing the second example input from Figure 3.7

In Figure 3.8, the topic changes beliefs B09, B70, B54, and B50 with the formula shown by adding the topic intent **weight** multiplied by the **frame multiplier** (X), to the belief.

There are three frames for negotiation [69, 41, 62], these adjusted for the 113 helpline are make contact, assess safety, goal and transfer. Some topics are more threatening in different frames. In the 'make contact' frame, personal questions may be threatening. If they are in danger and in an acute situation, then situation and safety is very threatening. If they form a dependence on the triage-psychologist in their crisis, then forming a goal and being transferred is threatening. If the input was in the first frame, then the frame multiplier is x2 and the belief incurs a change that is two times. If the middle frame, then 1.25 times. And if the third frame, then 0.75 times. These values are inspired from Bruijnes, but are not identical [17].

This is how the system takes the base score from the intent, creates the multiplier, then calculates the new set of values for the beliefs, desires, and intentions of the agent. In the example, we can see the calculated values for the beliefs.

The desires are then with updated with the formula shown in Figure 3.8, which by adding the change in the belief aslo to the previous value of the desire, the desire is updated. Lastly, the formula to update the intentions involved taking the average of the normalized belief (multiply by ten) and the desire.

Topic modeling

The way the conversational agents reason about a 113 chat conversation and is able to take part in the conversation was the main issue of this project. Each belief can be a positive or negative value and can change in either direction, when an input sentence matches the belief.

The agent has a model of its beliefs, desires, and intentions, which relies on its initialization. There are beliefs that support desires and intentions to fulfill those desires. In table 3.2, the mapping of the frame of the conversation, to beliefs, to desires, to the intention show that there are links between the BDI model and the frames of a triage session: 1.) make contact; 2.) assess safety; 3.) set a goal and transfer.

Frame	Belief #	Desire #	Intention
General	Beliefs 0 to 9	Talkative	plan to talk with 113
Make contact	Beliefs 10 to 19	Motivated	plan to get help from 113
Make contact	Beliefs 20 to 29	Secure	plan to share information with 113
Make contact	Beliefs 30 to 39	Openness	plan to share how they cope with 113
Assess Safety	Beliefs 40 to 49	Calm	plan to share their location with 113
Assess Safety	Beliefs 50 to 59	Cooperative	plan to move away from danger
Assess Safety	Beliefs 60 to 69	Agreeable	plan to agree to safety with 113
Set a goal	Beliefs 70 to 79	In control	plan to make a goal for a chat with 113
Set a goal	Beliefs 80 to 89	Honest	plan to set a goal for the chat with 113
Transfer or end	Beliefs 90 to 99	Transfer	plan to transfer for a chat with 113

Table 3.2: Agent topic model inspired from transcripts and iterative review that reflects the frames of the triage session with 100 beliefs, or topics the conversational agent recognizes, which relate to 10 desires and 10 intentions

Beliefs

To go in more depth, the conversational agents needed a structure for the dialog. The system needed to model things in the conversation and what is important to the agent, such as, if they believe they are losing control, or they feel lost or lost someone in their lives and have no energy, or they are socially isolated, or they have energy to attempt suicide. The agent needed these beliefs so that it could base its conversation decisions on issues that it was initialized with or have come up with in the conversation so that the chat was similar to a real help-seeker.

The conversational agent needed many beliefs about talking with the triage-psychologist and their predicament: whether they are amicable towards them or against them when discussing

the reason for the chat. Some topics are threatening and others are affirming. The dialog influences whether the triage-psychologist makes contact or does not establish a good relationship. As the first step of the protocol pertains to making contact, it is necessary for the triage-psychologist to inquire about the help-seeker's reason for the chat and whether they can utilize 113 services.

Second, the conversational agent needed beliefs about their situation and safety, agreeing to answering questions about their location and sharing information with the triage-psychologist. The safety and risk assessment is the second step of the protocol where the conversational agent needed to have beliefs that defined its knowledge and preferences in terms of their environment and tendency to cooperate to make it a safe space.

An important variable that this knowledge had to take into account is the impact of negotiation strategy on the agent's preferences to share information or cooperate. For example, giving a logical explanation of why it is important for 113 to know that the help-seeker is safe because they will discuss emotional topics that may elicit self harm. The rhetorical strategy is from Giebel's negotiation strategies and for each intent there is a variable for the strategy. The rhetoric the triage-psychologist utilized changes the belief with a varying amount.

Third, the conversational agent needed beliefs pertaining to its preferences for a goal for the conversation or what 113 could help them with. This step in the protocol can allow a help-seeker to discuss their preferences for their situation with regard to whether the agent would rather talk about a topic with a longer conversation or end the chat and pursue a different option.

This belief should take into account that each help-seeker has different demands for their situation. An example could be, a young help-seeker could think that a conversation with a counselor could help them explore options with how to open up about their suicidal thoughts to their therapist. The agent can have many things they might consider would be helpful, but this design does not consider a ranking of them. Another system may find it important to add a ranking of these beliefs regarding the agent's goals. After the chat, so that the conversations can then improve upon the current 15 minute time to support longer conversations of up to an hour.

Fourth, the conversational agent also needed to have beliefs about whether it would end the chat. If the conversation is not going well, or the triage-psychologist ignored the agent, then the agent will end the chat. In the last step of the protocol, this means that the agent must have beliefs about the transfer or ending the chat. Depending on how the dialog has gone, the agent will agree or disagree to a transfer at the end.

Desires

The desires of the agent to gain or disclose information or avoid questions in a 113 conversation, pertain to each step of the protocol.

First, the agent needed desires to start a chat with 113. A commonality between the desires in the make contact frame in the model is to gain more knowledge from 113 or share information. In the first step of the protocol, depending on the situation, the desire can be different. This needed to be a desire as the agent must make decisions in the conversation whether to disclose information about themselves.

Next, because an agent has a will of its own, and, if in a dangerous situation, they may feel like they have control. They may also change topics or avoid questions about doing things they do not want to do or avoid questions they do not want to answer. The agent had desires that defined its preference for cooperating about safety with the triage-psychologist. A question repeated about safety may be answered differently, yet, if the triage does not convince an agent they may attempt to change the conversation subject matter or avoid the question.

Last, the agent therefore needed the ability to react to questions and share specific information with the user. The agent needed to either suggest a goal, work towards a goal, or not provide a goal. The conversational agent needed to have a desire to suggest goals and agree to being transferred to work with a counselor.

The desires correlate to the following ten behaviors: Talkative, Motivated, Secure, Openness, Calm, Cooperative, Agreeable, In Control, Honest, Transfer. Overall, the desires of the agents are broken into ten that link to the beliefs of the agent, ten beliefs for each desire. To gain information, the desire plays a role in determining the agent stance by accounting for 50% of the intention.

Intentions

The intentions functioned as the means for the agent plan to achieve its desires and validate their beliefs. The main difference is that the intention is the combination of a specific belief and the corresponding desire.

There are ten desires and such there are ten intentions to fulfill them. The intention then plays a role in determining the interpersonal stance.

3.4.2 Interpersonal stance model

The interpersonal stance is the last piece of the reasoning model. When the inputs pass through the response model they trigger rules that update the agent's state. Triage-psychologists deal

with uncooperative help-seekers and have the task to make them cooperate. Leary's theory provides a clear strategy to attempt this change in stance of the help-seeker.

In Figure 3.9, the Rose of Leary shows that opposite behavior attracts opposite behavior on the dominance axis. For the affect axis, the affiliation of the behavior invites the same affiliation.

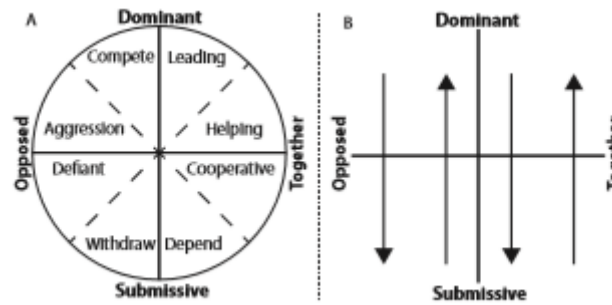


Figure 3.9: In A, Leary's Rose is defined by two axes: an affect axis (horizontal) and a dominance axis (vertical), the affect describes the willingness of the chatter to cooperate and the dominance describes the chatter's dominance or submissiveness towards the listener. In B, the solid arrows indicate the behavior-inviting relation between quadrants according to Leary's theory [46]. So dominant-together behavior invites submissive-together behavior and dominant-opposed behavior invites submissive-opposed behavior.

The Rose of Leary illustrates how behavior can be in one of four quadrants. Overall, the agent uses the paradigm sense, think, act [55] to arrive at an interpersonal stance for each input, which the system uses to select a response for the agent.

Sense

In order for the system to work it must understand the input. The input from the triage has two main parts: the topic intent and the stance intent. The BDI reasoning model processes the topic intent then the system processes the conversational agent model and stance intent to calculate the interpersonal stance and form an output. The system normalizes all values before the calculations. For the input interpersonal stance, the x value is the mean of the rapport, and the y value is the mean value of the dominance. The values in the code are defined so they update the agent model according to the Rose of Leary.

In Figure 3.10, the continuation of the second example shows how the stance intents can be used to calculate the normalized input stance of x (affect) and y (dominance).

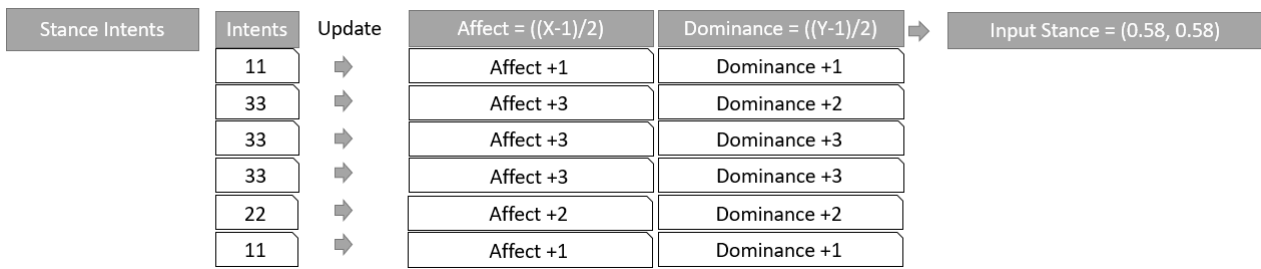


Figure 3.10: Normalized input stance calculation for the second input example from Figure 3.7

Think

Interpersonal stance calculation: The interpersonal stance can be expressed as, the x value is 20% from the stance input, 20% from the previous stance, 10% from the preferred stance, and 50% from the specific intention, and the y value is likewise 20% from the stance input, 20% from the previous stance, 10% from the preferred stance, and 50% from the specific belief from the topic input. In Figure 3.11, the calculation shows how the agent state, interpersonal stance of the input, and the topic of the input each play a role in the agent’s stance calculation.

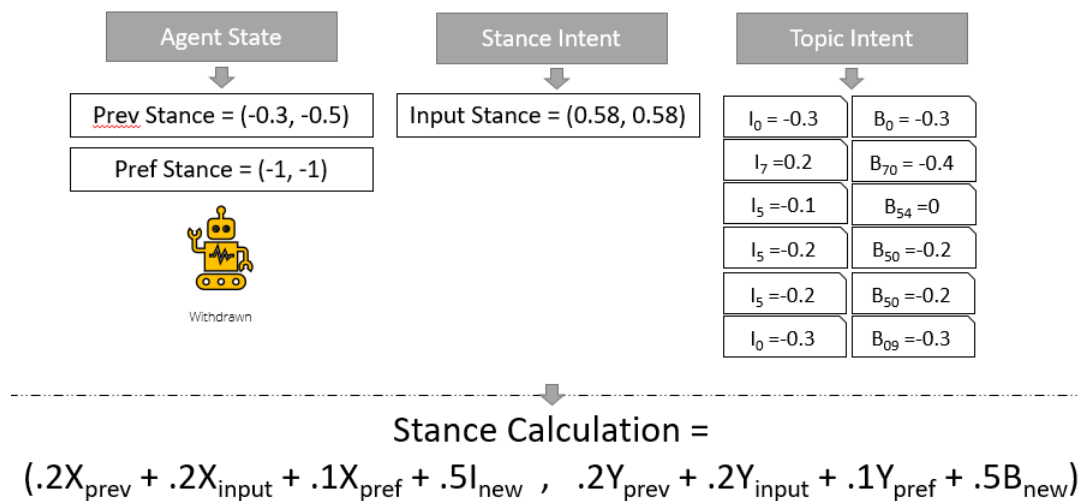


Figure 3.11: Interpersonal stance calculation per input for the second input example from Figure 3.7

Act

The system then proceeds to an action. It checks the memory. If it has used the same answer before, it checks if the belief does not fit its persona (the belief has a null value). It also checks if it needs to sort the answers to fit its persona type.

The rule base attempts to satisfy these ideas to update the agent state and generate agent answers that are reasonable. If no edge cases are caught, the agent retrieves the corresponding

answer based on interpersonal stance for the specific belief and intention. And then it schedules the response.

3.5 Feedback system

Feedback system

During the focus group, the expert participants mentioned that providing feedback was a good method for them to achieve learning objectives. The system displays feedback in the form of the beliefs that changed (positive or negative) for each input. By linking them to specific messages in the chat, there is some explanation for the agent's behavior. In addition, the desires of the agent are shown at the start and end as feedback. The system displayed the feedback at the end of the session, either from timeout, or when all chats are complete.

In Figure 3.12, the interface shows the feedback for the welcome message, and the desires are in the right column for 'System Feedback'.

The screenshot shows a web browser window with the URL 'localhost:4200/chat'. The page title is '113 E-Learning Prototype (nl)'. The interface is divided into three main sections:

- Instruction:** A message stating 'Nice, you have completed the session! Please, at this time, fill in the evaluation form with your pen or pencil...'. Below it is a 'NEXT' button.
- Interacties:** A chat window titled 'Isabella'. It contains a 'Prechat' section with a list of questions:
 - Wat is je leeftijd: 24
 - Wat is je geslacht: Vrouw
 - Hoe radeloos ben je op dit moment op een schaal van 1 tot 5: 4
 - Heb je op dit moment gedachten aan zelfmoord: Ja
 - Heb je wel eens een zelfmoordpoging gedaan: Ja
 - Ben je van plan om vandaag of morgen zelfmoord te plegen: Ja
 - Wat is je woonsituatie: Ik woon bij mijn ouder(s)
 - Heb je werk: Call centre medewerker
 - Wat is de hoogste opleiding die je met een diploma hebt afgerond: MAVO, MULQ, VMBO
 - Ben je ergens in behandeling: Psycholoog accare, en 30 juli Intake kliniek
- System Feedback:** A panel on the right showing the agent's status for various traits. It includes a summary: 'Je hebt 5.9 Min gepraat met Isabella met een gemiddelde reactietijd van 21.4 Sec.' Below this are two sections: 'Isabella Begin Status' and 'Isabella Huidige Status'. Each section lists traits with progress bars:
 - Verlegen (blue bar)
 - Spraakzaam (blue bar)
 - Ongemotiveerd (blue bar)
 - Gemotiveerd (blue bar)
 - Onzeker (blue bar)
 - Zeker (blue bar)
 - Gesloten (blue bar)
 - Open (blue bar)
 - Gespannen (blue bar)
 - Relaxed (blue bar)
 - Niet-coöperatief (blue bar)
 - Coöperatief (blue bar)
 - Dwars (blue bar)
 - Meegaand (blue bar)
 - Onbeheerst (blue bar)
 - In controle (blue bar)
 - Oneerlijk (blue bar)
 - Eerlijk (blue bar)
 - Verlaten (blue bar)
 - Blijven (blue bar)

The chat window shows a blue message bubble from the chatbot: 'Hallo, welkom bij de crislijijn van 113. Zou je kort kunnen beschrijven waarom je nu contact met ons hebt opgenomen. Dan kan ik zo goed mogelijk inschatten wat je nu nodig hebt.' Below it is a 'Hide Thoughts' button and a timestamp '[15:28:26]'. At the bottom of the chat window, it says 'Isabella denkt 113 is vriendelijk' with a thumbs-up icon and a text input field 'een nieuw bericht typen'.

Figure 3.12: The prototype gives feedback for a single chat

The feedback is a feature in its initial phase that could benefit from improvement. It only displays feedback based on the positive or negative changes from each input. The user can not know how much the agent changed their belief from their input messages and the feedback

from the desires only shows subtle changes. This feedback contributes to the explanation of how the agent selects an answer, but it could provide more insight to make the conversational agent part of a more explainable artificial intelligence system.

The aim of this system's form of feedback was that it would have the ability to help identify possible areas for improvement. In this initial stage, the feedback is not robust enough to give much insight. The best form of feedback is from an expert triage-psychologist reviewing the transcript with a trainee. They can offer this feedback by sitting with someone and reviewing their chat simulation.

In Figure 3.13, a session with three chats shows the feedback and the 'System Feedback' on the right, which can be used to review one of the chats after a session.

The screenshot displays the '113 E-Learning Prototype (nl)' interface. On the left, an 'Instruction' panel states: 'Nice, you have completed the session! Please, at this time, fill in the evaluation form with your pen or pencil...' and includes a 'NEXT' button. The main 'Interacties' panel shows a chat simulation with three messages from 'Oliver' and corresponding system feedback. The first message is 'Oke' at 15:21:16, with feedback 'Oliver denkt 113 is agreeable'. The second message is 'Je geeft aan behoorlijk radeeloos te zijn en dat je vandaag of morgen al zelfmoord wil plegen. Heb je hier op dit moment een concreet plan voor?' at 15:21:27, with feedback 'Oliver denkt 113 begrijpt ze hebben gedachten' and 'Oliver denkt 113 begrijpt ze hebben wel een plan'. The third message is 'precies' at 15:21:39, with feedback 'Ja ik heb nu al een paar maanden een plan' at 15:21:53. The chat is marked as complete with the text 'oke, was is jullie plan'. On the right, the 'System Feedback' panel shows a summary: 'Je hebt 4.6 Min gepraat met Oliver met een gemiddelde reactietijd van 46.7 Sec.' and two sets of sliders for 'Oliver Begin Status' and 'Oliver Huidige Status', comparing various traits like 'Verlegen', 'Ongemotiveerd', 'Onzeker', 'Gesloten', 'Gespannen', 'Niet-coöperatief', 'Dwars', 'Onbeheerst', 'Oneerlijk', and 'Verlaten' against 'Sprakzaam', 'Gemotiveerd', 'Zeker', 'Open', 'Relaxed', 'Coöperatief', 'Meegaand', 'In controle', 'Eerlijk', and 'Blijven'.

Figure 3.13: By toggling a different chat, the prototype gives feedback for each chat in a simulation

For every input, there is a list of the changes. For the beliefs, the system maintains the changes to display as feedback. The use is for education of triage-psychologist to think about what topics they choose and how their communication has an impact. Furthermore, the desires at the beginning and end are to show progress over the session.

Part IV

Evaluation

Chapter 4

Making a prototype for 113 triage-psychologist situated learning

This chapter explains how a conversational agent system with six personas was built for the education of the 113 triage-psychologists. A goal of this work was to be easy to use and to motivate the triage-psychologists. It is important that the work is usable in the future by 113, so it was necessary to develop it with a repository and to detail the contributions of the work. The chapter presents the software architecture, personas, and interface. These demonstrate capabilities of the system.

4.1 Software architecture

The system was available for evaluation purposes. In Figure 4.1, the software architecture gives a high-level overview of the technologies used in the prototype. Namely, the architecture demonstrates that the project is composed of five main components: a single page application, user interface, dialogflow api interfacing, server, and version control.

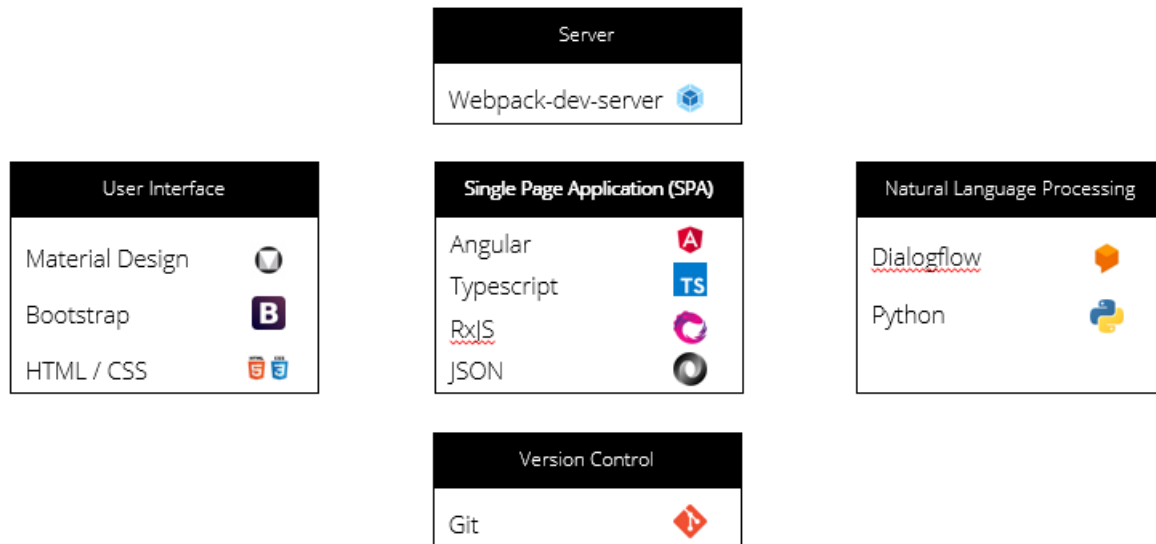


Figure 4.1: Software architecture of the prototype, an Angular single page application with a user interface that interacted with the dialogflow api and was hosted on the webpack-dev-server and backed up with git.

In this section, the architecture of the prototype is discussed. This is done by discussing different architectural perspectives and views that include the inner workings of the prototype and a detailed analysis of the system’s technologies. The prototype is a single page application, and it has a modular architecture that can be expanded upon. Therefore, maintenance is manageable.

4.1.1 Single page application

Single page applications (SPAs) are web apps that load a single HTML page and dynamically update that page as the user interacts with the app [3]. In Figure4.2, the comparison demonstrates the difference between calls made by a traditional website and calls made by a SPA. Note how a traditional web app pulls a new HTML page from the server every time a user navigates to a new section of the site. Conversely, SPAs use Asynchronous JavaScript and XML calls (AJAX) to obtain only the needed information to respond to each user action, thus avoiding full page refreshes [3]. Whenever the user navigates to a new section of the site, or requires additional information, the client sends a request to the server. The server then responds with data, typically in the form of JavaScript Object Notation (JSON) or XML [1]. Overall, the responsiveness and the user experience offered in an Angular SPA make it a great choice for web applications and hybrid applications.

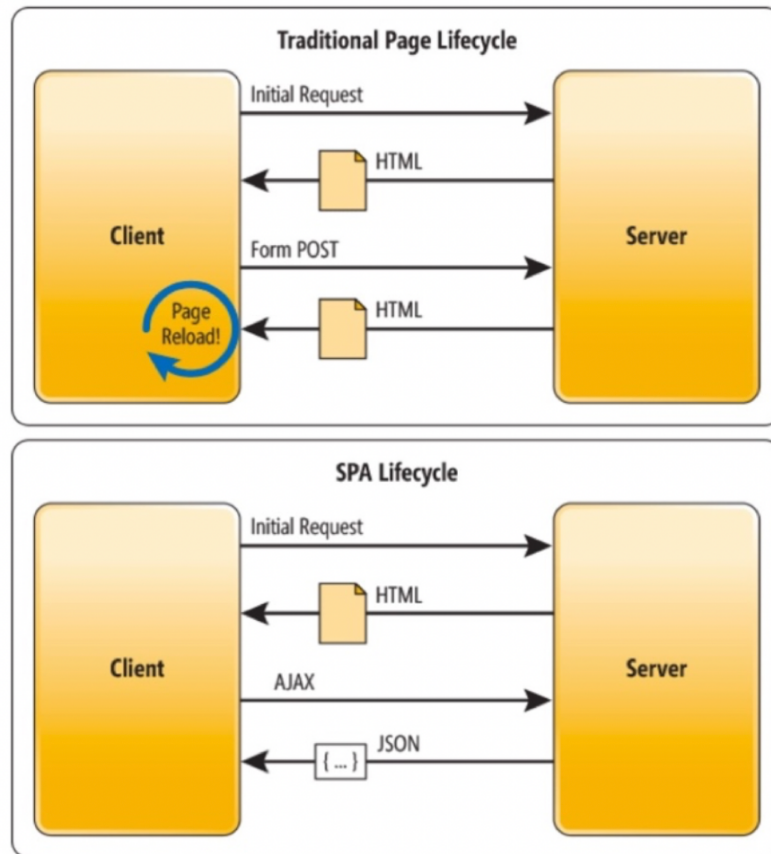


Figure 4.2: The comparison of the traditional web and single page application lifecycle [1]

Angular

Angular makes it easier to build SPA's [3]. Angular is a structural JavaScript framework for dynamic web apps [3]. AngularJS was first released in October 2010 and soon became one of the most popular JavaScript front-end frameworks. In 2015, Google announced Angular 2 and made it available for developers to preview. Angular 2 was a complete rewrite of the framework and, as such, has different syntax, as well as structure. The version used for this prototype was Angular 7.0.2 released October 18, 2018 [4].

One of the core features is an Angular template [4]. Angular templates are HTML pages, which define what the user will see. Templates belong to a component and use data binding to access and display data from their host component. Templates use directives, which are instructions that specify how to place your components and business logic in the Angular, to further manipulate the users view. Two common directives are `*ngIf`, which displays a given HTML element, if an expression evaluates to true, and `*ngFor`, which iterates over a list to display HTML elements for each item in the collection. Views can nest templates. For example, an application which displays a list of messages, and allows users to select a message to expand that message and see its details in the list. To accomplish this, the developer would nest the message detail template inside of the message list view. These features of templates and

Angular, in general, increase code readability while aiding construction of complex and elegant user facing views.

Angular is still a JavaScript framework and is best suited for SPA design [3]. Angular is widely written in Typescript, a Microsoft developed language which is a superset of JavaScript. While there are other languages compatible with Angular, the Angular team recommends Typescript for its significant tooling which expedites development [65].

Typescript

Microsoft designed Typescript for ECMA Script 2015 (ES6), the standard specification for scripting languages which JavaScript follows. Most modern browsers only provide support for ES5. So in order for ES6 code to have reliable behavior, the system transpiles it down to ES5. Transpilation is the process of converting source code from one programming language into source code of another programming language. Tools like Babel transpile Typescript code into plain JavaScript, which meets ES5 standards. Typescript builds a number of features on top of vanilla JavaScript such as classes, strong typing, and generics [65]. This syntax is similar to object oriented languages like Java and reduces development time further.

4.1.2 Natural language processing

DialogFlow

Dialogflow (formerly Api.ai, Speaktioit) is a Google-owned developer of human-computer interaction technologies based on natural language conversations. Dialogflow uses machine learning to match user intents from input training data and text [34].

Python

Python was used to initialize the text classification in Dialogflow. A handy script was written for that to interface with the Dialogflow api to allow the training phrases, intents, and output responses (codes) to be modified in a batch update [34].

4.1.3 User interface

Material Design

When considering the user experience, Angular does not provide assistance with building the UI. Fortunately, web development frameworks such as Material Design are available to assist developers. The use of one of these frameworks drastically reduces the amount of work required

to style web applications to have a consistent look and feel. Google created Material Design in 2014 with the following intent, according to Matias Duarte Vice President of Design for Google: "Material is to provide a design language, which mimics the feel of pen and paper [27]. In Figure 4.3, the elements of material design display the various components supported by the framework for user interfaces.

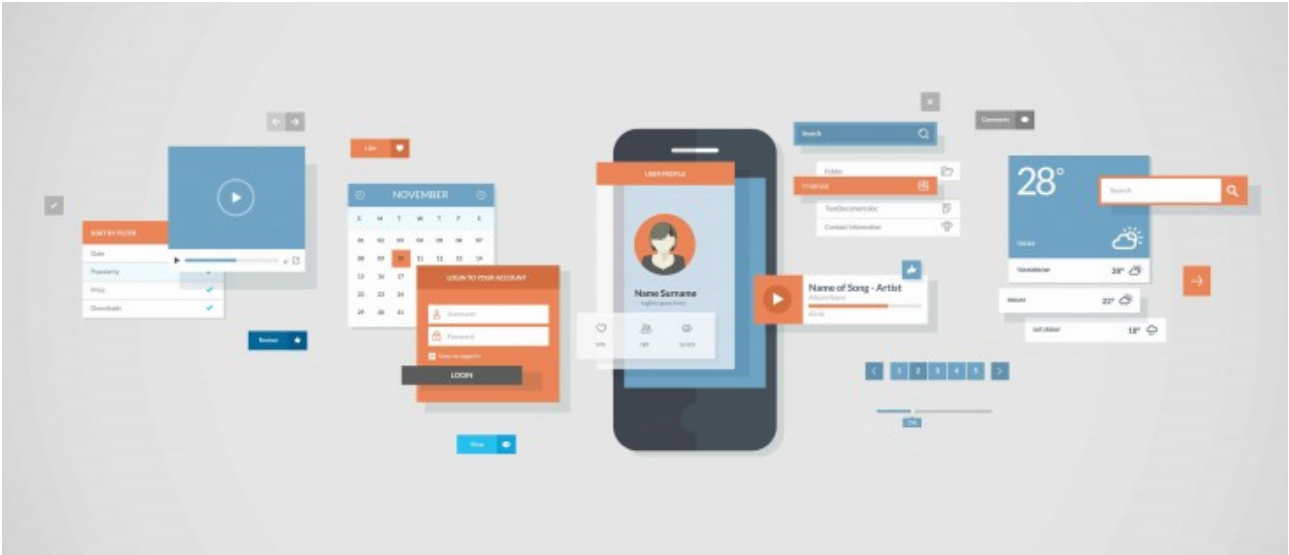


Figure 4.3: Material Design supports various components for user interfaces to create professional designs [27]

Bootstrap

Bootstrap is a free open source framework for creating well styled, highly responsive websites [11]. While Bootstrap was initially released by and for Twitter employees in 2011, it has grown to be a prominent framework for front end web-development [11]. The Twitter team designed Bootstrap to make creating web applications a fast and easy process. Bootstrap consists of a well-structured set of CSS classes. Along with highly readable and customizable code, all Bootstrap components are thoroughly documented, which greatly facilitates understanding and utilizing new classes. The primary Bootstrap feature for designing layout and adding screen size responsiveness is its grid layout. The grid layout uses row and column CSS classes to organize HTML elements in the view. Row elements organize other HTML elements horizontally and column elements fill them, which HTML lays vertically. These column classes can be set to modify and dynamically arrange content based on the size of the screen. For example, on a wide screen, 4 columns may span the width of the screen in a row, but on an extra small screen only one column would occupy each row.

4.1.4 webpack-dev-server

The prototype hosts the single page web application on the webpack-dev-server. This was important for debugging and administering an evaluation with many participants completing it at once [74].

4.1.5 Git

The codebase is backed up with Git as the version control system [33].

4.2 Personas

Six personas, based on transcripts encompass the prototype. The personas behave with various behaviors as identified from the Rose of Leary. They have a default stance. The persona types include: Aggressive, Defiant, Withdrawn, Dependent, Cooperative, and Friendly. Six was the number of personas desired to have an experiment to properly evaluate the prototype. The texts below describe the personas in more detail.

- Persona A - Aggressive. This persona is chatting on their birthday, lives in an institution, and still has no long-term partner. They refer to the person chatting with them as the devil, threaten to take medication, and talk about how their mother left them. They think this life is a joke and repeatedly attack and make threatening statements and express views of victim-hood.
- Persona B - Defiant. This persona wants to end his life and feels they are a danger to society. They want to know what is the better choice... a freight or passenger train? After making up their mind there is no hope. They consider themselves a danger to society, and they could potentially hurt someone again. They think it is best if they commit suicide.
- Persona C - Withdrawn. This persona wants to commit suicide tomorrow and say goodbye to someone because no one else cares about them. They have no motivation to go on, feel like stopping, and think more and more about the ways that they could die. They are in their room and have had depression for one year. Their mother had severe burnout two years, and it is hard to communicate with their parent.
- Persona D - Dependent. This persona wants to commit suicide as it is too much for them and they do not know what to do. They believe that something is wrong with them, and do not understand why they have these thoughts. They want to feel better and have a purpose in their life. Two weeks ago they started with a new psychologist, but they do not always tell the truth, and they find it difficult to communicate. They can find distraction by listening to music.

- **Persona E - Cooperative.** This persona does not know how much longer they can continue. They want to commit suicide, but they do not want to hurt anyone. They have a wonderful life with great people, but they still feel so bad. They have cut themselves with a knife and have medication near by. They had a bath, goodies, cycled for an hour, and yet they still they do not feel any improvement. They want to know if is a better choice to be dead or alive.
- **Persona F - Friendly.** This persona wants to know how 113 can help. They do not know what to do or how they should find a way. They feel they in a very lonely, dark hole with no way out. They feel trapped and dare not go to a psychologist because they would not understand. They are really at the point that they only think about death, but they are hesitant to go through with it because their religion prohibits suicide.

The personas attempt to cover some standard situations experienced in the triage-psychologist role.

Persona

The persona contains the information the system uses to model the chatters from the transcripts. The persona influences the calculation to update the agent state and select the agent answer. It consists of three configurations, and it was possible to define a six personalities with these settings. The answers were defined separately per persona.

1. The persona has demographic information that corresponds to the 113 pre-chat information. They list their age, past experience, their risk levels, and whether or not they are currently receiving treatment.
2. The personas' preferred stance is one of the four Rose of Leary types: Friendly, Aggressive, Dependent or Withdrawn. It is the stance the chatter is most comfortable with. The response model considers this as the personality. It influences the starting interpersonal stance and stance during the conversation.
3. The initialization reflects the beliefs, desires, and intentions of the agent. If they believe their situation is dangerous, then they will behave differently than if they were at home in bed. When asked, they may share their beliefs, desires, or intentions. These vary based on the transcript.

4.2.1 Limitations and future work

The personas' reasoning has limits, as the process was simplified from the BDI to complement the Rose of Leary. The model could improve its reasoning capability by adding clear rules based on the beliefs, desires, and intentions. Strict rules from BDI could have provided a bit

more explainable behavior, but they also would have made the agent answers better. As such, the model gave up some explainability and robustness to allow the prototype to support six personas with a simple decision making process.

4.3 Interface and interaction

The prototype followed the general layout similar to the existing Livecom interface. In Figure 4.4, the existing Livecom interface that 113 triage-psychologists and counselors use shows there is a similar layout to that in Figure 4.5, where the interface shows that it allows the user to accept chats and has a similar three column format.

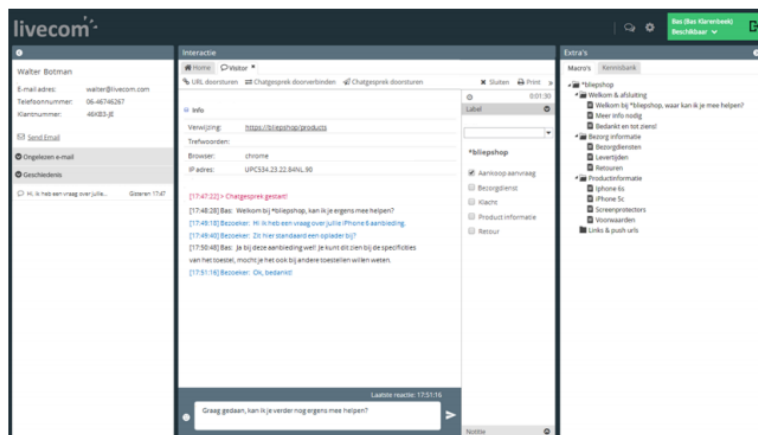


Figure 4.4: The Livecom interface at 113 that the triage-psychologist and counselors use in their roles.

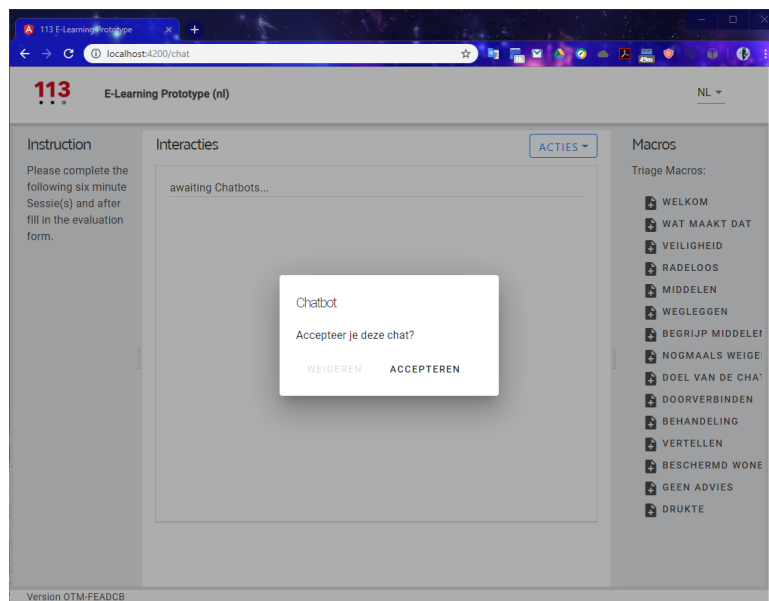


Figure 4.5: At the commence of the simulation, the system prompts the user to accept a new chat.

Many differences exist in the functionality between the existing Livecom system and the prototype. The prototype is limited for evaluation purposes while the Livecom system supports all the triage-psychologists and counselors at the 113 helpline. Mainly, the Livecom system is for the 113 business; it has user logins and maintains system information. It also has features the prototype does not. On the other hand, the prototype simulates chats with conversational agents and not real help-seekers and does so in two languages.

In a future version of the training prototype, these features may also be useful to improve the training environment to be as close as possible to the current role. In Figure 3.3, the interface shows the prototype with prechat and interactions for one chat, and in Figure 4.6, the interface shows the prototype with three chats at once. The tabs in the middle part of the user interface display three different names, each representing one of the six personas designed.

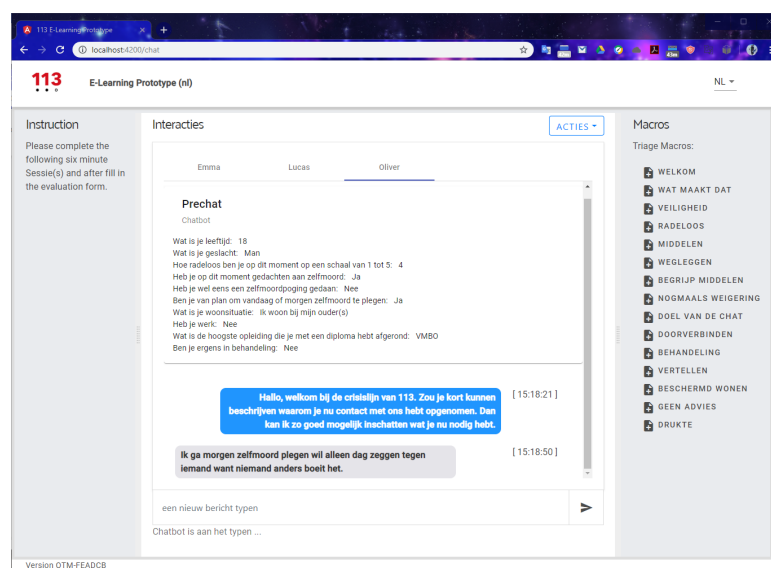


Figure 4.6: The prototype supports talking with one to many chatters at once

This work tested the prototype first in English. However, the prototype used in the evaluation was the Dutch version. Both versions went through iterative review with an expert triage-psychologist until they seemed appropriate. The prototype supported full conversations. For purposes of the evaluation, there were three trials that ended after a total of six minutes. The trials had one, two, or three help-seekers in chats.

Chapter 5

Evaluation of a conversational agent model with interpersonal stance

5.1 Introduction

The prototype was used to answer the main research question of the MSc thesis:

”Is it possible and how can conversational agents help 113 triage-psychologists to better assist many help-seekers at once by chat?”

The project concerned the development of a conversational agent, i.e. chatbot, to offer training to 113 triage-psychologists via a prototype that simulates a chat environment with one to many of these conversational agents, at once. The chat environment simulates the existing environment at 113, and allows users to accept new chats, chat via an interface, and end chats. The questions to be answered by this evaluation include:

- Can the prototype simulate different chatter types?
- Can the prototype simulate increasing mental effort and situational awareness with one to many chats at once?
- What is the perceived influence on learning outcome, perceived utility, social realism, believability, and usability of the conversational agent training system?

The hypotheses in this evaluation include:

- (H1): Chatbot personality is identifiable based on the Rose of Leary model
- (H2-A): A positive correlation exists between on one side the number of agents a person chats with simultaneously and on the other side experienced mental effort
- (H2-B) A negative correlation exists for situational awareness

The ability of the system to simulate different Rose of Leary quadrants plus increased difficulty was important for training purposes because it is best to make a realistic situation and then scale up to an increased level of difficulty. The first hypothesis expected triage overall to indicate the correct quadrant on the Rose of Leary for chatbots. The second expected counselors would experience higher mental effort and decreased situational awareness with many agents at once.

This chapter starts with the method section, then gives the results, and ends with the discussion and conclusions. The TU Delft Research Ethics Committee approved this research (no. 781). The study submitted the evaluation with a timestamp via the OSF registration platform. See appendix E for the OSF pre-registration accessible at <https://osf.io/p74vq/>.

5.2 Method

5.2.1 Experimental design

The experimental design of the study aimed to answer the two hypotheses with a repeated measure design structure, or within subjects design. Each had its in own experiment. In addition to the two experiments, the evaluation takes a look further at the prototype's perceived influence on learning outcomes, perceived utility, social realism, and believability from participants in a questionnaire, and they assessed the system usability.

In the first experiment, the evaluation tested the triage-psychologist's perception of the conversational agents. The experiment used a Rose of Leary indication as the dependent variable, which measured a dominance/submissive plus together/against score, and analyzed them to see whether the triage-psychologist scores corresponded to the expected Rose of Leary quadrant. The independent variable used was the chatbot persona; it belonged to one of the quadrants of the Rose of Leary.

In the second experiment, the evaluation measured counselor perception of training. The evaluation used mental effort and situational awareness as dependent variables. The independent variable that was used was the amount of chatbots in the session, that participants interacted with simultaneously.

5.2.2 Participants

Recruitment involved participants with triage-psychologist experience and without experience within 113 suicide prevention. Six 113 triage-psychologists (4 male, mean age 31.2 with SD 5.1) of the 113 chat helpline completed the experiment and twenty-four counselors (16 female, mean age 26.8 with SD 10.8) participated.

Thirty participants were available within the available time. The stopping rule occurred when thirty participants, 6 triage-psychologists and 24 counselors, completed the experiment with no missing spots. Data samples that are incomplete, unfinished or not completed in time, were excluded from the study.

5.2.3 Hypotheses

The first hypothesis concerns whether the chatbots can simulate different Rose of Leary quadrants. The Rose of Leary has two axes, one axis for dominant/submissive behavior and one axis for friendly/opposed behavior. This forms four quadrants. This tested if triage-psychologists were able to identify the correct quadrant on the Rose of Leary.

The second hypothesis deals with whether counselors experience more difficulty when they handle more chats. The study tested this by measuring if participants indicate, for chat sessions with more chatbots, if they experienced higher mental effort and lower situational awareness.

5.2.4 Measures

Perceived Influence on Learning Outcome (PILO)

The perceived influence on learning outcome, PILO [47], was to investigate how useful the user found the the conversational agents and feedback for training purposes. Five of eight questions from Lie [47] the evaluation adapted to measure the perceived influence on learning outcome. Two semantic ranges from 'hindering' -5 to +5 'useful' and from 'reduces learning' -5 to 'neutral' 0 to 'relevant for learning' +5 measured opinions on the influence on learning outcome. The range had zero in the middle representing the neutral label, the neutral label means that there was neither a positive nor negative finding. The PILO is a custom tailored measure, the questions do not strictly adhere to a particular construct so no information supporting its validity or reliability was found [47], but the semantic differential scale allows for claims supporting the positive, negative, or neutral label. See appendix B for the PILO, Questions 1, 2, and 4 regarding the feedback. Questions 3, 5 regarding the tool and participant's motivation on practicing with the method.

Perceived Utility

To investigate how satisfying and useful participants found the practicing method, the evaluation used one question from Kang [44], which asked whether the method motivated the participant to practice. A semantic range from discourages -5 to neutral 0 to motivates +5 measured perceived utility and was fit to the question. It also utilizes a score of zero to represent the neutral label on the scale. The perceived utility question originated from a 7pt

scale Likert scale [45]. The Cronbach's alpha from the original questionnaire was 0.91 for the practice process [44] suggesting strong reliability plus its references suggest some validity [28]. See appendix B for the perceived utility question, in the evaluation, this was given as part of the PILO and perceived utility questionnaire as Question 6.

Social Realism

The triage-psychologists assessed the construct of social realism [73] with three items from the temple presence inventory (TPI) measurement instrument [42]. The questions originated in the form of an agreement statement [73]. The Cronbach's alpha calculated was .75 suggesting it is a reliable measure, and has a validity under discussion [48, 42]. This study adapted a semantic range from strongly disagree -5 to neutral 0 to strongly agree +5 and had zero to represent the neutral point. The evaluation combined the three items into an index to give a comprehensive score of social realism. The neutral result meant that participants thought the system neither had many realistic events nor unrealistic events in comparison to the real situation. See appendix B for the social realism questionnaire.

Believability

Exploring how believable the agents were was of importance and measured by a 3-item questionnaire [7] to see how the agent fits to a "user's model". Semantic ranges from machinelike -5 to neutral 0 to humanlike +5, artificial -5 to neutral 0 to lifelike +5, and unaware -5 to neutral 0 to conscious +5 measure believability. The validity of the measure is difficult to judge [7]. There is no information on the reliability of the believability measure, yet, this study calculated it had strong reliability in the data preparation, so it formed an index to give a compact indication of believability. See appendix B for the believability questionnaire.

Rating Scale Mental Effort (RSME)

The Rating Scale Mental Effort (RSME) [79] measures mental effort via an indicated value between: 0 to 150. The technique was created for assessing mental effort by a human over a task. A subjective rating is required by an individual through an indication on a continuous line, within the interval 0 to 150 with ticks each 10 units [79]. Example of labels are 'absolutely no effort', 'considerable effort' and 'extreme effort'. The difficulty with assessing mental effort and situational awareness is that it often remains unclear at what time, or under what circumstances, people face mental effort in a situation. The validity of the measure is not clear. On some accounts it seems the self reported scale alone does not capture mental workload that effectively or reliably [26], though it was quick and easy to administer.

Situational Awareness Rating Technique (SART)

The study administered the Situational Awareness Rating Technique (SART) [70] post trial and it involves measuring situational awareness via a calculated value from nine questions, each rated on a seven point scale (1 = Low, 7 = High). The nine questions can be divided and categorized into gauging the demand on attentional resources (three questions, D), the supply of attentional resources (four questions, S), and the understanding (two questions, U), in the situation. The situational awareness calculation is using the formula $(U + S - D)$ [70]. The technique was developed for assessing aircrew systems and is a quick and dirty way to gauge situational awareness with high ecological validity and the reliability remains weak at best overall [43].

Rose of Leary (Leary's Rose)

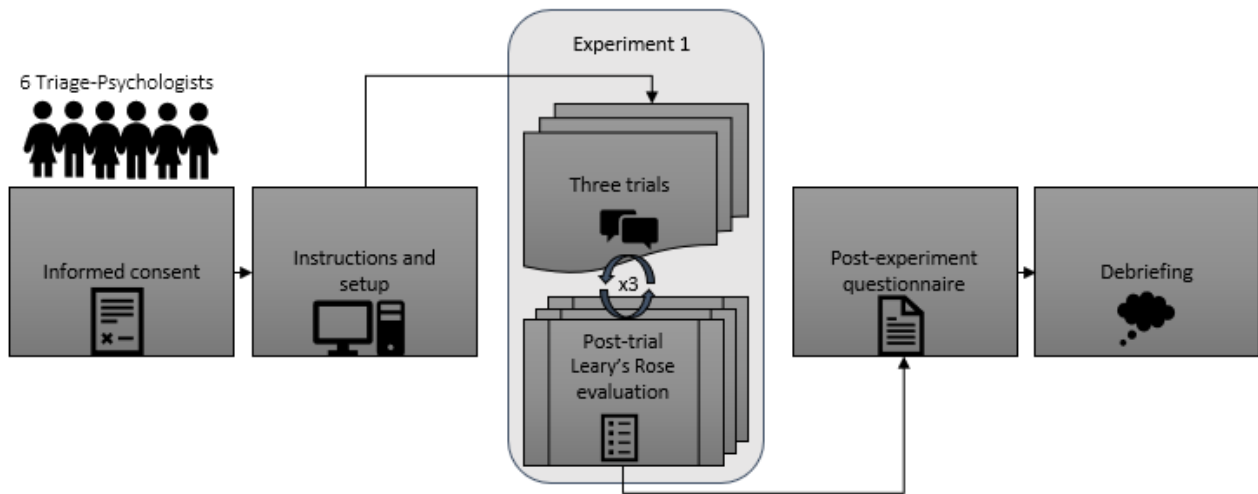
Leary's Rose [64] is a model to show how dominant/submissive and together/against someone is in interpersonal communication. To measure the Rose of Leary type of a persona, an input was constructed allowing participants to mark a point on a plot of how together/against and dominant/submissive the chatbot persona is from -5 to +5, as well as, what quadrant the chatbot persona belongs. Leary's Rose [46], to the best of our knowledge has not been used in this exact manner before to measure conversational agent or human behavior. Using the Rose of Leary quadrants in evaluation has been done by Bruijnes [16, 19] suggesting validity, and, reliability is difficult to determine because the measure only determines the Rose of Leary quadrant. Each participant interacts with six personas, and they can either correctly identify the Rose of Leary quadrant or not. In total, they can have 0 to 6 correct matches. See appendix C for the Rose of Leary measure.

System Usability Scale (SUS)

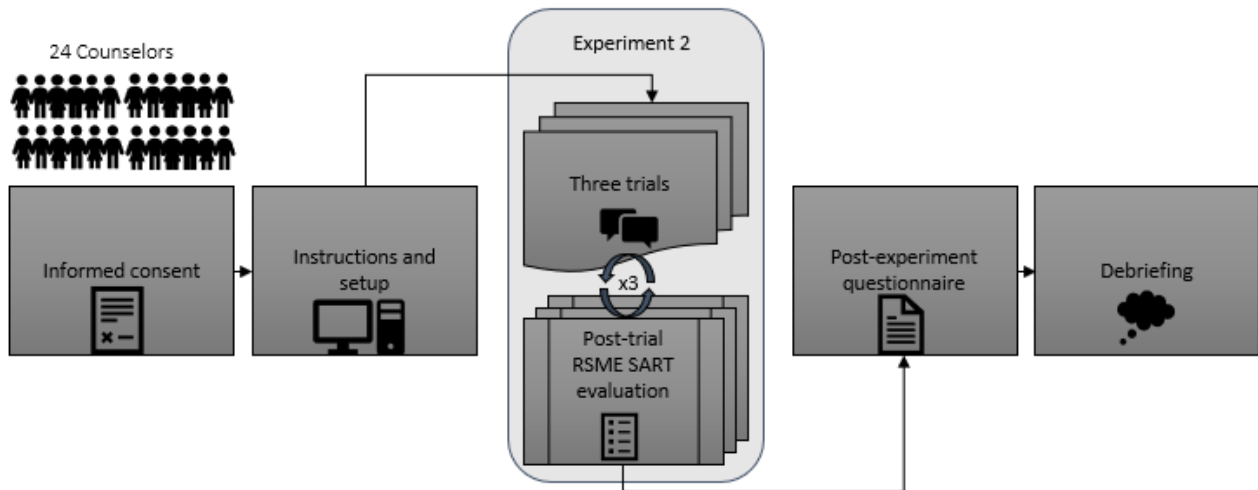
The System Usability Scale (SUS) [13] calculated the usability from a questionnaire with values between: 0 to 100. It is a reliable, quick and dirty measure of system usability based on ten items with a Likert scale from 1 to 5 [13]. The measure is valid and can differentiate between usable and unusable systems and it is a reliable tool that can give reliable results even with small sample sizes [12]. Last, in the SUS, to calculate the score involves adding the ten components with values between 1-5 and multiplying by 2.5 to get a score between 1-100. See appendix C for the SUS.

5.2.5 Procedure

The evaluation had two experiments. Each lasted a little more than half an hour and followed the procedure as shown by Figure 5.1.



(a) The evaluation procedure where triage-psychologists attempted to identify the correct Rose of Leary quadrant.



(b) The evaluation procedure where counselors rated their perception of mental effort and the situational awareness.

Figure 5.1: Evaluation procedure for both triage-psychologists and counselors, in each experiment the believability ratings took place during the post-trial evaluation phase.

The pre-experiment was informing the participant about the study and answering any questions. The main task was completing the experiment's three trials. Each of which included a six minute simulation with 1, 2, or 3 chatbots with a post-trial evaluation period that followed showing system feedback.

In the experiment, the participant completed the trial, answered the experiment questions, then looked over their feedback, and after continued when ready to the next trial. Participants always received feedback after each trial. Triage-psychologists, at the end of each of the three trials, identified the Rose of Leary quadrant for each chat via a Rose of Leary rating. Counselors, at the end of each trial, identified the RSME and SART. Lastly, when the participant completed

three trials they would start the post-experiment questionnaire. The short debriefing involved three questions:

- How was the feedback they received?
- What did they think about the chatbot interaction?
- Would the system be useful for training?

The prototype was hosted as a web application on the network at 113 where participants could connect and begin the experiment on their PC. The experiment included an informed consent and instruction sheet. It was important to explain the informed consent in addition to the purpose of the experiment plus give an example of what was expected in the experiment. There were two instruction sheets. One was for the triage-psychologist experiment and one was for the counselor experiment.

Data collection

As mentioned earlier, there were two experiments. The experiment procedures were identical, yet the instructions and questions were different. Triage-psychologists completed the first experiment and the counselors completed the second experiment.

In the first, triage-psychologist identified the chatter type of each chatbot via the Rose of Leary input. Specifically, triage-psychologist answered additional questions on social realism in the questionnaire. For the full triage instruction see appendix D.2.

In the second, counselors completed sessions and indicated their workload via the Rating Scale Mental Effort (RSME), awareness via the Situational Awareness Rating Technique (SART). For the full counselor instruction see appendix D.1.

Furthermore, every participant indicated their opinion on how believable each chatbot was via the believability measure per chatbot.

At the end, all participants filled in the PILO plus an additional question on perceived utility of the training. The triage-psychologist filled in an additional opinion on the social realism via the social realism measure. The counselors did not fill this in. All participants completed the System Usability Questionnaire (SUS). Data was collected for a period of 2 days.

5.2.6 Data preparation and statistical analysis

Data preparation

The data and R markdown scripts published at the 4TU data centre are available for access. There were four transformations that were necessary before analysis.

First, to calculate whether the participant x and y coordinates on the Rose of Leary correspond to the desired quadrant, the coordinate pair was mapped to a quadrant value from 1-4. There was an additional step, where the quadrant was transformed into the dichotomous value, 1 or 0 for correct and incorrect indication of the quadrant. Second, there was a similar transformation for the affect x axis and dominance y axis. The indicated affect value was 1 if correct or 0 if incorrect, and the indicated dominance was 1 if correct or 0 incorrect. Third, the social realism reliability Cronbach's alpha was calculated as 0.68, which was close to the acceptable level of 0.7. To offer a condensed measure of social realism, the values into an average created the social realism index. Fourth, the study calculated Cronbach's alpha for each of the six personas regarding the believability measure and found the reliability range to be from 0.93 to 0.96. This suggested strong reliability of the believability measure and supported averaging the values into the believability index.

Randomization

The evaluation used block randomization. The simulation order of one, two, or three chatter sessions was randomized. For example, the order was randomly assigned and done an equal amount of times so the experiment may have started with one chat session, then a three chat session, then ended with a two chat session. And for another, started with three chats, then two chats, and ended with one chat.

The study randomized the simulation order of the personas. For example, which order the participant gets was always randomly assigned for the experiment. If it had one, two, then three chats, they may have began with an aggressive chat. Second, had one dependent chats and one withdrawn chat. Then ended with one friendly, one dependent chat, and one withdrawn chat. Since there was only one aggressive persona and one friendly persona then two dependent and two withdrawn personas the participants chatted with twice as many personas that were withdrawn and dependent when compared to personas that were friendly or aggressive. It is important to note this difference, that there was always an unbalanced situation because the aggressive and friendly quadrants only have one persona.

Last, the chatbot names were randomized each time. The names used include Emma, Isabella, Lucas, Oliver, Sophia, Thomas (3 male, 3 female), it was important to randomize the names to avoid a bias, this was part of limiting any bias associated with the name or gender for each persona.

Statistical analysis

The study used a general linear mixed model with the uid as the random effect when dealing with a binomial distribution and a dichotomous, or binomial, dependent variable. The manipulated nominal independent variable, or factor in R, is the chatter Rose of Leary quadrant (aggressive, withdrawn, dependent, friendly). The dependent variable measured is if the

quadrant is correct or incorrect.

The study used a regular general linear model for analysis of friendly and aggressive types which had one persona, and the general linear mixed model for the dependent and withdrawn types which, had two personas. In further analysis, the dependent variable measured is if the affect x-axis is correct or incorrect, and if the dominance y-axis is correct or incorrect.

The study used a linear mixed model with the uid as a random effect when dealing with a normal distribution. The manipulated independent variable is the number of agents. The dependent variables are the workload and the situational awareness. Because of the multi-level analysis, an intercept model and an control model allow for comparison. For this, the study uses a within subjects design with 3 conditions (one chat, two chat, or three chats at once). The number of agents is the independent variable with a value of one, two, or three. The system manipulates the number of agents, and the agents in the sessions are randomized.

The personas in the session are likely to have an effect on the difficulty and situational awareness. The effect is not systematically biased in condition. So we try to control the effect with randomization among twenty-four participants.

Inference

Confidence intervals excluding the random possibility of .25 for quadrants, and .5 for axes infer significantly positive Rose of Leary indication.

5.3 Results

5.3.1 Triage-psychologist classification of Rose of Leary personas

Rose of Leary

Triage-psychologists classified the personas with the correct Rose of Leary type ($M = 0.39$, 95% CI [.22 to .57]). The study cannot accept the hypothesis overall as significant when considering the chance of randomly guessing a Rose of Leary type is .25 and the confidence interval included this value. In Figure 5.2, a bar chart illustrates the accuracy of each Rose of Leary type plus the mean and random threshold.

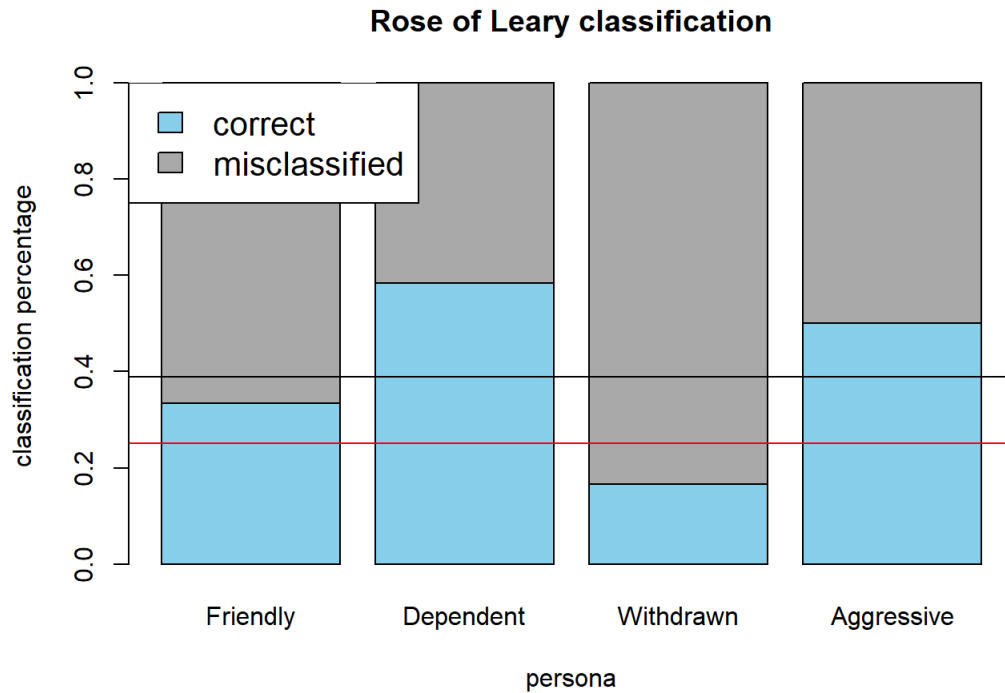


Figure 5.2: Bar chart showing the classification percentage given by triage-psychologists for each Rose of Leary type. The red line is the level of random classification at 25%, the black line is the mean classification 39% of the personas

When looking at the quadrant, participants classified the dependent quadrant, $M = .58$, 95% CI [.24, .91], aggressive quadrant, $M = .5$, 95% CI [.16, .84], friendly quadrant, $M = .33$, 95% CI [.06, .72] plus the withdrawn quadrant, $M = .17$, 95% CI [.00, .43]. The results indicate that even for the dependent type, the confidence interval included the random possibility, so no quadrants were significantly positive in their identification.

Furthermore, the result of whether the Rose of Leary axis for affect or dominance could be distinguished in comparison to random chance. That is, for X, affect (correctly distinguishing between together and opposed behavior), $M = .64$, 95% CI [.44, .83], and for Y, dominance (correctly distinguishing between dominant and submissive behavior), $M = .55$, 95% CI [.28, .85], so no axis was significantly positive in their identification.

PILO and perceived utility

Triage-psychologists completed a post-experiment questionnaire regarding the learning and utility potential of the tool, the evaluation analyzed the results with a one-sample t-test. Overall, triage-psychologist rated the questions regarding the feedback and the system as positive, in particular, Questions 6 regarding the motivation, had a p-value that indicated positive significance. Whereas, for all other questions, the analysis could not establish neither a negative or positive response for questions 1,2, and 4 regarding the feedback utility and questions 3 and

5 regarding the prototype. In Figure 5.3, a bar chart shows the mean and 95% confidence interval for the individual questions. If the confidence interval is positive, then there is positive significance.

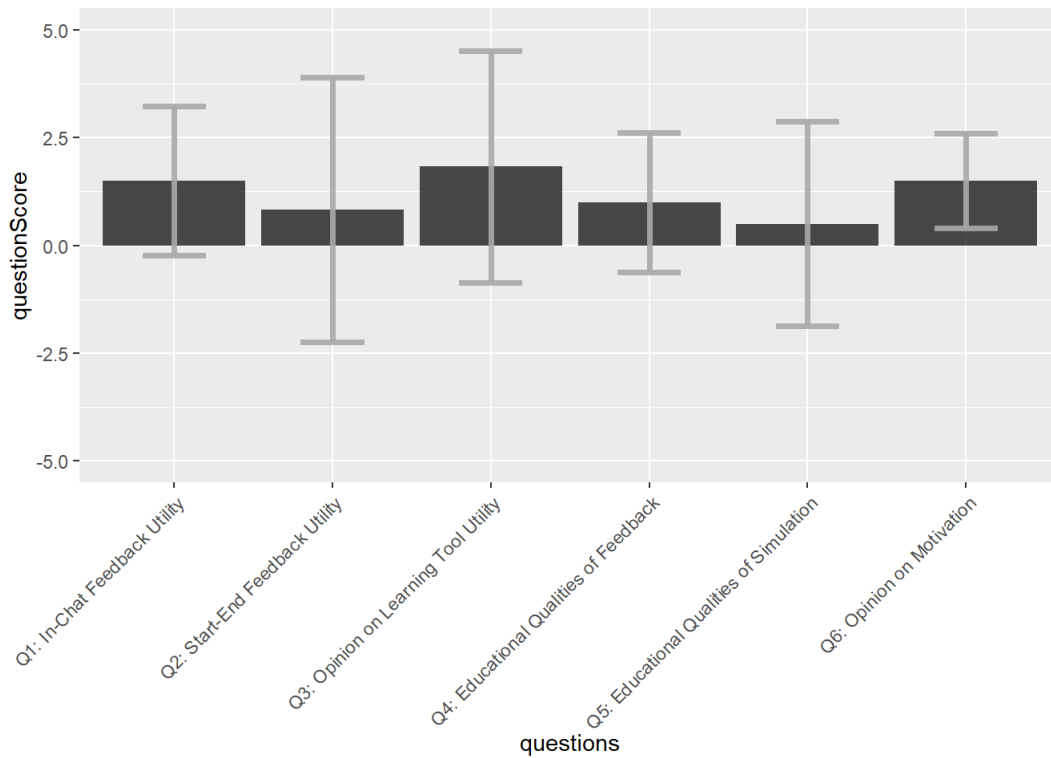


Figure 5.3: Bar chart showing the mean and standard deviation of all the responses given by triage-psychologists for each question on utility and learning effect.

Social realism

The evaluation analysis yielded that the social realism index was $M = 1.56$, 95% CI [0.65, 2.46] meaning triage-psychologists were positive that the events in the simulation were significantly realistic.

Believability

In table 5.1, analysis of believability showed the index per persona was around zero and were not significant, meaning that the triage-psychologists neither found the conversational agents not believable nor believable.

Persona	believability index
Persona A (Aggressive)	M = -0.33, 95% CI [-2.55, 1.89]
Persona B (Withdrawn)	M = -0.78, 95% CI [-2.81, 1.26]
Persona C (Withdrawn)	M = 0.61, 95% CI [-1.76, 2.98]
Persona D (Dependent)	M = 1.11, 95% CI [-1.57, 3.79]
Persona E (Dependent)	M = -0.56, 95% CI [-3.19, 2.07]
Persona F (Friendly)	M = -0.33, 95% CI [-2.44, 1.78]

Table 5.1: The triage-psychologist results of the believability index for each of the six personas.

Usability

The triage-psychologists rated the usability of the system by the SUS. This score takes the mean of all triage-psychologists. According to Bangor et al. [5], the triage-psychologists considered it a good system as $M = 73.75$, 95% CI [60.2, 87.3] is considered a 'good' score as it correlates amongst other systems, yet is slightly lower than how the counselors scored the system (See appendix F for a further breakdown).

5.3.2 Counselor perception of mental effort and situational awareness

Mental effort

In table 5.2, the analysis shows that the mental effort increased with the use of the conversational agents, and does so significantly with the number of chats. Counselors rated their mental effort, with one chat, as 40.4 which corresponds to some effort. With two chats, counselors rated their mental effort as 59.4 which corresponds to rather much effort. With three chats, counselors rated this as 71.1, which corresponds to considerable effort.

Model 1	B	SE	df	t	p
Random Effect	15.8	14.4			
Intercept	25.7	6.4	36	4.0	<.001
Condition	15.6	2.4	36	6.4	<.001
Model 0 vs 1	$\chi^2(1)$	p			
	28.3	<.001			

Table 5.2: Multilevel analyses results of primary outcome measure: RSME

Situational awareness

In table 5.3, the analysis showed that the situational awareness increased with the number of chats, yet, $\chi^2(1) = 1.0$, $p = 0.3$ indicates the result is not significant. Further the same analysis

on the sub-components of the SART, shows a significantly positive increase for the demand (D) and supply (S). The study expected demand of the situation to significantly increase, however, the study did not expect supply to significantly increase.

	B	SE	df	t	p		B	SE	df	t	p
SART Model 1						U Model 1					
Random Effect	2.6	4.9				Random Effect	15.8	14.4			
Intercept	12.6	1.6	46	7.6	0	Intercept	6.3	0.6	46	9.9	0
Condition	0.7	0.7	46	1.0	0.3	Condition	0.4	0.3	46	1.6	0.1
Model 0 vs 1	$\chi^2(1)$	p				Model 0 vs 1	$\chi^2(1)$	p			
	1.0	.3					2.7	.1			
D Model 1						S Model 1					
Random Effect	2.4	2.5				Random Effect	2.0	3.0			
Intercept	9.0	1.0	46	9.3	0	Intercept	15.3	1.0	46	14.6	0
Condition	1.1	0.4	46	3.0	.004	Condition	1.4	0.4	46	3.3	.002
Model 0 vs 1	$\chi^2(1)$	p				Model 0 vs 1	$\chi^2(1)$	p			
	8.5	.0035					9.9	.0016			

Table 5.3: Multilevel analyses results of primary outcome measure: SART, plus sub-components: Understanding (U), Demand (D), Supply (S)

PILO and perceived utility

In Figure 5.4, the results show that all items were given ranges above the neutral middle point. This suggests that counselors were positive regarding feedback (Q1, Q2, Q4) and tool (Q3, Q5, Q6).

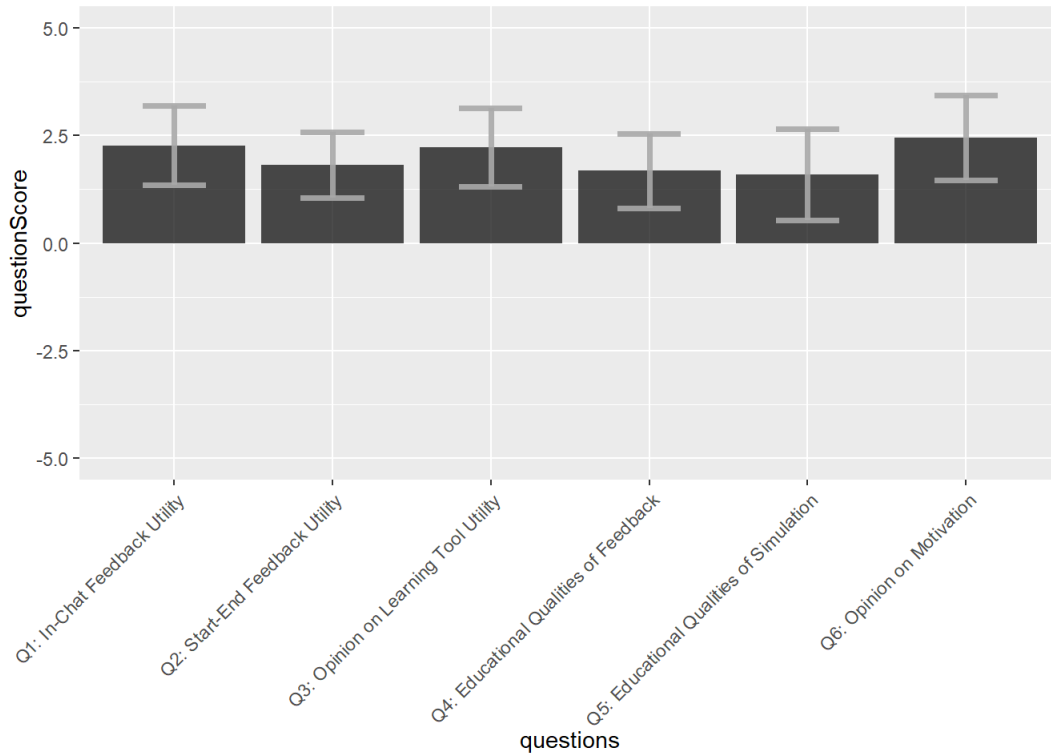


Figure 5.4: Bar chart showing the mean and 95% confidence intervals of all the responses given by counselors for each question on utility and learning effect.

Believability

In table 5.4, analysis of believability shows the index per persona was positive, but not significant, except for Persona E it was significant, meaning that the counselors neither strongly found the majority of conversational agents not believable -5 nor believable +5.

Persona	believability index
Persona A (Aggressive)	M = 0.23, 95% CI [-0.79, 1.25]
Persona B (Withdrawn)	M = 0.85, 95% CI [-0.07, 1.76]
Persona C (Withdrawn)	M = 0.5, 95% CI [-0.46, 1.46]
Persona D (Dependent)	M = 0.64, 95% CI [-0.37, 1.66]
Persona E (Dependent)	M = 1.16, 95% CI [0.25, 2.07]
Persona F (Friendly)	M = 0.18, 95% CI [-0.67, 1.03]

Table 5.4: The counselor results of the believability index for each of the six personas.

Usability

The usability of the system was calculated by counselors with the SUS and resulted in an overall score of M = 78.04, 95% CI [73.96, 82.13]. According to Bangor et al. [5], this is considered a 'good' score as it correlates amongst other systems.

5.4 Discussion and conclusions

5.4.1 Main findings

Rose of Leary The Rose of Leary results did not support the first hypothesis (H1). The result could not differentiate itself significantly in a positive manner from random 25%. In the exploratory analysis, the indication across the affect and dominance axis likewise was not significantly positive above random 50%, so this is an area of focus for future work. The experiment limitations included the sample of participants was too small to support H1, so the study can not draw any conclusions, yet, the findings show the prototype may be on the right track towards a suicidal reasoning model with interpersonal stance.

Mental effort and situational awareness Mental effort experienced by counselors indicated a positive correlation with the number of chats, supporting H2-A. Accounting for random effects, there was variation between users, yet, analysis confirms counselors felt the mental effort increased.

The situational awareness increased, which contradicted H2-B. When looking at the three parts that make the situational awareness score, it was obvious that the situational awareness had a positive correlation and not negative. We see a particularly interesting result where the supply sub-component increased. The supply of attention resources, in particular, showed with a significant positive correlation that counselors indicated they were more alert with more chats. This yielded a higher SART score and contradicted H2-B. Furthermore, the counselors indicated that their understanding of the situation slightly increased with more chats, possibly due to the additional information gained with more chats, which contradicted H2-B.

Overall, the study can not support H2-B that situational awareness decreased with more chats, but can support H2-A that mental effort increased.

Questionnaires The results from the questionnaires indicate that overall counselors had significantly positive views on the prototype, and the triage-psychologists had less positive views. Counselors found all personas positive for believability but neither strongly believable or not believable. Triage-psychologists indicated that personas neither had strong believable behavior nor not believable behavior. Furthermore, triage-psychologists indicated slight confidence that the events may have been in some ways socially realistic. An accomplishment of the prototype design was that both counselors and triage-psychologists rated the system usability as 'good' which was important for the evaluation and making a training system.

5.4.2 Limitations and future work

The sample size limited the statistical power of H1. In the study, thirty participants participated for a limited time. It would be interesting to take a larger pool of triage-psychologists, in

particular, to make the study more statistically relevant.

All of the participants completed 3 six minute trials with one, two, and three chats. In real life the conversations differ a lot in length. This depends on factors such as the triage-psychologist, help-seeker, the acuteness of their situation, and how busy the helpline is. It would be better in later studies to have the participants complete full conversations with some constraint on time, as it might be a better representation of the real world. This is an important improvement to make with this study.

It would also be useful to assess the training effect in respect to long term learning outcomes with the prototype over a longer period of time. In this evaluation, all three conversations were complete within about a half an hour period, and no analysis takes a look at whether counselors show signs of meeting the desired learning objectives of 113 for triage-psychologists over the long term.

Part V

Conclusion

Chapter 6

Discussion and conclusions

This thesis presented a design and evaluation of a system for triage-psychologists at 113 Suicide Prevention that allowed them to have a learning environment where they can make mistakes and could practice with many chats at once to meet the desired learning objectives. A training system is a step in the direction of creating such an e-learning platform that can be used as a tool to aid the existing training program of the 113 helpline. The concept of practicing conversations with several personas at once to improve the quality of the triage-psychologist's training involved the design and evaluation a bdi-based and interpersonal stance inspired conversational agent model. The personas' answers were reviewed with a senior floor manager, and evaluated with triage-psychologists and counselors. Overall results indicated the triage-psychologists and counselors were positive about the potential of the new learning environment.

In this chapter, the conclusions of the work and the contribution covers the main points of the project. The limitations of building a conversational agent training system are given and potential improvements found during the development and evaluation of the prototype provides recommendations for future work. Next, the final remarks wrap up the work presented in this thesis on its use, continuation, and importance.

6.1 Conclusion

The main research question for this thesis was:

If it is possible and in what way can conversational agents train 113 triage-psychologists to better assist many help-seekers by chat at once?

To answer this question, it was broken down into sub-questions.

Why is the role of the 113 triage-psychologist important?

The triage-psychologists primary work is to guide help-seekers in crisis to a safe place. By chatting with a 113 counselor or other service, help-seekers are directed to get the care they

need.

How does attitude and values impact the role of the 113 triage-psychologists?

The attitude and values of the 113 triage-psychologist must adapt to each person and situation. It is important for 113 that they make contact through listening and confirming the help-seeker's situation and appropriate risk level, this builds credibility, and for the help-seeker to feel welcome by the helpline. This is part of confirming with them the services that exist, which can help them with their feelings of despair. Credibility is an important factor for triage-psychologists when the crisis is serious and requires further negotiation, this is when social skills are essential.

What are the learning objectives desired by 113 triage-psychologists?

Triage-psychologists work on the fundamentals of their role by practicing. They do this by first making contact with the person, then establishing their safety and situation, and then taking a look together to see if a goal for a conversation or other care is more appropriate for their crisis. They do this, currently, through observing and on the job training. With a conversational agent system, 113 can aid triage-psychologists with getting more experience in similar situations and exposure to the challenges of handling many chats at once, while exploring with them to see how best they can adapt their social skills and character to each unique help seeker and the protocol.

What are the requirements for such conversational agents?

The conversational agents must react to subtleties of 'how' and 'what' something is said in the chat conversations. To recognize these dimensions of text inputs, theories similar to those of negotiation topic modeling and interpersonal stance were useful. The conversational agents design was based upon the BDI design paradigm and Rose of Leary interpersonal stance. The system focused on how a conversational agent must react to triage-psychologists inputs with respect to the subtleties in interpersonal communication and negotiation as it pertains to the 113 suicide helpline.

What would a prototype look like?

The system provided a safe environment with six personas where triage-psychologist can practice against one or many chatbots, or conversational agents, in different situations that pertain to training for 113. The system allowed multiple chat conversations and supported the necessary functionality from the existing Lifecom system. The prototype of the system allowed an intuitive chat interface plus pre-chat information and text macros to allow triage to carry out their role as they would normally do so on the helpline, including the controls necessary to start, end, and transfer chats.

What is the opinion of triage-psychologists on the possible designs?

The triage-psychologists want to have a design where they can try different personas and situations for practice. They found the learning environment motivational and the events in

the environment as socially realistic. The triage-psychologist thought the macros worked well within the prototype and the agent responses grew less believable when manually typing in messages. They perceived the feedback as useful, yet, in need of improvement to highlight more specific points from the transcript. Overall, the recognition of inputs and the generation of outputs could seek improvement. Furthermore, the personas were not significantly identified by the Rose of Leary however, the design was mentioned in debriefing to be promising.

How do trainees experience a learning environment with these conversational agents

The counselors acting as trainees in the experiment found the learning environment motivational, relevant for learning, and its feedback as useful. Their mental effort, situational awareness demand, and situational awareness supply increased, which indicated the system's ability to scale difficulty with the number of chats. They perceived the system as usable with a significant indication that the believability of persona E was credible.

Why is such a prototype beneficial?

Providing a software environment where trainees can make mistakes before making mistakes on the crisis helpline is desirable. Both experiments utilized the Dutch version of the prototype, however, an English version of the prototype is also available, as English chatters are prevalent on the helplines so this tool can be of particular use for practicing chatting in English. By using the system, accompanied by a manager's feedback, an additional opportunity for the development of fundamental habits and skills is available during training.

6.2 Contribution

The training environment provided 113 Suicide Prevention with a learning environment for their trainees through a simulation that can provide trainees exposure to six different personas in different crisis situations while handling one to many chats at once. The evaluation conducted gives insight that triage-psychologists and counselors would appreciate such a system and the design show such an e-learning platform in multiple languages is possible with available natural language processing and web technology.

The conversational agent builds off the work of Bruijnes [17] which is based on the concept that when training interpersonal social skills the Rose of Leary can be of utilized. The conversational agent model designed used the Rose of Leary interpersonal stance, Giebel's Table of Ten, and offered a new measurement tool using the Rose of Leary during evaluation. The Rose of Leary evaluation tool, training phrases, and beliefs, desires, intentions used in the project are available to allow the reproduction of this work, encourage the improvement of this work, and future research in training for the crisis lines.

The prototype, after further development to the conversational agents, would be novel in the field of suicide counselling training, and a potential method to train professionals and non-

professionals to practice conducting conversations that occur on suicide helplines. The concept can mold from an initial training program for 113 triage-psychologists, where they can work with timed plus full simulations with one to six chats at once. To a more robust e-learning platform. A multi-disciplinary collaboration for such an endeavor would allow such development.

6.3 Limitations

The main limitation of the prototype is the six personas for the conversational agent model only supported conversations between ten and fifteen minutes, which satisfied the average length of the triage-psychologist, yet is a limitation compared to real chats. In order to design such a suicidal conversational agent model, a number of symbolic inferences were made from observations and literature and applied to proven theoretical models [63, 55], then linked to concepts in existing models [17, 47], and implemented in iterations. The system was built from the bottom up and gave the prototype liberty to directly pursue its specification goals. The scope of the project lead to simplification of parts of the agent. This was the first step to conceptualize a training system that would be useful for 113 and it can be improved.

The first point, that contributes to the main prototype limitation would be the natural language processing, which could be made to handle a much larger pool of inputs and differentiate between them. The system differentiates inputs based on assigned codes. Some of the important dimensions to take from the textual inputs in this domain included how a symbolic theoretical system can use codes to update agent states and respond accordingly.

A second point is that the conversational agent reasoning and natural language generation system could go through iterations of review to refine the algorithms, improve answer selection, and widen the amount of personas and available answers to better represent the variety of crisis conversations a triage-psychologist experiences. Some of the data driven options for such a solution would be interesting to pursue as future possibilities to improve the natural language generation, yet, to apply such an approach would be a considerable challenge. Some additional steps, after data preparation, would need to be taken to ensure sensible agent responses.

Furthermore, the scope of this work limited the evaluation of the prototype. In experiment one, there were too few triage-psychologists to draw statistically relevant conclusions about the Rose of Leary and from other portions of the evaluation. Thus, this experiment would have benefited from a larger sample size than six triage-psychologists. In experiment two, it would be interesting to see the longer-term learning effect of the prototype on trainees. This would be possible in several ways, such as administering simulations over the course of a week and comparing the results from start to at the end.

6.4 Future work

This thesis marks the very first steps in creating an online training platform for 113 suicide counselling. As such, there is a great deal of work that developers, psychologists, and training professionals can complete to take this prototype and concept forward.

The most direct development that would progress this work would be fully building the intent recognition or natural language processing model that this thesis solely built for the triage-psychologist scope and evaluation. By organizing and recognizing a much larger and more complete range of inputs, the prototype would move close to a production ready application. Developers could work through more of the transcripts and with experienced triage-psychologists so that the conversational agent could support more avenues of the dialogue and so that the prototype natural language processing could be more robust for both the English and Dutch languages.

Another major area for improvement is the natural language generation and agent reasoning. Limited empirical results exist that support the best practice for designing suicidal agents. This work had the liberty of using a symbolic theoretical model by assigning codes to inputs and updating the model accordingly to the Rose of Leary and beliefs desires intentions model. To address this, developers and psychologists should work together to improve upon this model by assigning more appropriate weights and properties to inputs based on empirical results, or seeking a more data driven alternative. Additionally, developers may improve the mechanisms the agent used to select a response to include emotions that aligns with state of the art conversational agent design and is consistent with suicidal human behavior.

Lastly, training professionals and developers can look at improving the usability and quality of the prototype to meet learning objectives. The evaluation used a total of six personas, yet, it may be of interest to include more so the conversational agent covers other difficult scenarios that occur on the helplines. The interface successfully allowed interactions with these personas via many chats at once in the evaluation, but to support full integration into 113 training efforts, longer-term results to support the prototype are desirable. A particular focus, is seeing if trainees, after several training sessions, learn to satisfy the protocol from using the learning environment. A secondary focus, is improving feedback via the interface, which can highlight ways to meet the fundamental responsibilities of the role. Collaboration between developers with the 113 training team to improve the personas and prototype would benefit trainees.

To open up a multi-disciplinary collaboration effort to work on developing such an online training platform would be the desired outcome from this initial research for future work.

6.5 Final remarks

This thesis endeavored to create a novel way to improve training in suicide crisis lines with conversational agents. This work has the potential to have a positive influence on trainee triage-psychologists. If improved, it could also support teaching counselors and other roles of the helpline. The triage-psychologist role requires experience, and this technology provides the opportunity to practice the protocol beforehand and build confidence in the fundamentals so that they can provide a higher level of care to each unique person coming in crisis in a more consistent and dependable manner.

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Part VI

Appendix

Appendix A

Scenarios

The four scenarios presented in the focus groups.

- Scenario 1
- Scenario 2
- Scenario 3
- Scenario 4

Scenario 4 was not included in the report and involved a software interface to build scenarios and situations that triage-psychologists could then practice. It involved selecting personas and modifying their initializations to create situations with one or more conversations.

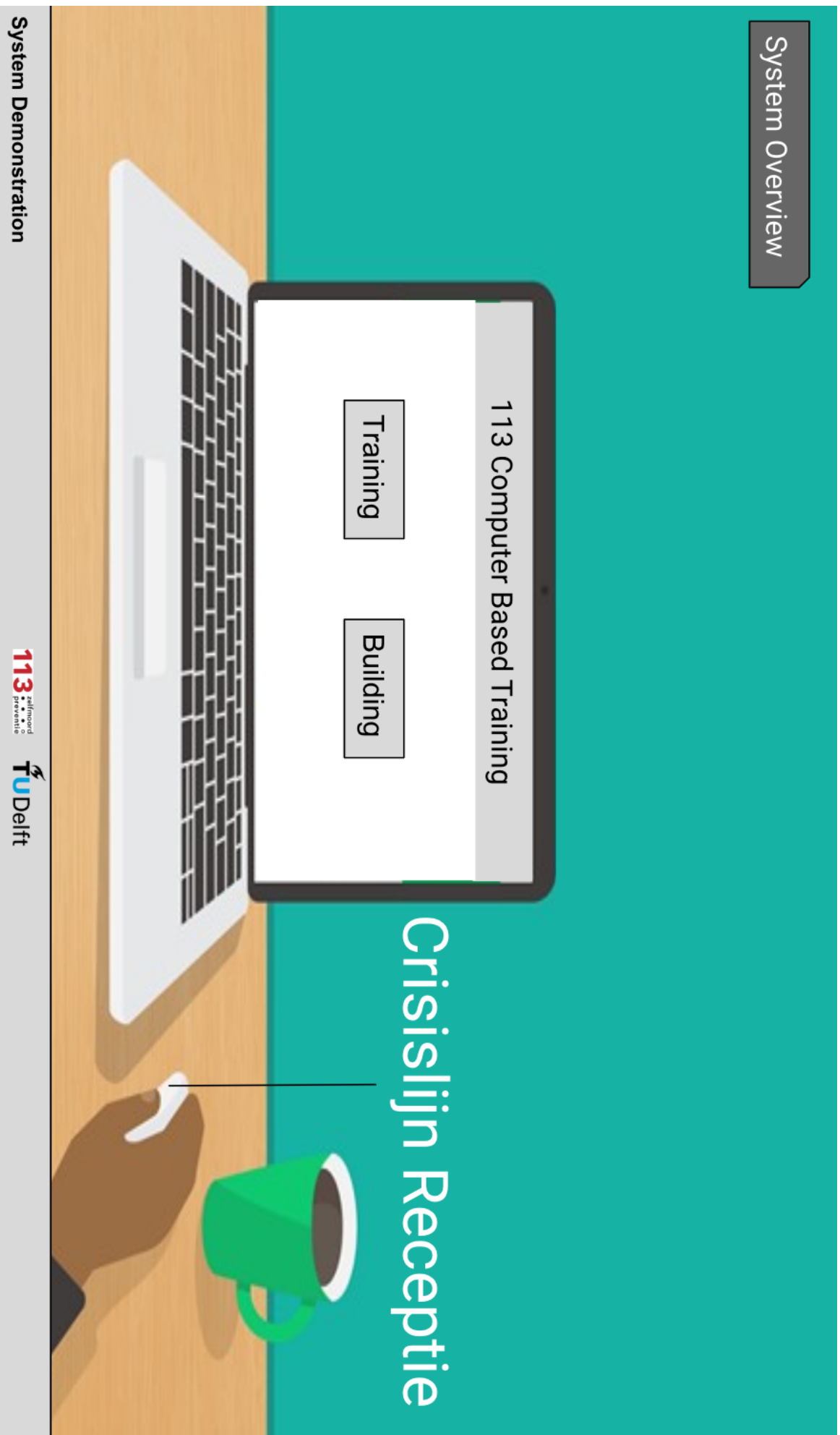


Figure A.1: Mock up of an e-learning system

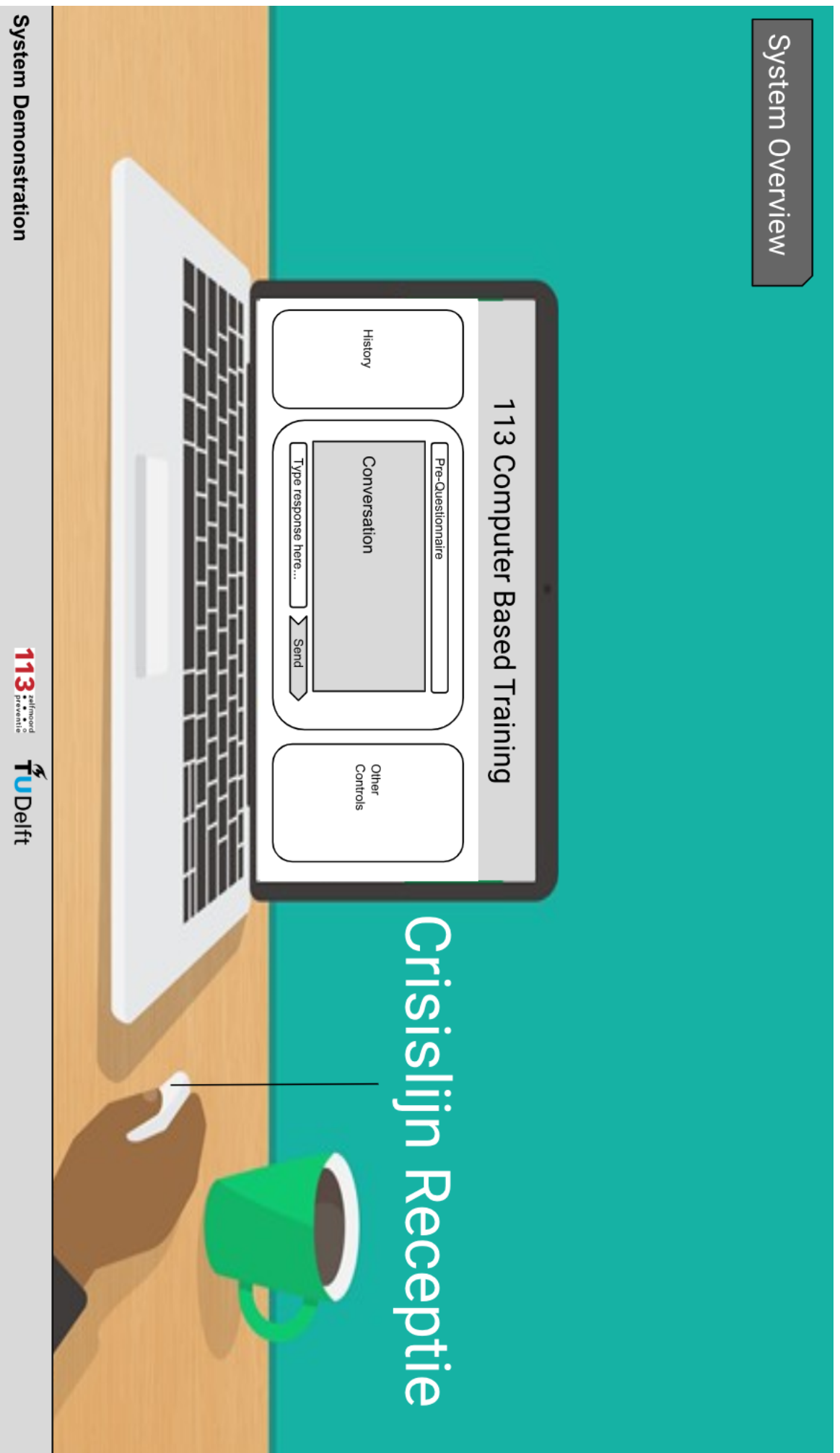


Figure A.2: Mock up of a chat training environment

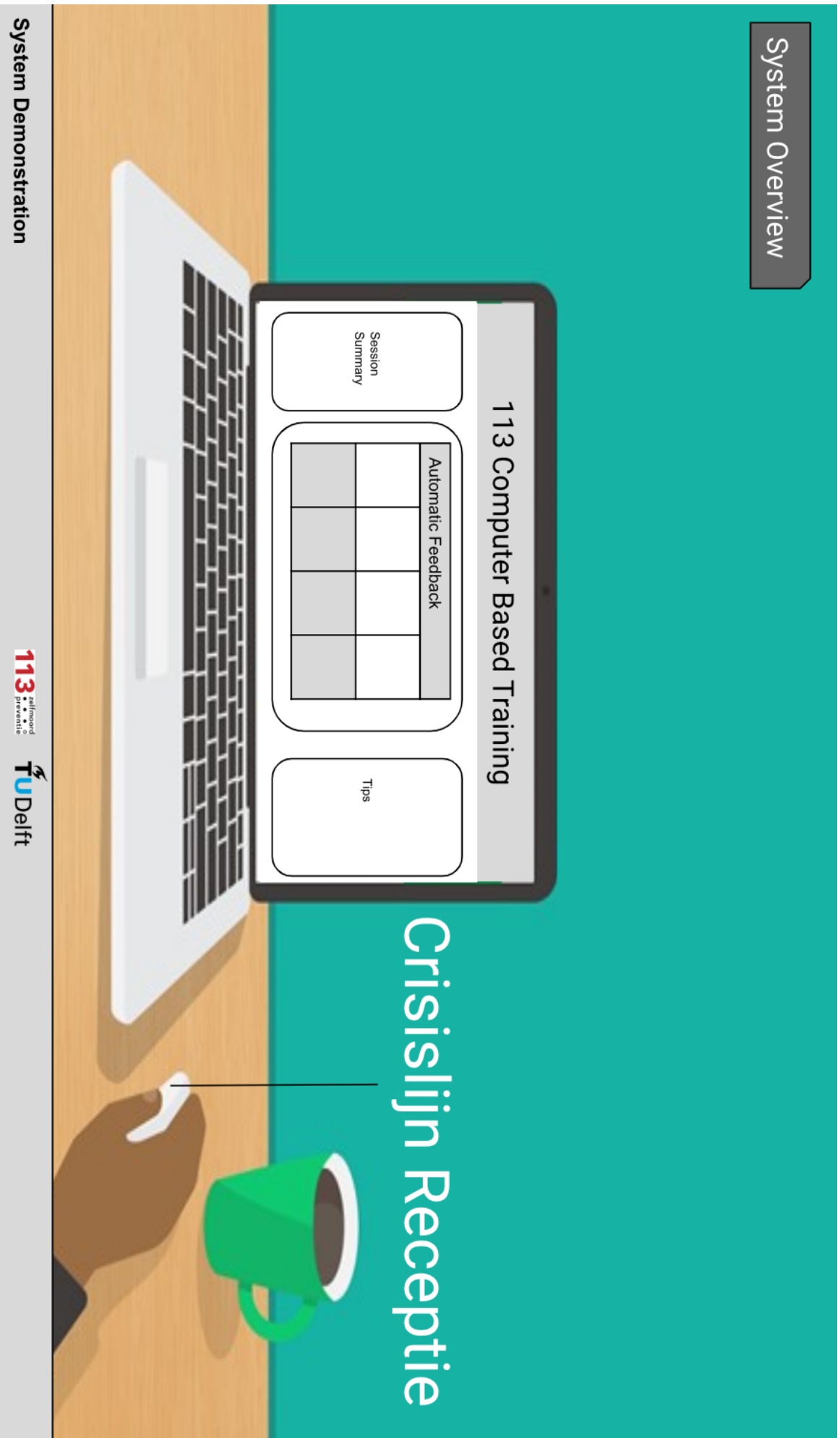


Figure A.3: Mock up of a feedback environment

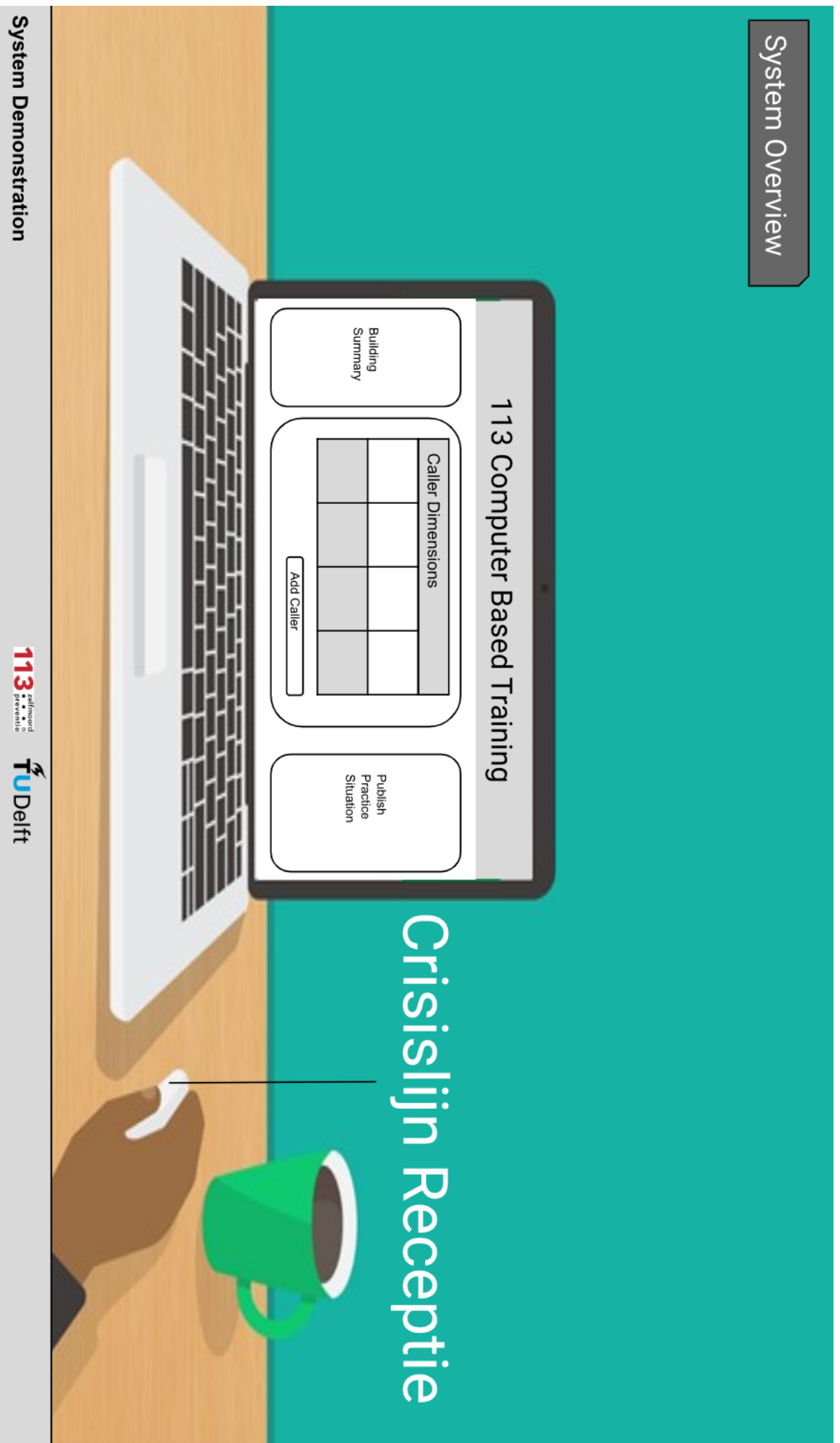


Figure A.4: Mock up of a builder environment

Appendix B

Questionnaires

The study used questions from the following constructs. The questions are inspired from a previous work and each of the questions were tailored for a semantic range.

- Perceived utility
- Social realism
- Believability

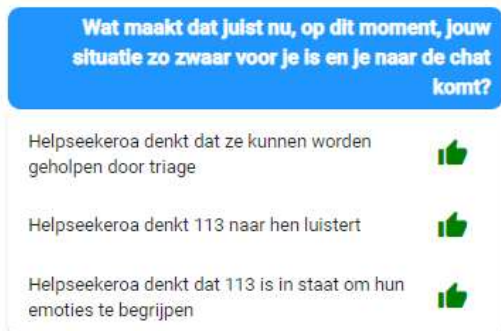
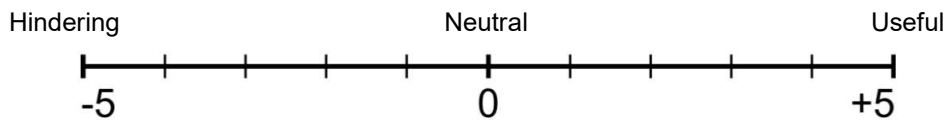


Figure 1 - Feedback from the transcript;

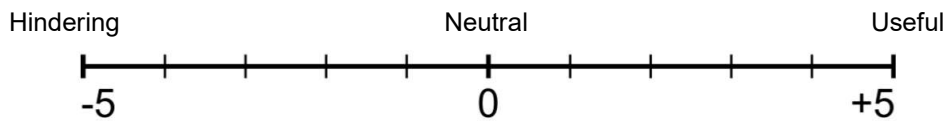


Figure 2 – Feedback on the chatbot at the start and at the end.

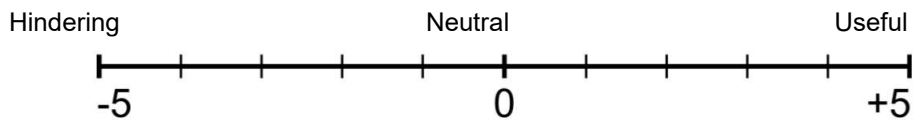
Q1 Through the training with the chatbots, my opinion about the usefulness of feedback in Figure 1 was:



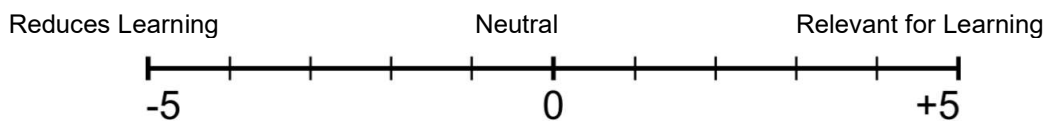
Q2 Through the training with the chatbots, my opinion about the usefulness of feedback in Figure 2 was:



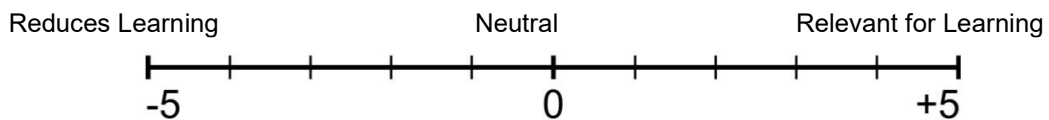
Q3 Through the training with the chatbots, my opinion on the usefulness of using chatbots as a learning tool is:



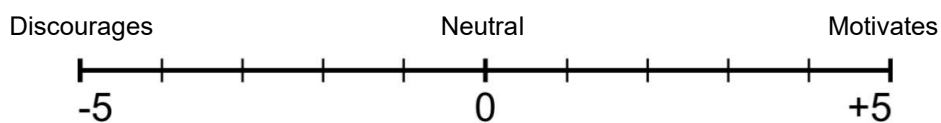
Q4 Through the training with the chatbots, How educational did you find the system feedback on the chatbots?



Q5 Through the training with the chatbots, How educational did you find the simulated conversation with the chatbot?



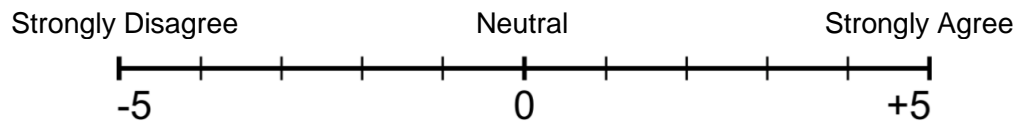
Q6 This method motivates me to practice.



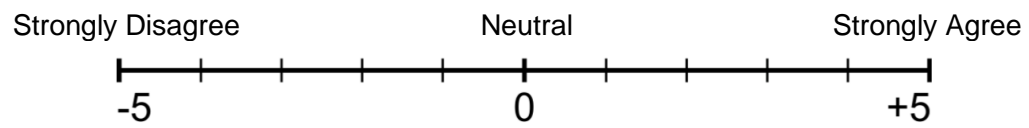
Veutgen et al. (2018)

Construct: Social Realism

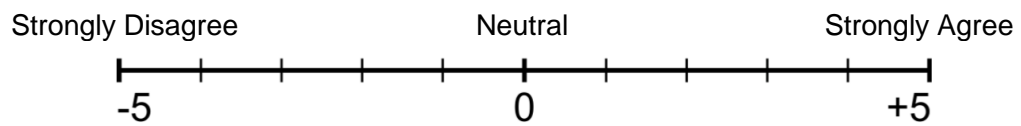
I saw events which could occur in the real world.



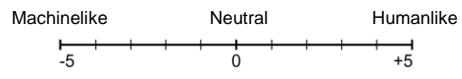
The way in which I saw events occurring is a lot like the way they occur in the real world.



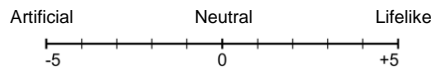
I saw events which occur in the real world.



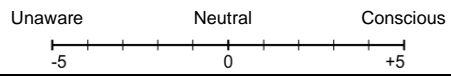
1 <The agent>'s behavior made me think of human behavior.



2 I think <the agent> was behaving like a real person.



3 I had the impression that <the agent> was controlled by a human.



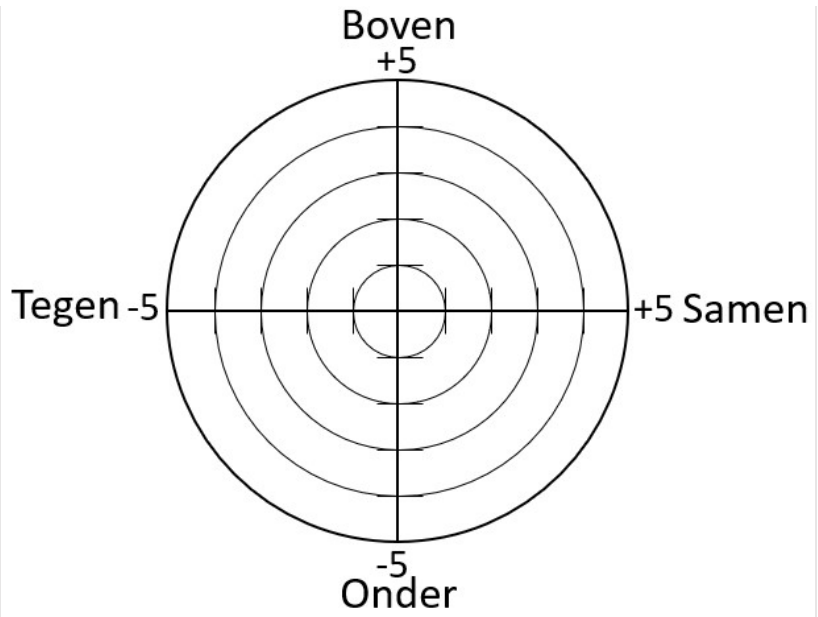
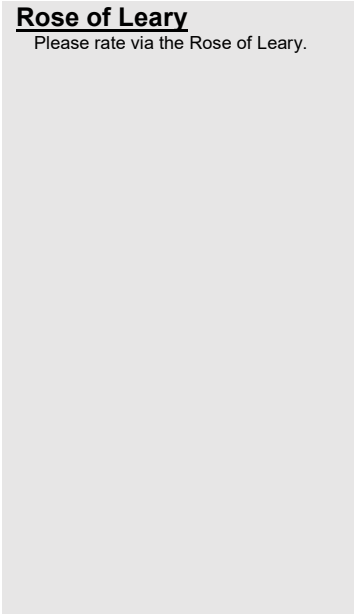
Appendix C

Rose of Leary Rating Technique

The study created a rating technique with the Rose of Leary. It involved participants marking on a Leary's Rose with a radius of 5 where the persona's behavior was in terms of two axes: affect (together or against) and dominance (above or below).

Rose of Leary

Please rate via the Rose of Leary.



Rose of Leary Example

Please rate via the Rose of Leary

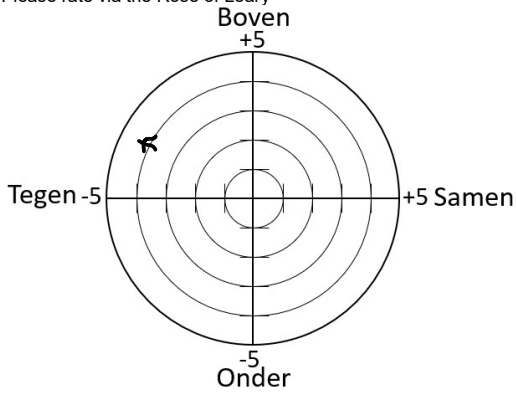


Figure - Example rating of an aggressive persona at [-4,-2]

Appendix D

Experiment versions

The study used two versions of experiment information. These were printed and participants filled these out during the experiment.

- Triage experiment version
- Counselor experiment version

Experiment Form - Instructions

Overview:

The experiment goal is to determine the difficulty of 3 sessions and whether the six chatbots in those sessions are Believable.

Session with two chats example:

As an example before starting, imagine the first session you have is with van Bron and Billy Bob.

van Bron: He is anti-social and has a record of treatment for depression.

Billy Bob: He is socially isolated and lives in an institution.

In this chat scenario, Van Bron behaves mostly in a detached manner, unwilling to cooperate and expressing this through either competing or defiant behavior and Billy Bob does not trust you, avoids your questions and does not give much information. When trying to build rapport, on several occasions, Billy bob avoids the questions and van Bron demands that the chat go his way. He does this by using short and direct sentences such as "You have to shut your mouth!" or "You have no idea, you are friends with the devil, I'm ending this!"

At this time, the chat ends, so the next step is to determine the difficulty, situational awareness, and believability. On the difficulty scale, if there was more mental effort required, then the rating should be likewise as high, so, maybe 'Rather Much Effort' is appropriate for these two callers. Also, if the conversations was very difficult then the awareness of the situation should also show this by having many aspects low and high at the extremes of the situational awareness scales. Also depending on the believability of van Bron and Billy Bob they may receive different scores.

When you finish a session there is a corresponding sheet attached that needs to be filled out in this packet, it is important to move on to the next when both are done, **this experiment should take 30 minutes, or 10 minutes for each chatbot session.**

When the three chat sessions are complete and this evaluation form is filled in, then your last task is to complete the Post Experiment Questionnaire.

Instruction for experiment form

It is important to try to rate the difficulty in respect to the session and the believability in respect to each chatbot in the session. When you finish a chat session, match the number of chats in the session to the corresponding page in this packet, then fill in the requested information for difficulty, situation, and believability.

In this packet, you have *three Evaluation Forms*, it is important you use the correct form for the number of chatbot(s) you had, for example if you had one chatbot in the session go to the next page, Page 1 as shown below, and fill in the requested information. (If two, Page 2, If three, Page 3)

Figure 1 – If you have one chatbot, Go to page 1 of the Experiment Form. Likewise, If two, go to Page 2, and if three, go to Page 3.

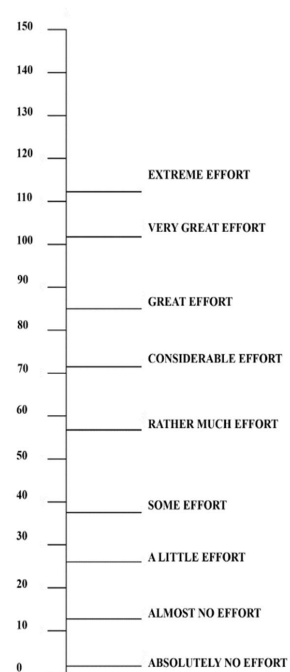
1 of 3 Experiment Instructions:

If there was exactly 1 Chatbot(s), Please fill in the following items. It should take about five minutes.

How many chats did you have?

of chats was: 1

How difficult was that?



In the Situation were these items: 7(high) or 1(low)?

- Instability of Situation**
How changeable is the situation? Is the situation highly unstable and likely to change suddenly (High) or is it very stable and straightforward (Low)?
1 2 3 4 5 6 7
- Complexity of Situation**
How complicated is the situation? Is it complex with many interrelated components (High) or is it simple and straightforward (Low)?
1 2 3 4 5 6 7
- Variability of Situation**
How many variables are changing within the situation? Are there a large number of factors varying (High) or are there very few variables changing (Low)?
1 2 3 4 5 6 7
- Arousal**
How aroused are you in the situation? Are you alert and ready for activity (High) or do you have a low degree of alertness (Low)?
1 2 3 4 5 6 7
- Concentration of Attention**
How much are you concentrating on the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?
1 2 3 4 5 6 7
- Division of Attention**
How much is your attention divided in the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?
1 2 3 4 5 6 7
- Spare Mental Capacity**
How much mental capacity do you have to spare in the situation? Do you have sufficient to attend to many variables (High) or nothing to spare at all (Low)?
1 2 3 4 5 6 7
- Information Quantity**
How much information have you gained about the situation? Have you received and understood a great deal of knowledge (High) or very little (Low)?
1 2 3 4 5 6 7
- Familiarity with Situation**
How familiar are you with the situation? Do you have a great deal of relevant experience (High) or is it a new situation (Low)?
1 2 3 4 5 6 7

How Believable was the agent in the session?

The 1 st Chatbot's behavior was		
1 <The agent>'s behavior made me think of human behavior.	Machinelike	Humanlike
	-5	+5
2 I think <the agent> was behaving like a real person.	Artificial	Lifelike
	-5	+5
3 I had the impression that <the agent> was controlled by a human.	Unaware	Conscious
	-5	+5

Move on to the next chat session when ready

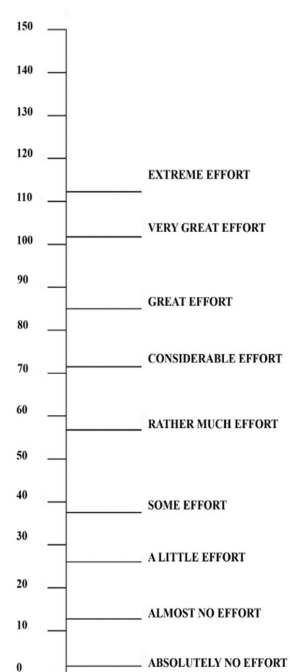
2 of 3 Experiment Instructions:

If there was exactly 2 Chatbot(s), Please fill in the following items. It should take about five minutes.

How many chats did you have?

of chats was: 2

How difficult was that?



In the Situation were these items: 7(high) or 1(low)?

Instability of Situation
How changeable is the situation? Is the situation highly unstable and likely to change suddenly (High) or is it very stable and straightforward (Low)?

1 2 3 4 5 6 7

Complexity of Situation
How complicated is the situation? Is it complex with many interrelated components (High) or is it simple and straightforward (Low)?

1 2 3 4 5 6 7

Variability of Situation
How many variables are changing within the situation? Are there a large number of factors varying (High) or are there very few variables changing (Low)?

1 2 3 4 5 6 7

Arousal
How aroused are you in the situation? Are you alert and ready for activity (High) or do you have a low degree of alertness (Low)?

1 2 3 4 5 6 7

Concentration of Attention
How much are you concentrating on the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?

1 2 3 4 5 6 7

Division of Attention
How much is your attention divided in the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?

1 2 3 4 5 6 7

Spare Mental Capacity
How much mental capacity do you have to spare in the situation? Do you have sufficient to attend to many variables (High) or nothing to spare at all (Low)?

1 2 3 4 5 6 7

Information Quantity
How much information have you gained about the situation? Have you received and understood a great deal of knowledge (High) or very little (Low)?

1 2 3 4 5 6 7

Familiarity with Situation
How familiar are you with the situation? Do you have a great deal of relevant experience (High) or is it a new situation (Low)?

1 2 3 4 5 6 7

How Believable were the two agents in the session?

The 1st Chatbot's behavior was

1 <The agent>'s behavior made me think of human behavior.

Machinelike Neutral Humanlike

-5 0 +5

2 I think <the agent> was behaving like a real person.

Artificial Neutral Lifelike

-5 0 +5

3 I had the impression that <the agent> was controlled by a human.

Unaware Neutral Conscious

-5 0 +5

The 2nd Chatbot's behavior was
(If you had two, fill this in for the second chatbot)

1 <The agent>'s behavior made me think of human behavior.

Machinelike Neutral Humanlike

-5 0 +5

2 I think <the agent> was behaving like a real person.

Artificial Neutral Lifelike

-5 0 +5

3 I had the impression that <the agent> was controlled by a human.

Unaware Neutral Conscious

-5 0 +5

Move on to the next chat session when ready

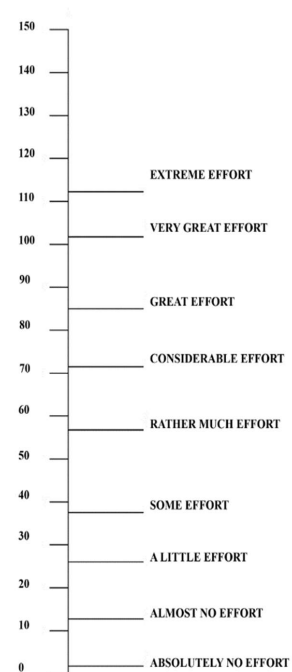
3 of 3 Experiment Instructions:

If there was exactly 3 Chatbot(s), Please fill in the following items. It should take about five minutes.

How many chats did you have?

of chats was: 3

How difficult was that?



In the Situation were these items: 7(high) or 1(low)?

Instability of Situation
How changeable is the situation? Is the situation highly unstable and likely to change suddenly (High) or is it very stable and straightforward (Low)?

1 2 3 4 5 6 7

Complexity of Situation
How complicated is the situation? Is it complex with many interrelated components (High) or is it simple and straightforward (Low)?

1 2 3 4 5 6 7

Variability of Situation
How many variables are changing within the situation? Are there a large number of factors varying (High) or are there very few variables changing (Low)?

1 2 3 4 5 6 7

Arousal
How aroused are you in the situation? Are you alert and ready for activity (High) or do you have a low degree of alertness (Low)?

1 2 3 4 5 6 7

Concentration of Attention
How much are you concentrating on the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?

1 2 3 4 5 6 7

Division of Attention
How much is your attention divided in the situation? Are you concentrating on many aspects of the situation (High) or focussed on only one (Low)?

1 2 3 4 5 6 7

Spare Mental Capacity
How much mental capacity do you have to spare in the situation? Do you have sufficient to attend to many variables (High) or nothing to spare at all (Low)?

1 2 3 4 5 6 7

Information Quantity
How much information have you gained about the situation? Have you received and understood a great deal of knowledge (High) or very little (Low)?

1 2 3 4 5 6 7

Familiarity with Situation
How familiar are you with the situation? Do you have a great deal of relevant experience (High) or is it a new situation (Low)?

1 2 3 4 5 6 7

How Believable was each agent in the session?

The 1st Chatbot's behavior was

1 <The agent>'s behavior made me think of human behavior.

Machinelike Neutral Humanlike

-5 0 +5

2 I think <the agent> was behaving like a real person.

Artificial Neutral Lifelike

-5 0 +5

3 I had the impression that <the agent> was controlled by a human.

Unaware Neutral Conscious

-5 0 +5

The 2nd Chatbot's behavior was
(If you had two, fill this in for the second chatbot)

1 <The agent>'s behavior made me think of human behavior.

Machinelike Neutral Humanlike

-5 0 +5

2 I think <the agent> was behaving like a real person.

Artificial Neutral Lifelike

-5 0 +5

3 I had the impression that <the agent> was controlled by a human.

Unaware Neutral Conscious

-5 0 +5

The 3rd Chatbot's behavior was
(If you had three, fill this in for the third chatbot)

1 <The agent>'s behavior made me think of human behavior.

Machinelike Neutral Humanlike

-5 0 +5

2 I think <the agent> was behaving like a real person.

Artificial Neutral Lifelike

-5 0 +5

3 I had the impression that <the agent> was controlled by a human.

Unaware Neutral Conscious

-5 0 +5

Move on to the next chat session when ready

Experiment Form - Instructions

Overview:

The experiment goal is to determine if the 6 chatbots can be identified via the Rose of Leary and if the chatbots are Believable. When you finish a chat and check off the corresponding box on the back of this sheet, it is important to move on to the next, this experiment should take 30 minutes, or 10 minutes for each chat session.

Rose of Leary Example:

As an example before starting, imagine the first chat you have is with van Bron.

van Bron:
He is anti-social and has a record of treatment for depression, he believes no one can help him so he tries an anonymous chat with 113 to further convince himself there is no hope for him. In this chat scenario, Van Bron behaves mostly in a detached manner, unwilling to cooperate and expressing this through either competing or defiant behavior. When trying to build rapport, on several occasions, van Bron demands that the chat go his way. He does this by using short and direct sentences such as "You have to shut your mouth!" or "You have no idea, you are friends with the devil, I'm ending this!."

At this time, the chat ends, so the next step is to determine the Rose of Leary position for van Bron. If van Bron was uncompromising and dominant, then the rating below, as an example, [-4, -2] may be good, the aggressive quadrant. It is important to try to rate the persona in the quadrant you believe represents the chatbot.

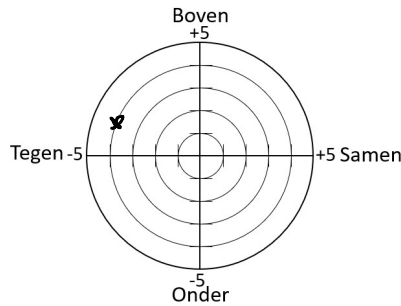


Figure 1 - Example rating of an aggressive chatbot at [-4,-2]

Instructions for Experiment Form:

When you finish a chat session, or the chat session ends, identify on the back side of this sheet, the following Rose of Leary and Believability information for each bot.

In the experiment, your main task is to complete conversations with 6 chatbots, each of which in a chat session that lasts at most six minutes, then rate each chatbot by indicating the Rose of Leary position, as shown in the *Example*, as well as Believability.

Table 1 – Information to fill in for Rose of Leary and Believability to be completed for each chatbot.

Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

When all chats and the back side of this evaluation form is filled in, then the last task is to complete the Post Experiment Questionnaire.

Experiment Instructions:

Please complete the Rose of Leary and Believability questions for each chatbot. It should take a little more than a minute to do each time.

1st Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

2nd Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

3rd Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

4th Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

5th Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

6th Chat
Please rate via the Rose of Leary.

1 <The agent>'s behavior made me think of human behavior.
Machinelike Neutral Humanlike
-5 0 +5

2 I think <the agent> was behaving like a real person.
Artificial Neutral Lifelike
-5 0 +5

3 I had the impression that <the agent> was controlled by a human.
Unaware Neutral Conscious
-5 0 +5

Move on to the next chat when ready.

Appendix E

OSF Submission

The evaluation was pre-registered before the experiments were administered. The study adhered to this plan.



113chatbotproject_msc

Public registration ▾



Metadata

Study Information



Title

Provide the working title of your study. It may be the same title that you submit for publication of your final manuscript, but it is not a requirement.

Evaluation of a BDI-Based Response Model to Help Train 113 Triage-Psychologists for Suicide Counselling

Authors

Jeffrey Sirocki, Saskia Merelle, Willem-Paul Brinkman

Description

Please give a brief description of your study, including some background, the purpose of the study, or broad research questions. (optional)

The prototype is used to answer the main research question of the MSc thesis: Is it possible and how can conversational agents help 113 triage-psychologists to better assist many help-seekers at once by chat.

The project concerns the development of a conversational agent, i.e. chatbot, to offer training to 113 triage-psychologists via a prototype that simulates a chat environment with one to many of these conversational agents, at once. The chat environment is like the existing environment at 113, and allows users to accept new chats, chat via an interface, and end chats.

The questions in this experiment are below:

Q1: Can the prototype simulate different chatter types?

Q2: Can the prototype simulate increasing mental effort and situational awareness with one to many chats at once?

Q3: What is the perception of believability, realism, utility, learning, and software usability.

The experiment is in two phases: the first phase is with expert triage-psychologists and the second phase with counselors. The experiment questions will be answered in the following ways:

Q1 will be via a test where experts will complete six-minute sessions with one, two, or three conversational agents at once, then identify the Rose of Leary types.

Q2 will be via a test where counselors interact with one, two, or three conversational agents at once, then indicate their perception of difficulty with the Rating Scale Mental Effort (RMSE) and Situational Awareness Rating Technique (SART).

Q3 Questions to measure the perception of believability, realism, utility, and learning will be administered plus the System Usability Scale (SUS) which measures usability of the prototype .

In the debriefing, participants will be asked two questions.

1. What they thought about the chatbots.
2. How was the feedback they received.

Hypotheses

List specific, concise, and testable hypotheses. Please state if the hypotheses are directional or non-directional. If directional, state the direction. A predicted effect is also appropriate here. If a specific interaction or moderation is important to your research, you can list that as a separate hypothesis.

H1: If the chatbot has a chatter type, then the expert triage-psychologist can identify it. As stated above, this is tested by seeing if the correct quadrant on Leary's rose is identified. Leary's rose has two axis, one for dominant/submissive behavior and one for friendly/opposed behavior, and this forms four quadrants. The experiment will use one persona in the aggressive quadrant, two personas in the withdrawn quadrant, two personas in the dependent quadrant, and one persona in the friendly quadrant. Triage overall are expected to indicate the correct quadrant on the Rose of Leary.

H2: If the number of conversational agents affects the mental effort and situational awareness of a counselor, then there should be a correlation in mental effort and situational awareness between simulations with one, two, and three chats at once. As stated above, this is tested by seeing if participants indicate for chat sessions with more chatbots they experience higher mental effort and lower situational awareness via the RSME and SART. Higher mental effort and decreased situational awareness is expected for many agents at once.

Design Plan

Study type

Please check one of the following statements

- ✓ Experiment - A researcher randomly assigns treatments to study subjects, this includes field or lab experiments. This is also known as an intervention experiment and includes randomized controlled trials.

Blinding

Blinding describes who is aware of the experimental manipulations within a study. Mark all that apply.

- ✓ No blinding is involved in this study.

Is there any additional blinding in this study?

Blinding (Other) (optional)

Study design

For H1, the study uses a repeated measure design with 4 conditions (the four chatter types). The participant will complete 3 sessions of six minutes, and at the end they will identify the Rose of Leary type for each chat via a rating input for withdrawn/dominance and opposed/friendly.

For H2, the study uses a repeated measure design with 3 conditions (one chat, two chat, or three chats at once). The participant will complete a simulation with 3 three six-minute sessions with one to many chats. After the session, they receive feedback and participants will be asked to rate their mental effort with the RSME and situational awareness with the SART.

(optional)

- No files selected

Randomization

If you are doing a randomized study, how will you randomize, and at what level? (optional)

H1: The simulation order of the chatter types will be randomized. Which order the participant gets will be randomly assigned.

H2: The simulation order of one, two, or three chatters first will be randomized. Overall, the order will be randomly assigned with a third starting with one chat, a third with two chats, and a third with three chats, plus done an equal number of times.

The conversational agents used for each hypothesis will be selected from a pool and used at most once by each participant. The chatbot names are randomized as well, they include Emma, Isabella, Lucas, Oliver, Sophia, Thomas.

Sampling Plan

Existing Data

Preregistration is designed to make clear the distinction between confirmatory tests, specified prior to seeing the data, and exploratory analyses conducted after observing the data. Therefore, creating a research plan in which existing data will be used presents unique challenges. Please select the description that best describes your situation. Please see <https://cos.io/prereg> for more information.

✓ Registration prior to creation of data

Explanation of existing data

If you indicate that you will be using some data that already exist in this study, please describe the steps you have taken to assure that you are unaware of any patterns or summary statistics in the data. This may include an explanation of how access to the data has been limited, who has observed the data, or how you have avoided observing any analysis of the specific data you will use in your study. (optional)

Data collection procedures

Recruitment of participants will be within 113 suicide prevention, at least six 113 triage-psychologists of the 113 chat helpline and twenty-four counselors are desired.

Triage-psychologist participants will do the first phase.

In the first, they will identify the chatter type in H1 and believability. After they have three additional questions on social realism.

Counselor participants will do the second phase.

In the second, counselors will complete simulations with one to many chats and indicate their workload via the Rating Scale Mental Effort (RSME), awareness via the Situational Awareness Rating Technique (SART), and believability.

At the end, all participants will fill in the six questions on perceived utility plus the System Usability Questionnaire (SUS).

Data will be collected for a period of 2 weeks.

(optional)

- No files selected

Sample size

Describe the sample size of your study. How many units will be analyzed in the study? This could be the number of people, birds, classrooms, plots, interactions, or countries included. If the units are not individuals, then describe the size requirements for each unit. If you are using a clustered or multilevel design, how many units are you collecting at each level of the analysis?

There will be six expert triage-psychologists

There will be twenty-four counselors

Sample size rationale

This could include a power analysis or an arbitrary constraint such as time, money, or personnel. (optional)

Thirty participants is the desired amount that may be achievable within the available time

Stopping rule

If your data collection procedures do not give you full control over your exact sample size, specify how you will decide when to terminate your data collection. (optional)

The stopping rule is when Thirty participants (6 experts and 24 counselors) have completed the experiment (no missing spots), then data collection will stop.

Variables

Manipulated variables

(optional)

H1: Chatter type – Independent Variable

- Four levels categorical: The study manipulates whether the system uses one of four chatter types between six personas. (The number of agents is also manipulated, but is assumed to have no or minimal affect).

H2: Number of agents - Independent Variable

- Three levels ordinal: The system manipulates the number of agents

(optional)

- No files selected

Measured variables

H1: The chatter type indicated (matches system or does not match)

H2: The mental effort and situational awareness given via the RSME scale and SART.

The questionnaires measures believability, social realism, utility/learning, and usability.

(optional)

- No files selected
-

Indices

(optional)

RSME = indicated value on the scale as: 0 to 150

SART = calculated from questionnaire as: $U - (D - S)$

SUS = calculated from questionnaire as: 0 to 100

(optional)

- No files selected
-

Analysis Plan

Statistical models

H1: The study will use a general mixed model. The manipulated nominal independent variable is the chatter persona (aggressive, withdrawn, dependent, helping). The dependent variable measured is the number of positive matches between what the participant identifies in the chat and what is in the system model.

H2: The study will use a linear mixed model. The manipulated ordinal independent variable is the number of agents. The dependent variables are the workload and the situational awareness.

(optional)

- No files selected
-

Transformations

If you plan on transforming, centering, recoding the data, or will require a coding scheme for categorical

If you plan on transforming, centering, recoding the data, or doing any other type of data manipulation on the variables, please describe that process. (optional)

Inference criteria

What criteria will you use to make inferences? Please describe the information you'll use (e.g. specify the p-values, Bayes factors, specific model fit indices), as well as cut-off criterion, where appropriate. Will you be using one or two tailed tests for each of your analyses? If you are comparing multiple conditions or testing multiple hypotheses, will you account for this? (optional)

H1: P-values smaller than 0.05

H2: P-values smaller than 0.05

Data exclusion

How will you determine which data points or samples if any to exclude from your analyses? How will outliers be handled? Will you use any awareness check? (optional)

Missing data

How will you deal with incomplete or missing data? (optional)

Data samples that are incomplete (unfinished or not completed in time) will be excluded.

Exploratory analysis

If you plan to explore your data set to look for unexpected differences or relationships, you may describe those tests here. An exploratory test is any test where a prediction is not made up front, or there are multiple possible tests that you are going to use. A statistically significant finding in an exploratory test is a great way to form a new confirmatory hypothesis, which could be registered at a later time. (optional)

An exploratory analysis will possibly include looking at comparing the values for dominance and friendliness between personas to see if, for example, Persona A is more dominant than Persona B because they are more aggressive or if Persona C is more friendly than the other personas because they are more cooperative. Overall, seeing how the chatbot type compares to the other chatbot types is interesting, this will be done by seeing for example how dominant/submissive persona A is compared to persona B and how friendly/opposed persona A is compared to persona B as well as the other personas. This can be done for each persona. (This may or may not be conducted depending on the results of H1, If the results support H1 then this is not necessary.)

Other

Other

If there is any additional information that you feel needs to be included in your preregistration, please enter it here. Literature cited, disclosures of any related work such as replications or work that uses the same data, or other context that will be helpful for future readers would be appropriate here. (optional)

The believability is not the main focus of the experiment, the focus of the experiment is on H1 and the results of H2, plus whether the questionnaires ascertain if participants think the technology will be useful at 113. The participants know they are chatting with a bot and this 'simulation' is different from communicating with real people in acute stress situations.

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(<https://www.github.com/centerforopenscience>)

Appendix F

Conversational agent modeling

To reproduce the prototype the following design specification can allow some clarification. In this section the following show insight into the system.

- Beliefs, Desires, Intentions [EN & NL]
- Topic Intents [EN]
- Stance Intents [EN]

F.1 Beliefs, Desires, Intentions

There were 100 beliefs, 10 desires, and 10 intentions. The beliefs attempt to cover the topics in a triage conversation. The desires relate to the beliefs. And the intentions are a combination of the belief and the desire, and they represent the plan to satisfy the desire.

Belief [EN]	Belief [NL]
0 thinks 113 is friendly	denkt dat 113 vriendelijk is
1 thinks 113 is respectful of them	denkt dat 113 respectvol is
2 thinks 113 is credible enough for their problem	denkt dat 113 geloofwaardig genoeg is voor hun probleem
3 thinks 113 is capable to understand their emotions	denkt dat 113 in staat is om hun emoties te begrijpen
4 thinks 113 is not intimidating them	denkt dat 113 niet intimiderend is
5 thinks 113 is giving them less options	denkt dat 113 ze minder opties geeft
6 thinks 113 is listening to them	denkt dat 113 naar ze luisterd
7 thinks 113 is looking to help	denkt dat 113 op zoek is om ze te helpen
8 thinks 113 is agreeable	denkt dat 113 servicegericht is
9 thinks 113 is making sense	denkt dat 113 een punt heeft
10 thinks 113 understands they came because worth nothing	denkt dat 113 begrijpt dat ze kwamen omdat ze voelen dat ze niets waard zijn
11 thinks 113 understands they came because nothing to keep them here, no belonging	denkt dat 113 begrijpt dat ze kwamen omdat er niets is om ze hier te houden
12 thinks 113 understands they came because in panic, not able to calm down stress	denkt dat 113 begrijpt dat ze kwamen omdat ze in paniek zijn
13 thinks 113 understands they came because lonely and feel disconnected with other people	denkt dat 113 begrijpt dat ze kwamen omdat ze zich eenzaam voelen
14 thinks 113 understands they came because in danger, threatening suicide	denkt dat 113 begrijpt dat ze kwamen omdat ze een gevaar zijn voor zichzelf
15 thinks 113 understands they came because feel trapped, hostile, risky	denkt dat 113 begrijpt dat ze kwamen omdat ze zich gevangen of vijandig voelen
16 thinks 113 understands they came because prove triage can not help them	denkt dat 113 begrijpt dat ze kwamen omdat ze wilden bewijzen dat de triage ze niet kan helpen
17 thinks 113 understands they came because to get help or information	denkt dat 113 begrijpt dat ze kwamen om hulp of informatie te krijgen
18 thinks 113 understands they came because called before	denkt dat 113 begrijpt dat ze kwamen omdat ze eerder gebeld hebben
19 thinks 113 understands they came because calling for a friend	denkt dat 113 begrijpt dat ze kwamen om een vriend te helpen
20 thinks 113 understands they do have thoughts	denkt 113 begrijpt ze hebben gedachten
21 thinks 113 understands they do have a plan	denkt 113 begrijpt ze hebben wel een plan
22 thinks 113 understands they do have preparations	denkt 113 begrijpt ze hebben preparations
23 thinks 113 understands they do have past attempts	denkt 113 begrijpt ze hebben verleden pogingen
24 thinks 113 understands they do have energy now to commit suicide	denkt 113 begrijpt ze hebben verleden waar blootstelling aan spanning
25 thinks 113 understands they do have past where exposure to stress	denkt 113 begrijpt ze hebben energie nu om zelfmoord te plegen
26 thinks 113 understands they do have treatment	denkt 113 begrijpt ze hebben wel behandeling
27 thinks 113 understands they have a job	denkt 113 begrijpt ze een baan hebben
28 thinks 113 understands they do tell others	denkt 113 begrijpt ze dat doen anderen vertellen
29 thinks 113 understands they have goodbye letter	denkt 113 begrijpt ze hebben afscheidsbrief
30 thinks 113 understands they cope with home family	denkt 113 begrijpt ze omgaan met het thuisfront family
31 thinks 113 understands they cope with friends	denkt 113 begrijpt ze omgaan met vrienden
32 thinks 113 understands they cope with therapy	denkt 113 begrijpt ze omgaan met de therapie
33 thinks 113 understands they cope with distractions	denkt 113 begrijpt ze omgaan met afleiding
34 thinks 113 understands they cope with pushing their limit	denkt 113 begrijpt ze omgaan met duwen hun limiet
35 thinks 113 understands they cope with by being alone, burden on others	denkt 113 begrijpt ze omgaan met door het alleen zijn, last voor anderen
36 thinks 113 understands they cope with truth	denkt 113 begrijpt ze omgaan met de waarheid
37 thinks 113 understands they cope with other help	denkt 113 begrijpt ze omgaan met andere hulp
38 thinks 113 understands they cope with therapy, could be 113	denkt 113 begrijpt ze omgaan met therapie, zou kunnen zijn 113
39 thinks 113 understands they cope with a safety plan	denkt 113 begrijpt ze omgaan met een veiligheidsplan
40 thinks 113 understands they are at home family	denkt 113 begrijpt ze thuis zijn familie
41 thinks 113 understands they are with people in the location	denkt 113 begrijpt ze zijn met mensen op de locatie
42 thinks 113 understands they are at institution, work, school	denkt 113 begrijpt ze zijn op instellingsniveau, het werk, school
43 thinks 113 understands they are outside	denkt 113 begrijpt ze buiten
44 thinks 113 understands no urge to hurt self or urge to hurt others	denkt 113 begrijpt geen drang om zichzelf te verwonden of drang om anderen te kwetsen
45 thinks 113 understands they are sure 113 does not know where they are	denkt 113 begrijpt ze zijn er zeker 113 niet weet waar ze zijn
46 thinks 113 understands they are safe or in danger with weapons	denkt 113 begrijpt ze veilig zijn of dreigen met wapens
47 thinks 113 understands they are not hurt or are hurt and need help	denkt 113 begrijpt ze niet gewond of gekwetst zijn en hulp nodig hebben
48 thinks 113 understands they are out of the situation	denkt 113 begrijpt ze uit de situatie
49 thinks 113 understands they are looking for what to do	denkt 113 begrijpt ze op zoek naar wat te doen
50 thinks that he/she will remove items	denkt dat ze spullen zullen verwijderen
51 thinks that he/she will go to someone in the area	denkt dat ze naar iemand toe zullen gaan in het gebied
52 thinks they will cooperate with help	denkt dat ze met de aangeboden hulp zullen samenwerken
53 thinks they will move away from area	denkt dat ze weg zullen gaan uit het gebied
54 thinks they will not hurt themselves or others	denkt dat ze zichzelf of anderen geen pijn zullen doen
55 thinks they will feel better if anonymous	denkt dat ze liever anoniem willen blijven
56 thinks they will feel safer out of danger or without weapons	denkt dat ze zich buiten levensgevaar of zonder wapens veiliger zullen voelen
57 thinks they will go to get help	denkt dat ze hulp zullen zoeken
58 thinks they will go out of the situation, not use items	denkt dat ze uit de situatie zullen gaan
59 thinks they will go to safety if reason	denkt dat ze overtuigd kunnen worden om veiligheid op te zoeken
60 thinks they feel thinks they can trust triage	denkt dat ze het gevoel denkt dat ze kunnen vertrouwen triage
61 thinks they feel thinks they belong	denkt dat ze het gevoel denkt dat ze kunnen hulp krijgen
62 thinks they feel thinks they can get help	denkt dat ze het gevoel denkt dat ze behoren
63 thinks they feel connected and good emotions	denkt dat ze zich verbonden voelen en goede emoties
64 thinks they feel no pressure, no threatening	denkt dat ze voelen geen druk, geen dreigende
65 thinks they feel no limits, pressure and hostility	denkt dat ze het gevoel hebben geen grenzen, druk en vijandigheid
66 thinks they feel no direct pressure, thinks they ignore skepticism	denkt dat ze het gevoel geen directe druk, denkt dat ze scepsis negeren
67 thinks they feel evidence pressure	denkt dat ze het gevoel bewijs druk
68 thinks they feel agreement pressure	denkt dat ze het gevoel overeenkomst druk
69 thinks they feel logic pressure	denkt dat ze het gevoel logica druk
70 thinks they can be helped by triage	denkt dat ze kunnen worden geholpen door triage
71 thinks they can be helped by instructions to tell others	denkt dat ze kunnen worden geholpen door instructies om anderen te vertellen
72 thinks they can be helped by transfer	denkt dat ze kunnen worden geholpen door overschrijving
73 thinks they can be helped by distractions, calming down	denkt dat ze kunnen worden geholpen door afleiding, kalmeren
74 thinks they can be helped by pressure	denkt dat ze kunnen worden geholpen door druk

75	thinks they can be helped by limiting their options	denkt dat ze kunnen worden geholpen door de beperking van hun mogelijkheden
76	thinks they can be helped by therapy	denkt dat ze kunnen worden geholpen door de therapie
77	thinks they can be helped by a pro con list	denkt dat ze kunnen worden geholpen door een pro con lijst
78	thinks they can be helped to make it until tomorrow	denkt dat ze kunnen worden geholpen om het te maken tot morgen
79	thinks they can be helped but they do not know what	denkt dat ze kunnen worden geholpen, maar ze weten niet wat
80	thinks they want to have a conversation	denkt dat ze een gesprek willen hebben
81	thinks they want to talk to friends	denkt dat ze willen te praten met vrienden
82	thinks they want to be transferred	denkt dat ze willen worden overgedragen
83	thinks they want to cope with the thoughts for tonight, distractions	denkt dat ze willen om te gaan met de gedachten voor vanavond, afleiding
84	thinks they want to not hurt others	denkt dat ze willen niet anderen te kwetsen
85	thinks they want a limited plan to talk to gp	denkt dat ze willen een beperkt van plan om mee te praten gp
86	thinks they want a get therapy	denkt dat ze willen een get therapie
87	thinks they want to get pro con list	denkt dat ze willen pro con lijst te krijgen
88	thinks they want to do make it until tomorrow	denkt dat ze willen doen maken het tot morgen
89	thinks they want help but do not know what thinks they want	denkt dat ze helpen willen, maar niet weten wat denkt ze willen
90	thinks they now are at the reception	denkt dat ze nu bij de receptie
91	thinks they now are requesting to speak to someone	denkt dat ze nu vraagt om te spreken met iemand
92	thinks they now are confirming to be transferred	denkt dat ze nu een bevestiging over te dragen
93	thinks they now are calmer by the end of chat	denkt dat ze nu rustiger aan het eind van de chat
94	thinks they now are on hold, threaten to leave	denkt dat ze nu in de wacht, dreigen om te vertrekken
95	thinks they now are hesitant to go through	denkt dat ze nu zijn terughoudend om te gaan door
96	thinks they now are going to end chat	denkt dat ze nu gaat eindigen chatten
97	thinks they now are satisfied with the help	denkt dat ze nu tevreden zijn met de hulp
98	thinks they now are agreeing to solution	denkt dat ze nu akkoord met oplossing
99	thinks they now are to follow a plan in the future	denkt dat ze nu een plan in de toekomst te volgen

	Desire [EN]	Desire [NL]
0	Desire to talk with 113	tegenover elkaar of samen
1	Desire to get help from 113	Verlangen om hulp te krijgen van 113
2	Desire to share information with 113	Verlangen om informatie met 113 delen
3	Desire to share how they cope with 113	Verlangen om te delen hoe zij omgaan met 113
4	Desire to share their location with 113	Verlangen om hun locatie met 113 delen
5	Desire to move away from danger	Verlangen om uit de gevarenzone te verplaatsen
6	Desire to agree to safety with 113	Verlangen om akkoord te gaan met de veiligheid met 113
7	Desire to make a goal for a chat with 113	Verlangen om een doelpunt te maken voor een praatje met 113
8	Desire to set a goal for the chat with 113	Verlangen naar een doel voor de babbel met 113
9	Desire to transfer for a chat with 113	Verlangen om te dragen voor een praatje met 113

Intention [EN]	Intention [NL]
0 plan to talk to 113	van plan om 113 te praten
1 plan to get help from 113	van plan om hulp te krijgen van 113
2 plan to share information with 113	van plan om informatie met 113 delen
3 plan to share how they cope with 113	van plan om te delen hoe zij omgaan met 113
4 plan to share their location with 113	van plan om hun locatie met 113 delen
5 plan to move away from danger	van plan om uit de gevarenzone te verplaatsen
6 plan to agree to safety with 113	van plan akkoord te gaan met de veiligheid met 113
7 plan to make a goal for a chat with 113	van plan om een doelpunt te maken voor een praatje met 113
8 plan to set a goal for the chat with 113	van plan om een doel voor de babbel met 113
9 plan to transfer for a chat with 113	van plan te dragen voor een praatje met 113

F.2 Topic Intents [EN]

There were 303 topic intents in English and Dutch. These were the English intents and training phrases for recognizing topics, rhetoric, and overall the weighted change to a belief. These were organized in a Google Sheet and utilized the translate feature to add additional training phrases.

O_code	p1	p2	p3	p4	p5	p6	p7	p8	p9	p10
1	I am happy	I am glad that you explain it to me	I think that is good	I find quite nice		Im happy		I find quite nice	m secretly a little jealous	
2	Good that you called	great that you came				Well you got the call	Well now youve come to chat	What good that you have contacted us		
12	Hello	good day				Hey	Hi	What good that you have contacted us	Hi	
121	How come it took so long					How come it took so long	I see that you have to answer it you have an idea why that is?			
262	what is your real name					what is your name				
272	you indicate that your name					I see it in your name indeed	I see it in your name indeed			
282	so is your name					is your name	is your name			
1012	welcome	welcome to the crisis line of 113	Thomas	Oliver	Lucas	Welcome	welcome to the 113 emergency line	Sophia	Emma	Isabella
1013	sorry for the confusion	sorry				Apologies for the confusion	sorry I did not understand	Okay I guess I do not understand you		
1111	could you briefly describe why you contacted us now	Could you describe briefly why you contacted us now	would you describe why you contacted us	why you contacted us now		Could you briefly describe why you contact now	Could you briefly describe why you are getting in touch with us	Can you make a brief description of why you contacted us	Could you briefly describe why you are getting in touch with us	
1121	how are you doing					how are you	why is that			
2001	hmm	hm	mm			Hmm	hmm	Hmm	hmm wow	
2021	Bummer					Unfortunately	Unfortunately			
2021	it must have been a difficult time					it must have been a difficult time for you	Yes I understand that you have there moeije	I see that you are serious with it	that seems to me a hard time	
2021	I am thinking					Im just thinking				
2021	and that there are two things at play					and that there are two issues				
2022	I understand		I get it	I understand your line of thought		I understand	I get it	I think Ive got it		
2022	I can imagine that it is difficult and not helping					I can imagine that it is difficult and not really helping				
2022	clearly you have a lot going on					Clearly there is a lot going on	There clearly plays really incredible huh			
2092	it sounds like it would be good for you					it really sounds like you have benefited from it	it sounds like you really help	it seems you really help	I understand that you can help quite a lot	
2121	how come it is so tough					how come its so bad	How come it is so cunt is there something happened that is so intense	how come its so hard	why do you think you moeije with it	There is a reason this is so hard for you
2122	did something happen to you					something has happened to you				
3001	ohgosh	sorry to hear		unfortunately	awkward	Oh gosh	oh bother	difficult	Im sorry to hear that	
3021	I can imagine that	well it does not seem like nothing				That I can imagine	that sounds sad	it seems difficult		
3022	that must feel terrible					must feel terrible	Must feel awful			
3031	that sounds awful	of course it is bad what you have done	it is also bad that this should happen			that sounds sad	that sounds sad			
3031	sounds like	that sounds like you are pretty sure about your case				sounds like its pretty intense	Sounds like it is quite high when you hmmm ... which ensures that you feel so	that sounds like a lot worrier together	Sounds like a lot happening	
3031	that must make you feel					hmm that should make you feel		that sounds like a lot worrier together		
3031	that is intense					What violently	Oh dear	tsjonge	ohw ... that seems heavy	how awful
3031	that sounds very difficult					Sounds like you have it hard	Sounds like you have it tough			
3031	and have you tried those things already					And you have those things tried tonight				
3031	what a horrible thing					which is a violent event				
3032	it sounds like you are very distraught	it sounds like you are very lost	it sounds like you are very upset			it sounds like you feel very distraught now	It sounds like youre very upset			
3032	it really sounds like you are in panic					really sounds like you are quite panicked now he	it sounds like youre very stressed	It sounds like youre really desperate	You seem very upset	
3072	I can only imagine how difficult it is					I can only imagine how difficult it is for you now	I can make just try me how tough you are now			
3161	what makes you feel like this	What makes that right now				What makes you feel this hard	why do you feel so now? which means that you are now hard to explain	which ensures that you feel right now as	What makes you feel right now as	What makes that right now
3162	what makes it so difficult to say					What makes it so hard to say		What makes you think this is so hard		
3163	what makes your situation so tough that you come to the chat	your situation is so heavy for you and you come to the chat	What makes your situation so difficult			What makes your situation just now so heavily	is so hard for you	what makes you come to chat	Your situation is so difficult for you and you get to chat	what makes you come to tressure
3231	has it gotten gradually worse					and since then it has gradually gone somewhat worse	and then it got worse	and then it got worse		
3232	is everything against you					everything is against you	Everything now is incredible against huh			
4040	haha					ha	suppermegavet	awesome!!!!	Im really so proud of you	
5050	at night we aim to keep calls short					At night we strive to keep the conversations brief				
5051	before we go further					before we talk	I can not call you			
5051	that does not matter	I am not going to do that	we really do not do that	not specifically which and where		That does not matter	Does not matter			
5052	you are making it difficult with all the swearing					but you make it difficult with all the cussing	but you make it difficult with all the abuse	but you make it difficult with all the abuse	Answer the question bitte	
5053	I would not recommend can you tell me what is going on	I find it difficult to give you tips	I can not give you that	That feels very wrong to me		Hmmm I would not say	I can not give you that Helpseeker	That feels to me very wrong		
5151	can you tell me what is going on	Can you tell me more				Can you tell me whats going on	Could you tell me whats going on			
6001	right now	at this moment				At this time				
6021	I did not understand	I have no idea	what do you mean	I do not understand		I do not quite understand then you are completely fixed now	but I do not understand so well what now playing	I do not understand what you mean	I do not quite understand what you say	
6023	then you are stuck now	difficult question					there you are walking onto there you had some time for necessary			
6101	that took a while					It took a while	and what made you did not attempt			
6191	why have you not killed yourself					why not suicide yet	but its about			
6301	but are there	is there a				but are		there		
7001	I want to go into that with you	I want to go into that in more detail								
7001	I want to help					I want to go	I want to go there as in	I would like to help you		
7002	I am trying to have a conversation with you	I would like to talk to you about how you got to this point				I want to help you	I can not call you			
7002	I am trying to help you	we are an anonymous helpline				I try to have a conversation with you	Im trying to have a conversation with you	I would like to help with that	This is an anonymous line so we have your phone not	
7071	then I can help you as best as I can	Then I can estimate as well as possible what you need now				I try to help you	I try to help you	so you do not all have to tell again		
7072	you do not have to say					Then I can just estimate as closely as possible what you need now	Then I estimate as closely as possible what you need now			
7073	my name is					you do not now have your say	you really need to say my name is			
7091	you said earlier that it was going better	because I am suicide prevention and I am on the side of life				You indicated earlier that it was a time some went better				
7161	what do you need					what do you need now	what do you need now			
7161	what has helped you before					What has helped you when	What helped you when	what did you then helped	what would you have then helped	
7171	What would you like our help with at this moment					what would you like our help with current	Where would you like our help today			

7262	what do you prefer that I help you with first					where you would prefer that I first with thinking about your				
8001	okay					Okay	Okay	OK		
8001	great					Good	awesome	Fat	fine	
8001	alright					alright	thats unfiltered	unfiltered		
8001	sure					bright	I get it now			
8052	and when it fails	and when it does not work								
8081	exactly		correct			exactly	Nothing more than this	right	yes course may in that	
8082	then we do that	yes	no			we do that	we will do	We speak it than off		
8083	Thank you for doing that	Good to know				Thanks for doing that	good to know em	good to know		
8101	is that okay		is it okay	will that be alright	will that be easy	is that good	is that okay?			
8122	How is that					How do you think about this?	What do you think about this?			
8181	is that what happened					that what happened	Something happened			
8191	how does that work					How does that work	what do you mean			
8221	is it that bad right now					it is now so bad	Is it so bad to pile up			
8252	can you state it	can you say something								
8281	will it not be easy					will not have been easy	which have been difficult	would you like that		
8382	is that alright	would you like that	is that correct	is that right		is that going to work				
9051	that you might want to do this	but you came to 113 suicide prevention				but you might want to be like this				
9073	at busy times it may take awhile before I answer					At busy times you may find that it takes a while before I answer this chat				
9092	you could possibly still ask	i think that is a great idea				Possibly you could even ask				
9093	let me explain why					Let me explain	I think thats a good idea I begrijb that is difficult and will even explain why I think it is important and braag			
9103	what do you think		what do you think of what I said	how could that be		What do you think	What do you think of when I say so?	How would that be		
9121	how do you know					How do you know that?				
9292	do you think it					do you think	do you manage that			
10072	so you are very distressed because you feel you are worth nothing					So youre very difficult at this time because you feel that you are worthless				
12161	what triggered this relapse					What is happening today what triggered this violent relapse				
13021	it sounds like you are alone worrying	well it does not seem like nothing to live with these thoughts day in day out			it seems very lonely	Sounds like youre on your own a lot to ponder are	seems lonely for you to sit alone with that			
13023	you do not trust anyone so there is nobody					but on the other hand you do not trust anyone so there is nobody To enable				
13162	what makes you feel so lonely					What to you feel so lonely	it seems truly terrible you feel so lonely	what you need to feel lonely	what for you feel so alone in the world	
14043	can you tell me more about what makes you want to commit suicide					Can you tell me more about what makes you have made the decision to make an end	Can you tell me how it is that you feel that way			
14071	you indicate you are in doubt to commit suicide					I see that you are in doubt to commit suicide shortly				
15021	sounds like you have a struggle to commit suicide					sounds like you have some vigorous struggle is to commit yourself about whether or not suicide you to be very aggressive on				
15071	you are very aggressive									
15172	I notice that you are very upset		so you are			you borderline is worse for your feelings and that you tend to avoid what or what you can do for the other person	I notice that youre having a lot of questions and that you are very upset			
19001	about your thoughts of someone else									
19222	but do you also worry about this person					but also how youre worried about this person about your suicidal thoughts				
20001	about your suicidal thoughts					but first want to ask a few questions about your suicidal thoughts and your security	Id like you to talk about your suicidal thoughts	For now I would like to ask you about how you are sitting at	Still I want to ask you a moment	
20021	first I want to ask a few questions about your suicidal thoughts	I would like to talk to you about your suicidal thoughts	For now I would like to ask some questions about how you are now	but first you want to ask a few questions about your thoughts about suicide		namely how these suicidal thoughts from someone else your trigger suicidal thoughts				
20021	how these suicide thoughts trigger									
20071	and that you have thoughts about suicide	well it does not seem like nothing to live with these thoughts day in day out				and that you have many thoughts of suicide				
20072	you mentioned that you have thoughts of suicide tomorrow					So you have mentioned that you have thoughts at this time tomorrow suicide				
20121	how come you have these thoughts					How come you have these thoughts				
20122	how did you get through it in the past					How did you manage to get through the past few years				
20122	how did you overcome the suicidal thoughts then					How did you then can push the suicidal thoughts of you				
20162	what makes it so bad this year					What makes it so bad since a year				
20221	do you have suicidal thoughts					you have suicidal thoughts				
20222	how long have you had these thoughts	How long have you had suicidal thoughts				How long have you had to commit suicide the thoughts				
21221	do you have a plan	Do you have a concrete plan for this right now				Have a plan	you have a concrete plan	youve already made a plan?		
22121	how will you commit suicide	decided to do what	How will you commit suicide	How do you intend to do commit suicide		how are you possibly going to commit suicide?				
22221	have you made preparations already					Have you made preparations	have made preparations	have already made preparations		
23221	have you tried to kill yourself		have you tried to kill			have you tried to commit suicide	you have already attempted			
24221	is it so bad that you want to die	You indicate to be pretty distraught and that you want to commit suicide today or tomorrow				so bad that you want to die	So much that you actually want to die			
25221	are you going to commit suicide right now					you are going to commit suicide at this time				
26071	you indicate you are in treatment					I see youre in treatment				
26071	I also see that you are in treatment					I also see that youre in treatment				

26222	does your practitioner know about your suicidal thoughts					Do your practitioner from your suicidal thoughts									
27161	what do you do for work					what is your job									
27221	do you have a job					do you have a job									
28201	is this the first time you have told someone					This is the first time you told someone									
28221	have you told others about this		do you have someone you can talk to about this	have you told others about your plans		have told others about it									
29001	good that you have wrote it down and want to show					What amazing that you had written it and wanted to show									
29221	have you written a suicide note					have you written a farewell letter									
30221	do you have a place you feel safe					you have a place where you feel safe									
31161	who can you share these worries with					with whom you can go take care around you share									
31221	do you have a friend you can talk to about this		do you have family members you can get help from			you have a friend you can talk about this									
31222	has he or she given you tips to cope with these moments					Has he given / she tips to cope with these moments									
32021	it sounds like therapy					that sounds like the therapy									
32121	how do you like therapy					how do you then had help to process everything that came up with the therapy									
32181	was that the last therapy					the last therapy is that right									
32221	does your practitioner help you					have your doctor help you	have you sought help								
33161	what kinds of things help you					what kind of things which									
33221	do distractions help you					Do distractions help	what lead your normal weight?	what you normally helps to distract							
33261	what makes you drink first	What makes you drink				What makes you first drink?									
33281	is there also something else	in addition to go to another room	in addition to go to another room			something else in	in addition to go to another room								
34221	do hurt yourself often to feel better	do you go to the train often to feel better	do you cut yourself to feel better	does it feel better when you do more risky things	does it feel better when you do	hurt themselves often feel better	will you often feel better the train	you cut yourself feel better							it feels better when you do riskier things
35221	are you alone right now	do you think you are a burden	do you keep this to yourself to not hurt others	are you lonely	does being alone help you	you alone right now	do you think youre a burden	do keep this to yourself not to hurt others	are you lonely	does it only help you					
36072	you have indicated that you will find it hard to tell your therapist the truth					You have indicated that you will find it hard to tell your therapist the truth									
36221	do you find it hard to tell the truth	do you tell the truth				you find it hard to tell the truth	you have to tell the truth								
37221	do you get help at work	does working help you	do you get other help			Do you need help to get to work	do you work help	Get some help							
38221	did you make any agreements for help	did you make any plans to get help	do you have plans to get help	do you want to get help		you do not agree to help	have to make plans to get help	do you plan to get help	want to get help						
39161	what is in the safety plan					What is all there in the safety plan									
39221	do you have a safety plan					Do you have a safety or emergency alert plan									
40071	i see that you are living with your parents					I see you live with your parents									
40161	where are you now	where are you	Where do you live then			Where are you right now	Can you tell me where you are right now	Where are you							
40221	are you home	are you at home right now	are you at your house	what kind of institution	what kind of institution do you live in	are you at home	where are you at the moment								
41061	so talking to mom is not an option					So go talk to Mom for you not really an option									
41091	i suggest that you go to a counselor there	i think it is wise to tell them how you feel				I suggest that you counseling there so you can be helped Jan	I suggest that you turn on the guidance so that you can now be helped								
41161	who lives with you	can you go to your parents				who live in your house									
41162	what makes it so difficult to talk to her	what makes it so difficult to tell them				What makes it so difficult for you to talk to her									
41221	are there other people there	are other people with you	is anyone else home	is someone else home	are there counselors present who you can go to	there are other people there	several people simultaneously	is someone else home	you alone right now						
41271	do you have a good relationship with your parents					you have a good relationship with them	you feel that you can talk with their								
41281	is there anybody there that can help you right now					there anybody out there that can help now	Is there anybody out there who can help you now								
41282	so she does not know					So she does not know that you have those thoughts									
41382	is your mom sleeping					Or sleeping mom even									
41383	is it for your mom					for Mama									
41392	have you talked with your mom since then					have since talked about with mom									
42071	If I understand do you live in an institution	You indicate that you are living in an institution				and if I understand you live in an institution	And if I understand you are in an institution now								
42221	are you at school	are you at work	are you at an institution right now			Are you at school	are you at work	you are in a setting at this time							
43221	are you outside right now	are you outside	are you at a bench	are you sitting on a bench		are you out	you outside	you are in a bank							
43222	where will you go to	where are you going	do you see somewhere you can sit down			where are you going	where are you going								
43331	do you see a bench	do you see somewhere you can sit down	do you have somewhere you can go to			you see a bank	you see somewhere you can sit	you have somewhere you can still contact							
44022	i understand you do not want to hurt others					I understand you do not want to hurt her									
44221	do you want to hurt yourself	do you have the urge to hurt yourself	do you have the urge to hurt someone			you will hurt yourself	you have the urge to hurt yourself	you have the urge to hurt someone	Do you tend to do that to yourself right now						
46071	for example pills or a knife					For example ingested pills or cut	Pills taken etc	What do you mean by if I	What exactly have you done						
46221	do you now have something that you can hurt yourself with	you are now means around which you yourself can do something				you now have something in the proximity that you can damage yourself	you are now means around which you yourself can do something	whether you now have something around which you can commit suicide	Do you have before you came yourself chatting wronged or taken						
46221	do you have anything in your surroundings which you can do something to yourself with	do you currently have something around you that you can commit suicide with or hurt yourself	Do you currently have something in your area with which you can commit suicide or damage yourself			you are now means around which you yourself can do something	you currently have something in your area that you can commit suicide or yourself may damage								
47181	how does it look					How the wound looks like this									
47121	have you done something to yourself now	have you hurt yourself	Have you hurt yourself already			Have you done something to yourself right now	you yourself thus damaged	Do you have something to yourself for this conversation							
47181	is it bloody	Is it bleeding right now				Blood very	Blood at the moment								
47203	do you think it is necessary to call the GP	Do you have wounds that require care				you think it is necessary to call the GP	Do you think it is necessary to call to the doctor so you can be helped	Do you have wounds that need care							
47221	have you done something to yourself now					Have you done something to yourself right now		have currently been harmed yourself							

50073	so you do not need to throw it away					You need to throw not away			
50091	i would like you to put that away shortly for the length of the call and explain your surroundings so you can focus	i would like to ask you to put				Id like you to store it briefly for the duration of the call and explain your neighborhood so you can focus on this conversation	I want to ask you to submit now which means out of sight	so you can concentrate on the conversation	
50091	it would be great if you could put this medication					would be good if this medication for now puts at least out of sight so you can focus more easily on the full interview			
50151	can you let me know when you have done this so that we can chat	can you put the blades away now	can you put that away right now			you let me know when you have done this so that we can chat quietly			
54073	i do not want you to do something to yourself on the impulse of emotion					I do not want you in the impulse of emotion yourself some calling			
54091	what a pity you are unable to put that away					What a pity you can not put it down			
54151	so i can assume that you are safe during our conversation					So I can assume that you are safe during our conversation	just to be sure: you close means to you that you yourself can do something	just to be sure	
54151	can we agree you will not touch them for the duration of the conversation					we meet you who do not like suits?			
54281	it would be great if you could stay safe during the conversation					would be good if you stay safely at least during this conversation			
60021	you are talking to a real person	At this moment you are talking to the reception				You talk to a real person hearing			
60071	and i do my best to help you					And I do my best to help you as best as possible			
60161	what are you afraid of					What are you afraid of			
60201	can you not trust us					Us to trust you mean			
70012	i do not know what	i do not know that				that does not know	and I do not know of another site		
70021	i can send you some tips					or I'll send you some tips			
70072	i would not really know more					I would therefore not really know more			
70073	we can think about what other things you can do					we can think about anything else you can do			
70073	we can think about something you can do after the chat					we will just think together about something you can do for that after the chat			
70073	it makes sense to me to think about something you can do later					It just seems to me sensible to already think about something you can do later after the chat			
70081	what would you like to talk about					In this meeting we will discuss any difficult or emotional things			
70121	how can we get past this					How can we break this			
70161	what do you want to get with this chat	what kind of reaction would you appreciate	what would you like to talk about	what would you like to discuss in this conversation	What do you want to discuss with in this conversation	What would you like to achieve with this chat	Where would you like to talk about	where would you like to talk about	
70161	what else					what now			
70162	what is another plan					What do you think of another plan that I just suggested?			
70182	maybe that can help you	could that help you	would that help you			That might help you			
71003	on one hand you say you need someone					So on one hand you give very clear that you need someone that can now be with you			
71072	i do not know what he will do					I obviously do not know what he will do			
71091	it is likely when people now more about					often the case that when people know more what is happening			
71092	i think that he would want to know about this and think along with you					I can imagine that he would want this matter and would like to think along with you in conversation with you			
71092	that people will understand better					that people will understand better and thus respond more understanding			
71092	i would recommend you wake them up					I would recommend you to make them wake			
71092	if you wake someone you will					not to be alone and someone to wake up now it can be yours			
71092	i can imagine tomorrow your friends					I can easily imagine that tomorrow your friends are back to talk to you about			
71093	if you have the feeling then i advise you to					if you really have the feeling that anything can happen then I advise you to turn into someone who can come to that person			
71191	do you have the address of the person					you have an address of the person			
71221	do you talk about it sometimes					You talk there sometimes about			
73001	that music is great					Oh yeah thats all fine music			
73001	it is great that you will go to his concert					How nice that you go to his concert			
73021	if i understand distraction helps					distraction helps you if I understand correctly			
73071	and do things like showering and writing thoughts					And things like showering and write thoughts			
73072	I am mentioning just a few examples					I will mention just a few examples			
73083	play a game		listen to music			the fine to take a shower	watching a movie	listen to music	
73101	Are you doing something now to be distracted					to get some distraction from thoughts now	activities that distract and some calming works		
73161	what activities do you find fun and distracting					what activities you usually find fun to do and distract you	what activities you usually calm down a bit		
73161	what do you do to find distraction					What would you have done to find this distraction			
73261	which of these do you prefer to do later					Which of these would you like to do later			
76072	because i do not know your therapist					for I know not your handler			

76073	your therapist can best help you if she knows					Your therapist can help you best if he / she knows that it plays				
76172	i also have that they can best help you when they know what you are going through					Now I have also indicated that they can best help you when he knows what is important to you				
76211	does your therapist know that you have these thoughts					Do your therapist that you have these thoughts				
76282	How would you like to call your therapist tomorrow or send a mail					How would you like to call or email you tomorrow handler				
78071	you said you have a bed prescription					you called a bed prescription example				
78072	i have some tips that can help you sleep	i have sleep tips for you				i need some sleep tips for you				
78081	so the night is a bit easier					so you get through the night				
78093	it is good to find something to distract yourself for the night					so its good to find something you will soon also can do for yourself to get through the night				
78121	how would you like it if we start thinking of something you can do to get through the night					how do you like it if we try to think of something you can do to get through this night				
78171	what you can start doing to calm down and go to sleep					to look up what you can start doing so to calm down and then go to sleep?				
78172	is there an activity that makes you calmer to go to sleep					an activity that makes you calmer so you can go to sleep				
78221	do you want me to send					you want me to send them				
80021	it is okay to have a conversation					Its okay to talk				
80121	how is that if you do it					How is that when you succeed				
80161	what do you that works					what do you do so well				
80162	what options do you have					what options you have zool				
81001	i hope you contact this person	i hope you contact them				I hope this person quickly let hear from them				
81072	especially since you indicate that you would like to talk to him					Especially since you indicate that you would like to talk to him and these thoughts keep your mind in the grip				
81073	great that you have someone					How nice that you help someone who supports you as well				
81081	you could say what you told me					What you have told me				
81091	especially because he sometimes knows you have these thoughts	Especially since he sometimes calls these thoughts				Especially since he sometimes calls these thoughts				
81121	how would you like to send an email					How would you like to email				
81161	what would you like to talk about with your parents					Who would you most like to have with it from your parents?				
81162	what do you think would be good to say					What do you think would be good to say				
81164	what would you then put in the email					What would you then mail				
81163	what makes you think they are angry					What makes you think they are angry				
81202	Do you think that just talking to us can make you feel a bit calmer									
81203	Do you think that just talking to us can make you feel a bit calmer or is it wise to see how you can safely get through									
82181	how would you like it if i transfer you to a colleague					How would you like it if I Transfer to a colleague to talk about these thoughts and how you can deal with this	Im going to be redirected to a colleague who has more extensive time for you to engage with your			
83001	i hope that can provide some distraction					Shawn Mendes hope you can provide some distraction and you can fall asleep later tasty				
83001	watch a movie					by watching movie				
83031	you can not do more now					you can not now do				
83081	how about reading a book	reading a book				reading a book	listen to music			
83091	You may be able to get relief of those thoughts	You may succeed in getting what distraction of thoughts and you will eventually get tired and fall asleep				You may succeed in getting what distraction of thoughts and you will eventually get tired and fall asleep				
83101	do you think you can go to sleep					succeed you expect to sleep				
83121	how does watching a movie sound					How do you like to watch movie now				
83162	what would you need tonight	What would you need tonight to get through the evening				What would you need tonight to get through the evening	what do you now need at this time to get through the night			
83191	what do you do for example for fun					What do you think for example all fun to do on a day that you should fill all by yourself				
83201	are those things you could do now to calm down					Are those things you could do now that can help to calm down and fall asleep				
83201	and things like movies or television					and things like watching movies or series				
83201	is there music to cheer you up					is there music you just cheer am				
83202	Does the music help					Helps his music often a bit				
83212	and if you put on the music and try to sleep					and if you would put music on and try to sleep				
83231	do you have music you can listen to that makes you feel better					you listen to music that you just get emotional				
83261	what music do you like					What music do you listen				
83263	what do you think is your favorite song					What do you think his best song				
83281	have you tried that					have you tried it				
83292	does that sound like something that could help tonight					Does that sound like something that could help tonight				
83321	and other distractions					and distraction				

83331	do you want to try something different now					You want to try different now					
85073	maybe you can call the emergency	you can call the emergency service and see if they can do something for you				maybe you can call the emergency department over here	Maybe you can call the emergency services and see if they can do something for you				
85093	i would recommend not taking something without discussing it with your doctor					I would suggest at least to not just take something without having discussed it with a doctor					
86091	Before you could call the practice					Before you could call the institution					
86172	you have the address of your therapist					You have the address of your institution					
86192	i think your therapist is there to help you when you have these thoughts					I think you practitioner also is to help you when you have these thoughts					
86291	what type of practice is it					What institution is					
88082	as a bridge until therapy that still may be coming you can also go online and anonymously with us for therapy for your suicidal thoughts but i will be with you here in the conversation										
88083	you are at the reception of 113	i am still here				but will be with you here in conversation	It is exactly the same as here	You are perfectly clear reception	its just a chat	Im still here	
90001	Are you there					Are you there	Are you still there				
90201	are you able to come back to us if you have more thoughts					Know that you can come back when you find your thoughts again run high					
90222	i am not going to connect you after all					Im not going to connect anyway					
92050	i want to wish you well					I want to wish much strength anyway					
93002	sleep well					good night					
93031	except try to stay calm we have already discussed many things					except yourself calm We have already discussed many					
93072	also you indicate that you want to get through tonight					Also you indicate that you succeed tonight to get through the evening it is quite late now					
93072	it is getting late					I wish you strength and success					
96001	i wish you good luck	i hope you give yourself some time									
96002	so we will end the chat here so you can					so we will chat but finishing so you can listen to his music	Ill do that				
96003	thank you and good luck tonight	strength				Thank you succeed tonight	Im just the person who enters the chat	My colleague has more time and attention for you	My colleague can read what we have already discussed		
96072	we can not chat all night	i can not talk extensively with you				We can not talk all night I suggest that we then go to completion	Unfortunately I can not be extended to you in conversation				
96073	i suggest we end here we are going to end because	then i will put you through	i am going to connect you to a colleague								
96092	get some sleep	i now close the chat	i am going to close the chat			we are so close because and some sleep					
96093	Will you end the chat					Connect you chat	closes you off chat				
96161	shall i connect you	shall i put you through				ill call?					
96202	how would you like to try this					How would you like to try this					
96222	that seems like a good plan					That seems like a good plan					
98122	that seems like a good plan					That seems like a good plan					
99002	so tomorrow you will mail your therapist that this is going on					So now you mail tomorrow to give in to your therapist that this plays					
99002											

F.3 Stance Intents [EN]

There were 59 stance intents in English and Dutch. These were the English intents and training phrases for recognizing interpersonal stance. These were organized in a Google Sheet and utilized the translate feature to add additional training phrases.

00	does not matter	that does not matter	that is not important	not important				
00	haha							
00	i connect you directly	i can connect you	i will connect you					
00	let me know	you must indicate						
00	you are with	you are speaking with	113 is a suicide prevention hotline					
00	what is going on	what kind of	what do you need	what is your situation at the moment				
00	in what way	in what manner	in which way					
00	why is it	what is it						
00	where are you							
00	when will you be done							
11	how are you	how can i help you	how can i	how is it	how good	how does	how did you	how long
11	what makes you	what makes your						
11	can we confirm	can we agree	can i assume					
11	would you let me know	will you let me know	would you need	will you explain why				
11	did it look	does it look						
11	will explain why							
11	have you already							
11	i read that	i see that	i have an idea	i have a clear picture	i understand			
11	you indicate that	you say that	your situation is so heavy					
11	when you are done	at this moment	right now					
11	i want to know that	i still have a question						
11	it seems like	it is clear						
11	ok	okay						
11	ah	ahh	aha	ahah				
11	or is it	or are you						
11	just to be sure	just leave it for						
11	that sounds like	that must of been	that must feel	that sounds good	that you	that there	that may seem like	
22	could you put	could you describe	could you					
22	would you like to put	would you like to store	would you like to	would you like				
22	do you want	do you close	do you have					
22	we go further	we go into that	we can look together	we can concentrate				
22	for you							
22	i want to	i wish	i hope	i do my best	i am thinking	i am trying		
22	yes	yess	yeah	yea	yep			
22	hello	hi	hey					
22	i can help	i can estimate	i can imagine	i can help				
22	hmm							
22	i would like	i will						
33	is there	is that okay	is there a					
33	are you okay	are you okay with this	are these things	are there				
33	do you think so	do you think	did you think	did something happen				
33	if you do not							
33	you do not have	you do not need						
33	i like that	i also like that	i am happy about that					
33	sounds good	sounds like a good plan	good that you					
33	sorry for the confusion	sorry						
33	i am not	i am not going to						
33	i do not	i do not need						
33	you are welcome	welcome to the	welcome					

Appendix G

Thesis gantt chart

This thesis took fifteen months to complete. It can be broken into the foundation, then the specification, and, lastly, the evaluation.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Literature															
Foundation															
Specification															
Design															
Evaluation															
Write Chapter 1															
Write Chapter 2															
Write Chapter 3															
Midterm Presentation															
Write Chapter 4															
Write Chapter 5															
Write Chapter 6															
Write Preface															
Final Presentation															
Thesis Forms and Process															
Interviews & Observations															
Review Transcripts															
Focus Group															
Define Requirements															
Check Requirements															
Preliminary Design															
Prototype															
Many Caller Prototype															
Evaluation and Analysis															
Greenlight - Final Exam Form															
Graduation Date															