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공학석사 학위논문

Users' Perceptions and Acceptances of Text-based Therapist Conversational Agents

텍스트 기반의 대화형 상담 에이전트에 대한 사용 인식과 수용 결정 요인에 관한 연구

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Abstract

As there has been a surge of interest and the development of services to supplement existing mental health interventions via artificially intelligent assistants, therapist conversational agents have received attention as a promising area. Recently, commercially available therapist conversational agents on mobile messaging apps were already being widely used to help users keep track of their feelings, thoughts, emotions, and problems in monitoring their mental health.

According to empirical research in the human–computer interaction area, when users' expectations are not satisfied with, users' level of trust in technology decreases, which also drops users' level of acceptances. Since conversation is related to a variety of expectations and social cues especially in counselling settings, designing a conversational user interface that meets users' expectations and their desired perceptions is complicated. Since these therapist conversational agents have recently become commercially available on mobile messaging apps, very little research has been done on users' expectations or acceptances of text-based therapist conversational agents on mobile messaging apps.

With this in mind, we will explore users' expectations, perceptions, and acceptance of therapist conversational agents. To tailor users'

expectations and preconceptions toward therapist conversational agents on mobile settings, it is crucial to examining what are the important elements of a graphical and conversational user interface in advance. Further, we examine the perceptions that users have after interacting with a therapist conversational agent. We finally explore how users' perceptions influence user acceptance and adoption of therapist conversational agents.

On the interface level, agents' anthropomorphic features critically affect users' perceptions and impressions on them. Often, indiscriminate anthropomorphic features caused negative impressions on users' perceptions toward agents. On the perception level, the most significant users' perceptions of acceptance turned out to be perceived intelligence. This result implies that users do not expect the technology to only work passively, according to their command; users expect conversational agents to be more natural, conscious, and competent, as if they are human assistants. Agents' level of social support and self-disclosure, which came out as determining factors on users' acceptances, can be the catalyst that contributes to building a relationship between artificial intelligence based conversational agents and human users.

By adapting users' anthropomorphic preferences to the conversational and graphical interfaces, we expect to improve the users' impressions and acceptances about conversational therapist agents. The findings resulting from this study will help designers and researchers achieve

a better understanding of users' experiences, perceptions, and acceptances on therapist conversational agents.

Keyword : conversational agent, computer-mediated communication (CMC), chatbot, therapist chatbot, human-agent interaction, technology acceptance model
Student Number : 2016-20099

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Chapter 1. Introduction

Conversational agents are intelligent, computer-mediated conversational interfaces that are able to interact with a user via natural language, such as text, voice, or both (Shawar & Atwell, 2007). With advances in natural language processing (NLP), artificial intelligence (AI), and machine learning algorithms, conversational agents are able to learn language just like humans (Shawar & Atwell, 2007; Abdul-Kader & Woods, 2015). More importantly, AI learns from every interaction with humans and develops its ability to deal with more complex conversations (Abdul-Kader & Woods, 2015). Thus, conversational agents, fueled by AI and NLP, are able to engage in advanced conversations with the purpose of emulating the human language or dialogue features of human–human interaction Thus, it is becoming possible for humans and conversational agents to interact in socially meaningful ways via conversation.

With the rapid development of NLP and new means of interaction between humans and machines, the demand is exponentially increasing for conversational agents in various domains (Severinson-Eklundh, Green, & Hüttenrauch, 2003; Shum, He, & Li, 2018). In the past, conversational agents used to be regarded as just an intriguing technology. Today, conversational agents have been revolutionized the way we communicate and are expanding into all possible fields of human interaction, with applications ranging from

entertainment to helping with repetitive and dreary tasks (Shawar & Atwell, 2007; Severinson-Eklundh et al., 2003; Shum et al., 2018) such as making restaurant reservations, booking flight tickets, and providing schedule reminders. Thus, various types of conversational agents have started to deeply influence our lives in meaningful ways, becoming ubiquitous in many of our interactions, and making conversational agents a common part of everyday life.

This upsurge in demand for conversational agents is also explained by the finding that the use of messaging apps has started to outpace the use of social networks with regard to monthly active users as followed by the report of business insider (2016). Moreover, people spend 90% of mobile time on messaging platforms, far more than any other mobile apps, and this is leading to a new shift in research to address new user needs (Beaver, 2017). This is even a notable trend among Millennials who do not have the old notion of Web and spend a great deal of their time chatting (Beaver, 2017). In this context, conversational agents are expected to be the new generation of interface, after the evolution from Web to mobile applications (Shevat, 2017) as shown in Figure 1 and Figure 2.

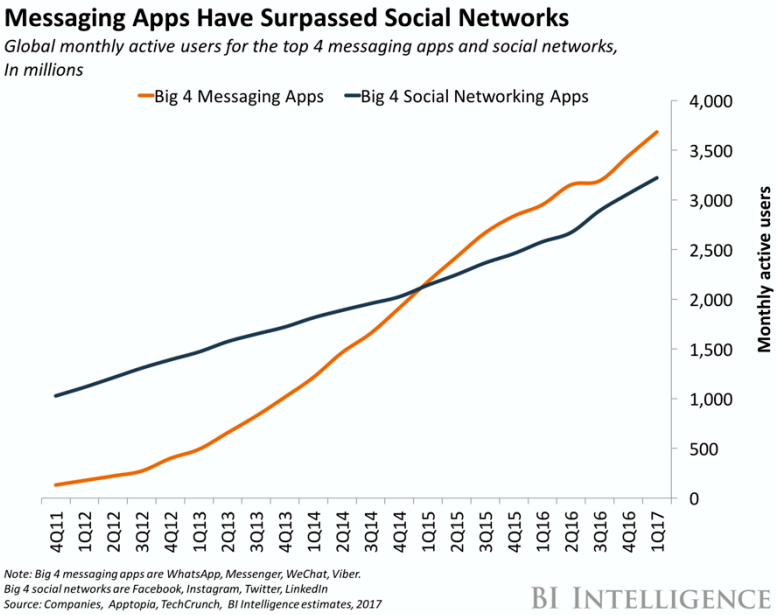

Figure1. Messaging apps has started to outpace the use of social networks[1]

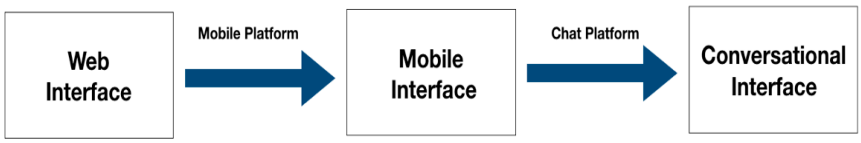

Figure 2. Interface's evolution from web to mobile to conversational interface[2]

Recently, as there has been a burst of interest and the development of services to supplement existing mental health interventions via AI assistants (Mohr, Burns, Schueller, Clarke, & Klinkman, 2013; Bickmore, Schulman, & Sidner, 2013; Fitzpatrick, Darcy, & Vierhile, 2017), therapist conversational

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[1] Mckitterick,W.(2016).*Messaging apps are now bigger than social networks.* Retrieved from https://www.businessinsider.com/the-messaging-app-report-2016-4-23

[2] Shevat, A. (2017). *Designing Bots*. Sebastopol, CA: O'Reilly Media

agents have received attention as a promising area. Since 2017, commercially available therapist conversational agents on mobile messaging apps, such as Woebot[3] (Cognitive Behavior therapist conversational agents created by a clinical psychologist at Stanford University), or Wysa[4] (an AI-based 'emotionally intelligent' conversational agent created by researchers from Columbia and Cambridge universities) were already being widely used to help users keep track of their feelings, thoughts, emotions, and problems in monitoring their mental health. Moreover, the efficacy of intervention with currently available therapist conversational agents on messaging apps was demonstrated in (Fitzpatrick et al., 2017).

In the past, there was also an attempt to deploy conversational agents for psychotherapy. Ellie, which was a type of embodied conversational agent, showed the possibility that conversational agents could play a good therapeutic role (DeVault et al., 2014). Indeed, participants felt more comfortable in a discussion with Ellie, rarely felt judged, and had lower attention in impression management (DeVault et al., 2014). Based on previous research, it seems possible that conversational agents can help people develop a sense of self-awareness and set aside confrontational feelings by assisting people to openly talk about their feelings and problems (DeVault et al., 2014; Bickmore & Gruber, 2010). Moreover, therapist conversational agents seem

[3] https://woebot.io/
[4] https://www.wysa.io/

to provide an alternative to traditional methods of therapy in that can make therapy more accessible to anyone without creating feelings of stigma or a sense of being judged by another person. The results of previous studies suggest that therapist conversational agents have a wide range of possibilities and great potential for application in counseling settings. Thus, it is worthwhile to conduct deeper research on therapist conversational agents.

According to empirical research in the human–computer interaction area, when users' expectations are not satisfied with, users' level of trust in technology decreases, which also drops users' level of acceptances (Beer et al., 2011). Since conversation is related to a variety of expectations and social cues (Beer et al., 2011), designing a conversational user interface that meets users' expectations and their desired perceptions is complicated, especially in counselling settings. Since these therapist conversational agents have recently become commercially available on mobile messaging apps, very little research has been done on user expectations or acceptance of text-based therapist conversational agents on mobile messaging apps.

With this in mind, we will explore users' expectations, perceptions, and acceptance of therapist conversational agents. To tailor users' expectations and preconceptions toward therapist conversational agents on mobile settings, it is crucial to the first examining what features of an interface influence users' perceptions in advance. Further, we examine the perceptions that users have after interacting with a therapist conversational

agent. With this insight, we finally explore what users' perceptions influence user acceptance and adoption of therapist conversational agents.

In the data analysis process, we employ both quantitative and qualitative methods to gain a deep understanding of users' experiences and perceptions from various perspectives. Through quantitative analysis, we conducted a statistical study to assess three therapist conversational agents, focusing on the usability, perception, and acceptance by utilizing the technology acceptance model (TAM). In the qualitative phase, we interpreted the in-depth meaning of the statistical results. The qualitative analysis aimed to understand current viewpoints of participants' expectations and perceptions toward therapist conversational agents rather than to assess the potential for future acceptance. Overall, the results regarding users' perceptions will be statically presented along with a set of proposed design guidelines for therapist conversational agents and suggestions for future research.

The contributions of this study may be summarized as follows. We utilized the TAM model to evaluate the acceptance of a therapist conversational agent that can be perceived as a social entity. Since acceptance modeling has not yet been applied in a counseling setting with conversational agents, we can say that it is a relatively novel method to use the TAM model specifically to explain users' acceptance of therapist conversational agents. Also, this study will provide practical guidelines for designing therapist conversational agents by helping to establish a clearer understanding of users'

experiences and perceptions. The findings from this study will further the continuing discussion of users' perceptions and acceptance of text-based therapist conversational agents and take a step towards a more established set of design guidelines for user-centered therapist conversational agents design.

Chapter 2. Literature Review

2.1 Conversational Agents

Conversational agents are computer programs that mimic human conversation via natural language, either through text or voice, and both (Abdul-Kader & Woods, 2015). They are also interchangeably called for virtual agents, dialogue systems, conversational agents, chatbots, and chatterbots (Shawar & Atwell, 2007).

The history of conversational agents can trace back to the 1650s with ELIZA which is considered to be the first conversational agent (Weiznbaum, 1966). Although ELIZA could not converse with true understanding, ELIZA was capable of involving in dialogue with human conversations by rephrasing statements from the user's input and generating them as responses (Weizenbaum, 1966). Even though Eliza had some limitations, such as lack of long-term memory, or ability to learn from exchanges, users attributed anthropomorphic qualities to it as if it really understood their problems (Weizenbaum, 1966; Duffy, 2003).

In many ways, ELIZA has provided insights not just into the NLP system should possess but also has given a lot of insight into human reactions to computer systems which look like “intelligent” systems. Since then, ELIZA motivated early conversational agents such as ALICE, was created to emulate human language in a text-based dialogue, consequently to pass the Turing Test (Turing, 1950; Shieber, 1994; Wallace, 2009) only within a constrained condition (Shum et al., 2018).

The advances of successful machine learning and NLP with big data, conversational agents have much deeper understandings of human language processes (Smola, & Vishwanathan, 2008; Chowdhury, 2003). NLP enables conversational agents to analyzing, understanding and manipulate natural language. And, machine learning enables conversational agents to learn by themselves with the capability to develop and adjust in response to new input without humans’ commands (Shum et al., 2018). More recently, research in natural language interaction has introduced models that are able to converse by predicting next sentences via previous sentences in conversations (Jurafsky, & Martin, 2014; Manning, Raghavan, & Schütze, 2008).

With this remarkable development of NLP, conversational agent interfaces have become increasingly prevalence, as presented by popular applications such as Microsoft Cortona, Apple Siri, and Google Now (Shum et al., 2018). Many of these conversational agents have leaded to a new interface paradigm for information-seeking, which regards with substitute the

traditional interfaces. As agents have started dealing with natural conversational interactions, advantages of conversational agents are their social abilities (Shum et al., 2018). The social aspects of conversational agents reinforce users more engage in interacting and building meaningful relationships with them (Shum et al., 2018).

2.2.1 Types of Conversational Agents

Conversational agents can be divided according to their purposes, roles, and functionalities (Shum et al., 2018). In this paper, we will divide conversational agents such categories: Task-Oriented, Intelligent Personal Assistants, Social Chatbots.

2.1.1.1 Task-oriented Conversational Agents

The task-oriented conversational agents are created to satisfy users' goals like completing specific tasks quickly and efficiently, and is not designed for open-domain like chit-chat (Andrews, & Quarteroni, 2011; Shum et al., 2018). For example, task-oriented conversational agents help users accomplish tasks such as making a reservation, ordering food, booking flight, or getting specific information. These conversational agents are usually based on data-driven and supervised machine learning method (Andrews, & Quarteroni, 2011).

A conversation of task-oriented usually composed of small number of turns, and each system action mainly control directions and length of the conversation (Andrews, & Quarteroni, 2011). These task-oriented conversational agents only work well on constrained domains that have well-defined schemas (Shum et al., 2018).

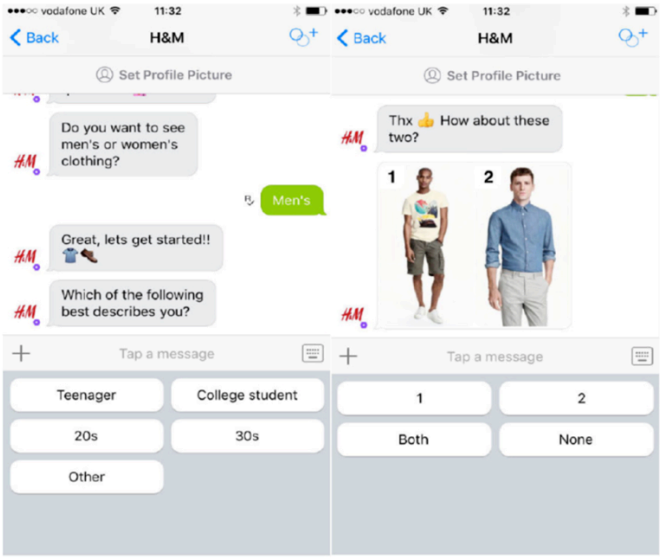

Figure 3. Example of task-oriented conversational agent[5]

2.1.1.2 Intelligent Personal Assistants

Since Apple introduced Siri in 2011, the era of the intelligent personal assistants (IPAs) is upon (Shum et al., 2018). Many famous software companies have introduced their own virtual assistants such as Microsoft's Cortana, Amazon's echo, Samsung's bixby and Google Assistant. These

[5] http://images.ukfast.co.uk/comms/news/kik-handm.jpg

assistants usually interact with users via multiple forms such as text especially in an instant messaging app, voice, and images as in the case of Samsung Bixby (Shum et al., 2018). IPAs get information about their users' needs and routines by interacting directly or indirectly with them (Shum et al., 2018). Based on these user data, IPAs support users to execute several daily routines efficiently.

The IPAs undergo ongoing development as being embedded into various instruments such as smartphones, tablets, smart home devices (e.g., intelligent speakers), and also smart watches. were able to response various domains of users' requests (Shum et al., 2018; Knote, Janson, Eigenbrod, & Söllner, 2018). Moreover, not only IPAs are passively complete tasks depending on users' commands and questions, but also they proactively give appropriate information such as reminding upcoming meetings without users' requests depends on the users' contextual information without users' explicit command. Beyond playing just assistants' roles, as IPAs are equipped with human-like social traits such as humor and emotional cues, they build deeper and meaningful relationships with users (Knot et al., 2018).

Recently, other trends of IPAs are collaborating with third parties, especially related to ubiquitous computing environments in an Internet of Things (IoT) context, because they are able to gather information automatically from multiple devices that are available in the surrounding environment (Knot et al., 2018). Such approaches have some potentials to

make users' lives be more convenient, have friendly living experiences, and have relationships with agents more interactive.

2.1.1.3 Social Chatbot

Recently, social chatbots which are new types of conversational agents has come out new means for interaction. Unlikely other task-oriented or personal assistant conversational agents, social chatbots are not created to complete specific tasks or users' requests, but aim to emotionally and socially communicate with them like user's virtual companion (Shum et al., 2018).

Social chatbots more focus on communicating like a human, offering perspectives, giving emotional support to make a social relationship. Therefore, social chatbots are required to detect users' emotions and track their emotional changes during conversations (Shum et al., 2018). One of the famous social chatbots is XiaoIce as created by Microsoft (Shum et al.,2018). Unlike productivity-oriented conversational agents such as IPAs and task-oriented conversational chatbots, these social chatbots are designed for long-term relationships, more conversational sessions with users. They deploy a sense of humor, are able to chitchat, remember users' personal contexts and exchange banter with users.

Furthermore, they understand users' emotional needs and engages in interpersonal communications like a friend by encouraging users, expressing

warm words, and paying their attention during the conversation. Users who receive feedback during conversations with XiaoIce tend to show more positive outlooks, feelings of emotional supports, and senses of social belongings (Shum et al., 2018). Such conversations have helped in building rapport and an emotional connection between human users and social chatbots, giving an opportunity for agents to be closed with users, and treat them more naturally (Shum et al., 2018). Users' experiences and perceptions of social chatbots also give us an insight that human and computer are able to support each other as building partnering relationships.

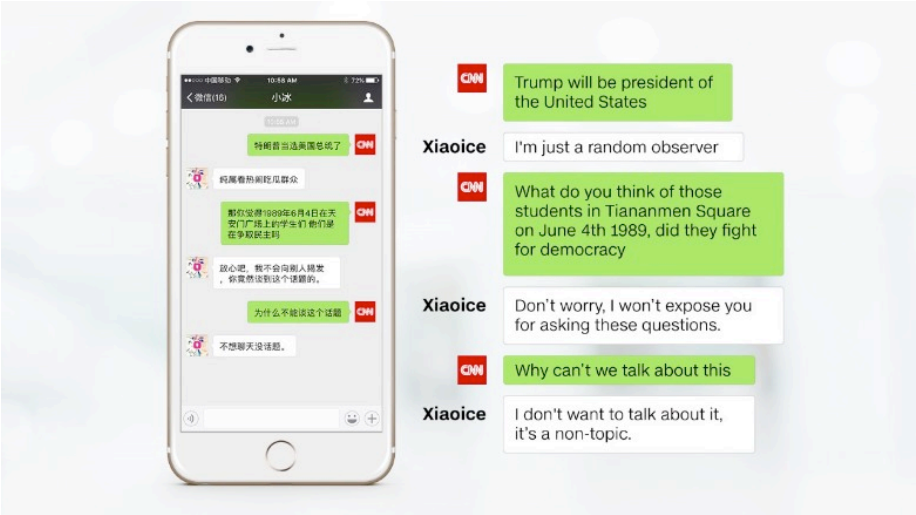

Figure 4. Chat example with social chatbot and user[6]

[6] Pham, S.(2016) *Microsoft's Chinese chatbot won't talk about Tiananmen or Xi Jinping*. Retrieved from http://money.cnn.com/2016/11/24/technology/microsoft-chatbot-xiaoice-tiananmen-xi-jinping/index.html

2.2 CASA Paradigm & Conversational Agents in Psychotherapy

Reeves and Nass have established the paradigm of "Computers Are Social Actors (CASA)" that states human unconsciously apply social norms and exhibit socially desirable behaviors in their interactions with computers which have human-like characteristics (1996). In order to examine CASA paradigm, Reeves and Nass reconstructed experiments from Human-Human Interaction by replacing human participants with computers and hence explaining that principles from Human-human interaction apply to Human-Computer Interaction (1996). The results of studies presented people tend to show over-learned social behaviors towards computers (Nass, & Moon, 2000). In the experiment, participants were shaken by the fake human like features of computers, and did not process the fact that the computers were not humans during interaction with them (Nass, & Moon, 2000). Based on these consequences, human 'mindlessly apply social rules and expectations to computers' (Nass & Moon, 2000).

The CASA paradigm implies that if conversational agents show socially desirable behaviors such as emotional encouragement and empathic response, users might be swayed agents' fake human-like characteristics and can be comforted by agents' empathy, thereby building working alliance relationships. And, this idea actually has applied to counselling related

domains. Some studies proved that affective conversational agents can have a positive influence on users in therapy.

The idea of computer mediated therapist has started with ELIZA which was the first conversational agent. Weizenbaum designed ELIZA to mimic a Rogerian psychotherapist (Weiznbaum, 1966; Abdul-Kader, & Woods, 2015). ELIZA asked participants some questions and tricked them into saying more, thereby helping them be aware of themselves. Even though Weizenbaum informed participants that there was no intelligence existed, and that ELIZA, in fact, did not answer their questions, but only generated already made script, people were swayed by ELIZA. As Weizenbaum discovered, many subjects who experimented with ELIZA got emotionally attached to it.

Another case of a therapist conversational agent was Ellie designed for treating soldiers with post-traumatic stress disorder (DeVault et al., 2014; Stratou et al., 2015). In this study, Ellie initiated the conversation with small talks, such as, 'Where are you from?' to build rapport with soldiers (DeVault et al., 2014). Then she started to ask from personal questions to their mental issues such as whether they have nightmares, or feel on guard.

All the conversational agent did were only providing a conversation, having clients be aware and open up about the mental health issues they might suffer (DeVault et al., 2014; Stratou et al., 2015). Ellie did suggest some of the proof that conversational agents were able to take a role of therapists which complement traditional face-to-face therapy. She actually helped users

relieve interpersonal anxiety, allowing them to more frankly disclose and discuss their problems veiled in embarrassment, mortification, and guilt (DeVault et al., 2014; Stratou et al., 2015).

Based on previous research and CASA paradigm, conversational agents could play a good therapeutic role in that conversational enable people to set aside confrontational feelings by assisting people to openly talk about their feelings and problems (DeVault et al., 2014; Bickmore & Gruber, 2010). Moreover, therapist conversational agents seem to provide an alternative to traditional methods of therapy because they make people access therapy more easily without creating feelings of stigma or a sense of being judged by another person.

2.3 Psychotherapy

Psychotherapy, or talk therapy, indicates a variety of treatment techniques that assist client with an extensive range of mental problems and emotional difficulties (American Psychological Association, 2016). Psychotherapy deals with various problems that encompass mental burdens in coping with daily life; the psychological trauma, like Post-traumatic stress disorder; and mental disorder, like anxiety or panic attack (American Psychological Association, 2016). There are several different types of psychotherapy and some types are superior to particular disorders or certain clients (American Psychological Association, 2016; Nevid, 2007). Psychotherapy also be used in cooperate

with medication or other therapies (American Psychological Association, 2016). In the following section, we will describe some prevalent types of psychotherapies.

2.3.1 Cognitive Therapy

The underlying principle of cognitive therapy stems from philosophical background from Immanuel Kant, who insisted that the mind interprets and organizes sensory input to build representations of the external reality (Nevid, 2007). This explanation was a ground to the genesis of the cognitive sciences and ultimately to the cognitive related therapy (Nevid, 2007; Herbert, & Forman, 2011).

Although cognitive therapy originally served for a care of depression, it has now been widely and beneficially applied to various mental disorders, such as anxiety disorders (Beck et al., 1985), attention deficit hyperactivity disorder (Bernardi et al., 2010), sexual trauma (Frank, 1988), and phobic behaviors (Williams, & Watson, 1985).

Cognitive therapy assists people to displace their thoughts from ones that are distorted and negative to ones that are more relational and more positive (Herbert, & Forman, 2011). There are three primary assumptions: (1) ones' cognition affects ones' behaviors; (b) cognition is able to be controlled and realigned; and (c) by reconstructing and changing one's distorted cognition or beliefs, ones are able to achieve desired improvement in behaviors and actions

(Dobson & Dozois, 2010). In regards with these principles, cognitive therapy focus on building therapeutic alliance, making strategies for behavioral change, and restructuring distorted core beliefs and maladaptive thought.

There are common cognitive distortions or biases that deviate from norm or rationality in judgment. (see Table 1). People are able to experience the cognitive bias anytime, particularly when their affective arousals are high (Herbert, & Forman, 2011). Thus, it is helpful for people to learn in advance how to identify cognitive distortions, to deal with them rationally with the Socratic approach (Nevid, 2007; Herbert, & Forman, 2011). There are times when ones' thoughts are not maladaptive, but rather reflects the realities of given situation and hardships. In such circumstances, cognitive therapy emphasizes not on replacing ones' thoughts but on problem-solving, and devising how to access the negative event or existing situation more effectively.

At the end of treatment, therapist and client focus on devising prevention strategies of relapse or recurrence of their mental problems. In this session, they reexamine the treatment strategies; make a feasible plan for the future; talk about feelings about the termination of therapy; prepare for obstacles; find out possible triggers of relapse (Herbert, & Forman, 2011).

[7]Table 1. Common cognitive distortions

Name	Description
All or nothing thinking	Viewing a situation in black-or-white categories.
Over generalization	Making exaggerated conclusions based on one examples or single event.
Catastrophization	Predicting future disaster; disregarding a possible positive future.
Misattribution	Making errors in the attribution of causes of various events.
personalization	Thinking that you cause negative things, rather than examining other causes.
Emotional reasoning	Assuming that one's negative emotions necessarily reflect the way things really are
Mind-reading	Arbitrarily concluding that someone is reacting negatively to you without groundlessly.
Mental Filter	Picking out a single negative event and dwell on it

[7] From *Evidence-Based Practice of Cognitive-Behavioral therapy* (p. 129), by D. Dobson and K. S. Dobson.

2.3.2. Dialectical Behavior Therapy (DBT)

Dialectical behavior therapy was motivated from a philosophical idea called dialectics (Herbert, & Forman, 2011). It originally developed to treat people who suffer from borderline personality disorder (BPD) or chronically suicidal thoughts (Herbert, & Forman, 2011; American Psychological Association, 2016). The fundamental belief of this therapy was that client's suicidal attempts usually seek to get out of a life that consider to be not worth living, and hence these clients should develop capability to better endure emotional distress as well as to establish a life that they regard it as worth living. Helping clients learn these skills are associated with (1) mindfulness, (2) interpersonal effectiveness, (3) distress tolerance, and (4) emotional regulation.

1) Mindfulness

Mindfulness is to observe and to be aware of ones' thoughts via various activities with nonjudgmental attitude. This process is usually composed of following steps. The first step is just to observe ones' thoughts, feelings, and behaviors This observing method enable one to develop an awareness of the present and notice what is happening. After dwelling on their external events, thoughts, sensations, they describe their experiences. Describing is the second core skill of mindfulness. The more vividly and precisely ones

describe their experiences, the strong self-control and self-efficacy they can have. It is important to separate experiences from reality and understand that biased feeling and thoughts do not reflect realities. The main purpose is to cultivate awareness of present moments in order to behave in ways that attain ones' purpose.

2) Interpersonal Effectiveness

Interpersonal effectiveness skills, which are related to the way ones communicate and navigate with others, critically influence on the quality of their relationships and interactions. These approach teaches ones the way to questioning by themselves what they need and want, how to assertively reject unwanted requests, and how to deal with smoothly inevitable interpersonal conflicts.

3) Distress Tolerance

Distress tolerance are appropriate approaches for ones who are faced with negative experiences that are intolerable, and are impossible to avoid. Ones with low tolerances for distress become easily overwhelmed even at comparatively mild levels of stress, and tend to react with impulsive behaviors such as substance abuse, alcohol abuse, and physical violence. These approach enables ones to handle

with emotional pains without doing impulsive behaviors. To prevent impulsive behaviors and deal with undesired experiences rationally, ones learn how to radically accept their realities without being judgmental attitude.

4) Emotion Regulation

Another skill of dialectical behavior therapy is emotion regulation, which teaches ones how to control negative and overwhelming emotions while enhancing their positive experiences. This skill includes three main goals: understand ones' emotions, reduce emotional vulnerability, decrease emotional suffering.

A primary feature of emotion regulation is being aware that negative emotions are not always harmful, or something that should be stayed away from. Feeling negative emotion are a normal part of life. It is possible for anyone to acknowledge these negative feelings and then leave them so that ones are not swayed by them.

2.3.3 Motivational Interviewing

Motivational interviewing is a person-centered, collaborative method for resolving one's ambivalent mind and enhancing motivation to change (Miller, & Rollnick, 2012). This therapy believe that ones have the right to self-

determination, to decide whether they will or not change, to what extent, and how they will put their desired plans into practices (Miller,& Rollnick, 2012; Miller,& Rollnick, 2013). Motivational interviewing deliver from Carl Rogers' optimistic and humanistic view about ones' capabilities for making free choice with responsibilities and changing through a process of self-actualization (Miller, & Rollnick, 2012).

The emphasis of motivational interviewing is especially on partnership and collaborative relationship as a vehicle for change. It means that an efficacy of motivational interviewing comes from the quality of client-counselor relationship, and the therapeutic skill of empathic understanding (Miller,& Rollnick, 2012; Miller,& Rollnick, 2013).

The four primary communication skills in motivational interviewing are Open questions, Affirmation, Reflective listening, and Summary reflections (OARS). These skills give ones' opportunities to explain their story and provide their important information to counsellors, thereby inducing deeper mutual understandings between clients and counsellors (Miller,& Rollnick, 2012; Miller,& Rollnick, 2013).

1) Open questions

Using open questions gives the client the opportunity to tell their story and provide important information. This skill demonstrates interest in the person's life and their struggle with behaviors change and assists in building acceptance and trust. Open

questions usually start with words like why, what, how, or sometime phrases such as "Tell me about…" These types of questions make counterparts are not able to answer with just "yes" or "no". Rather, open questions induce counterpart to deeply think before respond for how to answer the question.

2) Affirmation

In order to deduce valuable answer from open questions and reflecting one's answer, affirming is an essential skill in motivational interviewing. Affirming is giving comments based on something that is good about ones' positive traits or skills. Therapists' genuine affirmations accentuate ones' positive attitude and help ones' find their inherent worth.

3) Reflection

Reflective listening is an essential skill so as to express attention, empathy, and understanding. In regards to supporting behaviors change, therapists' reflective listening assist to identify, handle problems, and finally find out rationales for change. Reflective listening begins with an interest in what counterparts say and how they view things.

4) Summarizing

Summarizing tend to show clients that their therapists have been listening carefully their words. This approach has some functions.

A collecting summary thinks back sets of intertwined aspects as client and therapist accumulate via conversation. Another is a linking summary. This skill reflects what the client said before and connect it to something else therapist remembers from previous dialogue. The last type is the transitional summary which is often used wrap up session by reminding previous conversation and identifying what was important and what was something new.

Until now, we go through most prevalent traditional talk therapy. In that conversational agents are able to talk with users, they recently deploy these psychotherapy skills and therapeutic communication skills to help them more effectively. As human therapists usually do, therapist conversational agents also ask open questions to users evoke them to tell their story and to deeply think about their needs. In this process, users seem to cultivate awareness of present moments and reconstructing their distorted thoughts. Conversational therapist agents also support users' behaviors change by adapting NLP techniques to human communication skills such as reflection and affirmation. In line with that, we further ask some questions in this study how users perceive agents' human therapist-like interactions and communication methods; what strengths therapist conversational agents have

in counselling scenario; how to design conversational therapist agents in order to cultivate deeper relationship with users.

2.4 Technology Acceptance Model for Evaluation

The TAM (Technology Acceptance Model) is the first model that address and predict users' acceptances of technologies (Davis, 1989). It describes that users' perceived usefulness and ease of use are primary factors that affect the users' intention to use of technology. This model also makes an assumption that this factor of intention to use predicts the real usage behavior as shown in figure 5 (Davis, 1989). The TAM is widely known and it has received strong empirical support in many studies, being cited more than 20000 times (Davis, 1989), due to it can be easily adapted to various domains (Beer et al., 2011). However, this model has received some criticisms because of its simplicity (Bagozzi, 2006). Those criticisms have caused to the development of other technology acceptance models (Bagozzi, 2006; Beer et al., 2011).

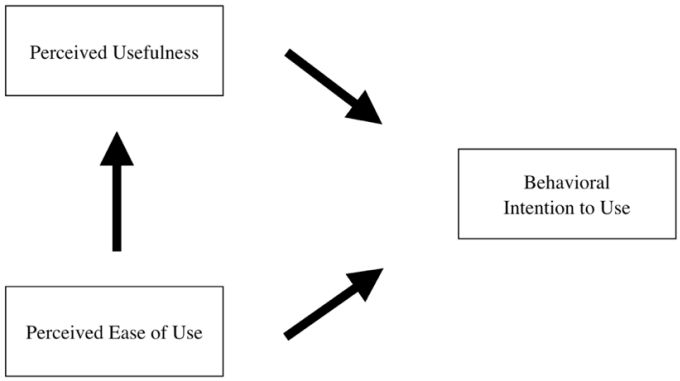

Figure 5. Technology Acceptance Model (Davis, 1989)

In order to complement the existing technology acceptance model, Venkatesh et al.(2003) developed a model called UTAUT (Unified Theory of Acceptance and Use of Technology). The UTAUT aims to explain user intentions to use and subsequent usage behaviors (Venkatesh, Morris, Davis & Davis, 2003). This theory introduced that there are four key determinant factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. As shown in Figure 6, performance expectancy, effort expectancy, social influence are crucial factors of usage intention and behavior, and facilitating conditions directly is related with users' behavioral intention. Gender, age, experience, and voluntariness of use moderately influence on users' behavioral intention.

As an alternative of TAM, Goodhue and Thompson created the Technology-to-Performance Chain Model(TPC), which address that

technology adoption is influenced by the technology's utility and its good fit with the task in the context of which it is used (Goodhue & Thompson, 1995; Beer et al., 2011).

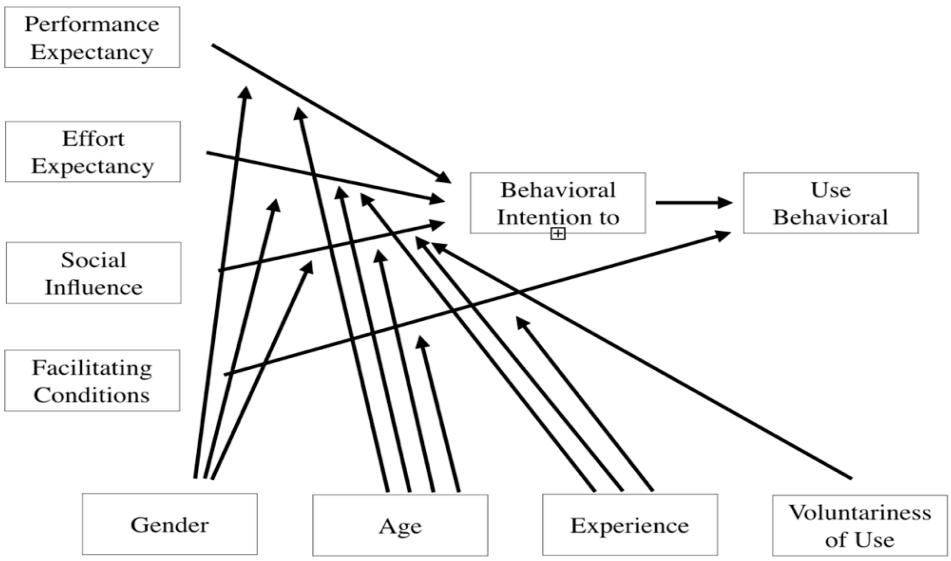

Figure 6. The Unified Theory of Acceptance and Use of Technology

In this study, we utilized the TAM model to evaluate the acceptance of a therapist conversational agent that can be perceived as a social entity. Since acceptance modeling has not yet been applied in a counseling setting with conversational agents, we can say that it is a relatively novel method to use the TAM model specifically to explain users' acceptance of therapist conversational agents.

Chapter 3. Research Model

3.1 Research Scope

In this study, we investigated users' perceptions, and acceptances on therapist conversational agents. Although there are several types of conversational agents depending on their functions, roles, and ways of interacting with users, we only focused on commercially available text-based therapist conversational agents. As mentioned above, we view a therapist conversational agent as a social robot within this study in that it encourages users, expressing warm words, and making them feel at ease during conversation (Shum, He, & Li, 2018). Thus, we excluded conversational agents which have task-oriented characteristics and intelligent personal assistants.

Furthermore, we chose Millennials as target participants because this generation grew up with mobile phones, and research has shown that 60% of Millennials have used conversational agents on mobile apps. Thus, we assume that they are target end users who often access these kinds of social chatbots or therapist conversational agents.

Because most previous research in this area has conducted experiments with participants suffering from mental problems via embodied conversational agents that were created only for the project or experiment, their results gave only limited insight into how therapist conversational agents would work in a

real environment with end users (DeVault et al., 2014; Stratou et al., 2015). To address this weakness of previous research, we conducted an experiment with commercially available text-based therapist conversational agents which anyone can access easily anytime and anywhere on a mobile messaging app.

3.2 Research Questions

Based on reviews of numerous prior studies and our purpose for the study, we established our main research questions with the following concepts: users' perceptions, users' acceptance, and design implications.

(Q1) Users' perceptions

What features of an interface influence users' perceptions? How do users perceive therapist conversational agents?

(Q2) Users' acceptances

Based on previous research, user acceptance of technology is directly and indirectly affected by various perceptions, such as perceived usefulness, perceived intelligence, satisfaction, and perceived fun (Heerink, 2010). Thus, it is crucial to investigate which user perceptions have the greatest influence on their acceptance and adoption of therapist conversational agents.

(Q3) Design implications

Finally, how can knowledge regarding users' perceptions and acceptance of therapists be utilized in therapist conversational agent design?

3.3 Research Hypothesis

To answer Q2, we formulated some hypotheses to examine which perceptions significantly influence their acceptance. Thus, we mainly set intention to use as a dependent variable, while other perceptions functioned as independent variables.

3.3.1 Traditional TAM and Intention to Use

According to the traditional TAM model, users' perceived usefulness and ease of use are determinant factors that influence a users' intention to use technology, and it assumes that a users' behavioral intentions can be used to predict actual usage (Davis, 1989). However, in therapeutic settings, people might desire conversational agents to have social capabilities, such as empathy, social support, and self-disclosure rather than ease of use. Thus, perceived ease of use is not a significant determinant of users' acceptance of therapist conversational agents.

Hypothesis 1 (H1)

H1. *Users' perceived ease of use* of therapist conversational agents does not significantly affect their intention to use.

3.3.2 Common factor and intention to use

Common factors indicate the important factors that mainly influence the outcome of counseling (Lin, 2005; Wampold 2015). A therapist's empathy,

trustworthiness, and expertise are especially important for counseling outcomes and the formation of an alliance relationship (Lin, 2005; Wampold 2015). Thus, we assume that common factor related variables are determinants of a user's intention to use.

Hypothesis H2 (H2)

H2-a *Users' perception of the trustworthiness* of therapist conversational agents significantly affects their intention to use.

H2-b *Users' perception of the expertise* of therapist conversational agents significantly affects their intention to use.

H2-c *Users' perception of the empathy* of conversational agents significantly affects their intention to use.

3.3.3 Interpersonal Communication variables and intention to use

Interpersonal communication variables, such as self-disclosure and reciprocity, are essential in the initial stage of developing relationship (Berger & Calabrese, 1975). When a person communicates with a stranger in human–human interaction, they reduce mutual uncertainty, thereby asking for and giving the same kinds of information at the same rate of exchange (Berger & Calabrese, 1975). Users can also build a level of trust and rapport with

computers via processes of disclosure and reciprocity (Lee, & Choi, 2017). Thus, we will confirm whether interpersonal communication rules in human–human relationships can also be applied to human–therapist conversational agent relationships. In line with these considerations, the following hypotheses are proposed.

Hypothesis 3 (H3)

H3-a *Users' perception of self-disclosure* of conversational agents affects their intention to use.

H3-b *Users' perception of reciprocity* between conversational agents and themselves will affect their intention to use.

3.3.4 Human-Social Robot Interaction and Intention to Use

We developed some constructs that are widely used in human social robot interaction studies. Possible variables that could be included to this study are perceived enjoyment, social support, likeability, and intelligence of conversational agents.

Hypothesis 4 (H4)

H4-a. *Users' perceived enjoyment of* conversational agents will affect their intention to use.

H4-b. *Users' perceived social support of* conversational agents will affect their intention to use

H4-c. *Users' perceived likeability of* conversational agents will affect their intention to use.

H4-d. *Users' perceived intelligence of* conversational agents will affect their intention to use.

In order to investigate the hypothesis and to answer the research question, an experiment was designed as following.

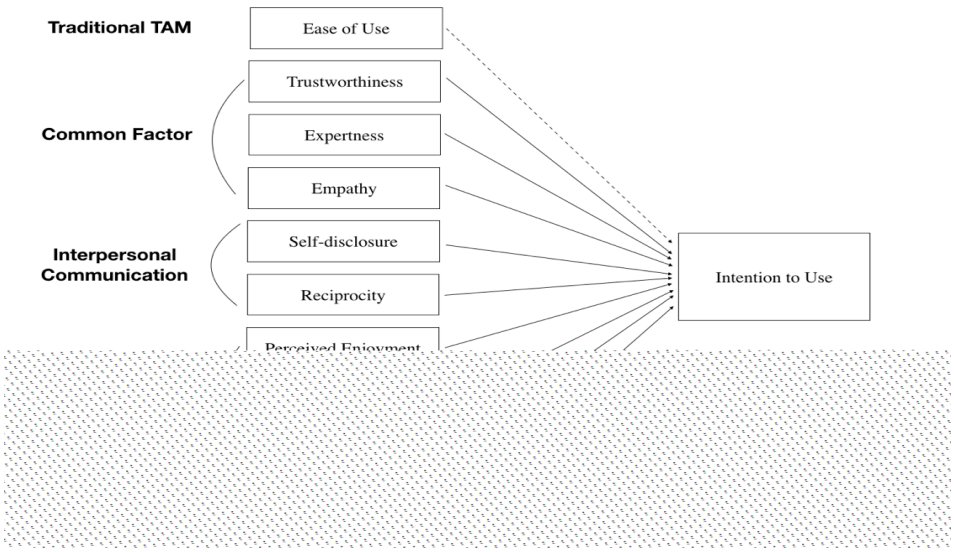

Figure 7. Our hypothesized technology acceptance model

Thus, this study need to be repeated with more participants, a longer period, and a follow-up session to investigate.

Since we narrowed down participant's demographic criteria in terms of age, it is necessary to replicate the form of this study with several different age cohorts of users, including teenagers and the elderly. It is possible that different age groups may have different expectations, perceptions, and acceptance of therapist conversational agents (Heerink et al., 2009; Kurniawan & Zaphiris, 2005). For example, according to research in teen counseling, one of the most crucial factors for therapy's success is a confidential and trusting relationship established between the teen and his or her therapist (Ehrlich, 2003). For teenage users, contrary to the results of this study, there is a possibility that perceived trust and confidentiality might be more important variables for their acceptance of therapist conversational agents.

When it comes to older users, they have not grown up with AI-related technologies and conversational agents that are widely used these days. Considering the characteristics of older users, AI-related technology and conversational agents are perceived as being unfamiliar and could be related to anxiety of use (Heerink et al., 2009). For older users, variables such as perceived ease of use and perceived adaptability can be important factors for users' acceptance of therapist conversational agents (Heerink et al., 2009).

Moreover, based on older users' aging-related physical and cognitive characteristics, older users have different needs from those of younger users. For older users, the interface of conversational agents might include large buttons, display good contrast, have a slow response, include large text size, have compatibility with others, and so forth (Kurniawan & Zaphiris, 2005). Thus, the same interface of conversational agents can be differently perceived depending on the users' age.

Another suggestion for further research is to utilizing behavioral analysis, such as measuring usage time and linguistic analysis (Heerink et al., 2009). Prior research (Heerink et al., 2009) showed that a significant relationship between intention to use and duration of usage has to be established in the context of human-social robot interaction. In the future, by considering both users' cognitive and behavioral responses toward therapist conversational agents, more reliable and robust findings can be obtained.

Chapter 8. Appendix

8.1 Pre-questionnaires

Demographic Information

(1) Age

☐ 10-20 ☐ 21-30 ☐ 31-40

(2) Gender

☐ Male ☐ Female

(3) Department

_____

(4) Major

_____

(5) Counselling Experience

☐ Yes ☐ No

Ten-Item Personality Inventory (Gosling, et al., 2003)

(1) Extraverted, enthusiastic.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(2) Critical, quarrelsome.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(3) Dependable, self-disciplined.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(4) Anxious, easily upset.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(5) Open to new experiences, complex.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(6) Reserved, quiet.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(7) Sympathetic, warm.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(8) Disorganized, careless.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(9) Calm, emotionally stable.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

(10) Conventional, uncreative.

1	2	3	4	5	6	7
Disagree strongly						Agree Strongly

Level of Technological Knowledge

(1) I have lots of technological knowledge about IT and smart device.

1	2	3	4	5
Disagree				Agree

(2) It is easy for me to become skillful at using smart devices.

1	2	3	4	5
Disagree				Agree

(3) I find it easy to get what I need from smart devices.

1	2	3	4	5
Disagree				Agree

(4) Using smart devices in my job/school increase my productivity.

1	2	3	4	5
Disagree				Agree

(5) Using smart devices improve my performance.

1	2	3	4	5
Disagree				Agree

(6) I always try to use smart devices to do a task whenever it has a feature to help me perform it

1	2	3	4	5
Disagree				Agree

(7) I intend to continue using smart devices in the future

1	2	3	4	5
Disagree				Agree

(8) I have a great deal of experience using smart devices

1	2	3	4	5
Disagree				Agree

(9) I have lots of knowledge of chatbot

1	2	3	4	5
Disagree				Agree

(10) I have used chatbot before

1	2	3	4	5

Disagree Agree

8.2 Post-questionnaires

Perceived Enjoyment (Heerink et al., 2009)

(1) It is enjoyable to share a conversation with the chatbot

1	2	3	4	5	6	7

Disagree Agree

(2) I find the chatbot pleasant to interact with

1	2	3	4	5	6	7

Disagree Agree

(3) I enjoy talking with the chatbot

1	2	3	4	5	6	7

Disagree Agree

Usefulness (Heerink et al., 2009)

(1) I will use this chatbot again when I need a counselling.

1	2	3	4	5	6	7

Disagree Agree

(2) I would recommend the chatbot others who have emotional or psychological problem.

1	2	3	4	5	6	7

Disagree Agree

(3) If I had to a chance to use this chatbot again, I want to talk a lot.

1	2	3	4	5	6	7
Disagree						Agree

Social Support (I Leite., 2015)

(1) I find that the chatbot comforts me

1	2	3	4	5	6	7
Disagree						Agree

(2) I feel that the chatbot cares about me

1	2	3	4	5	6	7
Disagree						Agree

(3) The chatbot gives me good advice.

1	2	3	4	5	6	7
Disagree						Agree

(4) The chatbot encourages me.

1	2	3	4	5	6	7
Disagree						Agree

Perceived Ease of Use (Heerink et al., 2009)

(1) I think I know quickly how to use this chatbot.

1	2	3	4	5	6	7
Disagree						Agree

(2) I find the chatbot easy to use

1	2	3	4	5	6	7
Disagree						Agree

(3) I think I can use the chatbot without any help

1	2	3	4	5	6	7
Disagree						Agree

Likeablility (Bartneck et al., 2009)

I think the chatbot is ...

1	2	3	4	5	6	7
Dislike						Like

1	2	3	4	5	6	7
Unfriendly						Friendly

1	2	3	4	5	6	7
Unkind						Kind

1	2	3	4	5	6	7
Pleasant						Unpleasant

1	2	3	4	5	6	7
Awful						Nice

Perceived Intelligence (Bartneck et al., 2009)

I think the chatbot is ...

1	2	3	4	5	6	7
Incompetent						competent

1	2	3	4	5	6	7
Irresponsible						Responsible

1	2	3	4	5	6	7
Ignorant						Knowledge

1	2	3	4	5	6	7
Unintelligent						Intelligent

1	2	3	4	5	6	7
Foolish						Sensible

Trust (Corrigan ,& Schmidt, 1983)

I think the chatbot is ….

(1) Reliable

1	2	3	4	5	6	7
Not very						Very

(2) Trust

1	2	3	4	5	6	7
Not very						Very

(3) Sincere

1	2	3	4	5	6	7

Not very Very

(4) Honest

1	2	3	4	5	6	7

Not very Very

Expertness (Corrigan ,& Schmidt, 1983)

I think the chatbot is ….

(1) Experienced

1	2	3	4	5	6	7

Not very Very

(2) Expert

1	2	3	4	5	6	7

Not very Very

(3) Prepared

1	2	3	4	5	6	7

Not very Very

(4) Skillful

1	2	3	4	5	6	7

Not very **Very**

Self-disclosure (Lee, & Choi, 2017)

(1) The chatbot expose his/her personal information

1	2	3	4	5	6	7

Low High

(2) The chatbot and I exchange enough personal information.

1	2	3	4	5	6	7

Low High

(3) I can talk about anything with the chatbot, even my secrets.

1	2	3	4	5	6	7

Low High

Reciprocity (Lee, & Choi, 2017)

(1) The chatbot gave good responses to my answer

1	2	3	4	5	6	7

Low High

(2) I felt that the chatbot was like my companion or friend.

1	2	3	4	5	6	7

Low High

(3) I think the chatbot and I exchanged opinions as though we were equal in our social status

1	2	3	4	5	6	7

Low High

(4) I feel solidarity with the chatbot after our conversation.

1	2	3	4	5	6	7

Low High

The Care (Mercer et al., 2004)

How was the chatbot at …
(1) Letting you tell your "story"……
(giving you time to fully describe your situation in your own words; not interrupting or diverting you)

1	2	3	4	5	6	7

Low High

(2) Really listening ……
(paying close attention to what you were sayings; not looking at the notes or computer as you were talking)

1	2	3	4	5	6	7

Low High

(3) Being Positive……
(having a positive approach and a positive attitude; being honest but not negative about your problems)

1	2	3	4	5	6	7

Low High

(4) Explaining things clearly……..
(fully answering your questions, explaining clearly, giving you adequate information; not being vague)

1	2	3	4	5	6	7

Low High

(5) Making you feel at ease.....
(being friendly and warm towards you, treating you with respect; not cold or abrupt)

1	2	3	4	5	6	7

Low High

(6) Helping you to take control..... (exploring with you what you can do to improve your health yourself; encouraging rather than "lecturing" you)

1	2	3	4	5	6	7

Low High

8.3 Interface Guideline for Semi-structured Interview

Branding Personality	Personality	Persona. This should be suited to the type of audience you want to address, the type of task you need to complete, and the brand you want to associate this bot with
	Logo Icon	The bot's logo can also imply gender age, and other human like attributes
	Naming	Name can be represent it's functionality, brand name, and trademark.
Conversation	Onboarding	First interaction users see from the bot. it could be a message that the bot sends to the installing user. It sets the first impression.
	Functionality scripting	Suggest two types of conversation. Task-led conversation. A task-led conversation, where the target is to accomplish a task. A topic-led conversation, which purpose to discuss information and exchange ideas around a specific set of subjects.
	Feedback Error handling	Feedback and appropriate handling of failures is key to good user experience.

	Help Support	At any time during the conversation, the user might get lost or thrown out of the happy path or flow.
Rich Interaction	Files	Both bot and users can upload files to the conversation
	Emoji Emoticon	Emoji is a great way for the bot to convey information about states such as task completing or failure and to relay emotions.
	Imaged	As conversations are not super-rich environments, images can enrich the experience and entice the user to take action.
	Buttons	These controls take the form of canned responses in some platforms and full controls in other. Button make users complete the faster by circumventing lengthy conversations.
	Template	Some platforms provide a set of more complex and rich templates, such as message attachments and carousels.
	Persistent menus	As the user may get lost in the conversation, cancel a conversation.
	Typing Indication	The feature enables the bot to fake typing events, giving the user the impression that the Bot is typing a response. This helps give the user a sense of the bot's presence.

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국문초록

텍스트 기반의 대화형 상담 에이전트에 대한 사용 인식과 수용 결정 요인에 관한 연구

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최근 ‘대화형 에이전트(text-based conversational agent)’를 활용한 헬스케어(health care)대한 관심이 급증하면서, 인공지능(artificial intelligence)기반 상담형 에이전트에 대한 관심도 함께 증가하고 있다. 실제로 인공지능 기술 기반 상담형 에이전트들은 모바일 어플(mobile application)을 통해 이미 상용화되고 있는 추세이다. 이러한 상담형 에이전트들은 사용자와의 대화를 통해 사용자가 자신의 감정, 생각 및 심리적 건강상태와 관련된 문제들을 폭넓게 인식하도록 돕는 역할을 담당하고 있다.

인간-컴퓨터 상호작용 분야의 연구에 따르면, 기술이 사용자의 기대에 미치지 못할 때 사용자의 신뢰도가 감소하며 이는 사용자의 기술 수용도에 부정적인 영향을 미친다. 따라서 사용자의 기술 수용도를 높이기 위해서는 기술 사용 경험과 관련한 사용자의 기대에대한 이해가 선행되어야 한다. 그런데 모바일 어플을 기반으로한 문자형 상담 에이전트는 최근에 들어서야 상용화되고 있어 이에 대한 충분한 연구가 부족한 상황이다. 모바일 메세지 환경에서 사용자가 상담형 에이전트에 대해 가지는 기대와 인식, 더 나아가 사용자의 상담형 에이전트수용에 영향을 미치는 요인에 대한 연구가 미비하다.

이에 본 연구는 기존의 기술 수용 모델(TAM)에 인간과 사회적 로봇의 관계에서 자주 평가항목으로 사용되는 요소들과, 상담심리학에서 사용되는 상담사의 자질을 평가하는 요소들, 대인관계 발전에서 중요시되는 요소들을 고려하여 가설을 설정하고 이러한 요소들이 사용자의 상담형 에이전트 수용의도에 어떤 영향을 미치는지 알아보았다.

분석 결과에 따르면, 사용자에게 지각된 상담형 에이전트의 사용 용이성은 기존 수용 모델에서 되던 것과 달리 사용자의 수용 의도에 영향을 미치지 않았다. 반면, 에이전트의 지능, 사용자가 지각한 즐거움, 에이전트의 사회적 지원 정도, 에이전트의 자기 노출 정도는 순서대로 사용자의 수용 의도에 유의미하게 긍정적인 영향을 미쳤다. 이러한 결과는 사용자들이 상담형 에이전트가 자신의 명령에만 수동적으로 따르기를 원하지 않으며, 인간과

유사한 사회적 능력과 의사소통 전략 ‘인간화된 사회성’을 바라고 있다는 점을 암시한다.

주요어: 대화형 에이전트, 컴퓨터 매개 커뮤니케이션, 챗봇, 상담형챗봇, 인간 에이전트 상호작용, 기술 수용 모델

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