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Analyzing the Impact of Chatbot Tone of Voice on Consumer Response and Its Implications for Business Strategies. An explorative study

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Chapter 1.

Introduction

1.1 Introduction

As time passes technology became more impactful in every aspect of our lives and the medical field is no exception, the use of it is creating a very big shift on how healthcare is organized and how it interacts with people (Timmermans & Berg, 2003).

A tool like IOT for example has been growing exponentially in the medical field, after 2020 over 161 million IOT are being used worldwide (https://www.statista.com/statistics/735810/healthcare-iot-installations-global-estimate/) and they are helping the medical service become for efficient and easier to access and use (Mavrogiorgou *et al.,* 2019*).*

Artificial intelligence, also known as AI, is the best automatic piece of engineering that the human created, it is bank of the data that is able to work on his own and acquire even more data to be more efficient (machine learning), this technology can be used in many fields but the focus will be on the medical one, AI works in 2 forms, a physical one such as robots that can help monitor a patient of doing basic tasks or maybe in the future doing true chirurgical operation, and, a virtual one which has the biggest potential through machine learning and the many things it can help automatize and discover (Hamet & Tremblay, 2017).

Together with AI there are virtual agents which provide digital assistance to consumer through chatbots.

In this domain, Chatbots are a technology which provides many useful uses to the consumer, they try to simulate a conversation with a real

human and can be used for many tasks ranging from entertainment to education, they operate thanks to advanced AI and algorithms (Adamopoulou, & Moussiades, 2020). Specifically, a chatbot is a computer program that uses artificial intelligence (AI) and natural language processing (NLP) to understand consumer questions and automate responses to them, simulating human conversation (Sestino & D'Angelo, 2023).

There are many types of Chatbots that operate on two types of domains, one that is "open", and one that is "closed" (Nimavat & Champaneria, 2017) the former is able to access a bank of data that provides him with the knowledge to answer many general questions while the latter is focused on a single field of knowledge and is not able to comprehend and answer question from other fields.

Another distinction is in the way they interact with the consumer Chatbot can operate in two ways: a conversation type of Chatbot will interact like a human and answer question while a Task type of Chatbot will only respond to tasks he gets assigned and must solve (Adamopoulou & Moussiades, 2020).

Chatbots are being used for everything, most commonly, for automated consumer service which also provides personalized solutions to the question that he gets asked, also they can be useful tools for educational purposes and to gather data in order to improve services of many businesses but most interestingly is the use of Chatbots regarding the medical field (Shawar & Atwell, 2007).

Chatbots are revolutionizing the medical field, in fact many tasks that before had the need of human nowadays can be done by an AI, for example when while feeling sick Chatbots are more convenient for asking

them question about symptoms instead of going right away to the hospital or just to ask question about disease in general to acquire more knowledge.

They can also create medical records of the user, keep them in constant update on which treatment they did in the past so that in the future they can easily track their medical history in order to be given a better diagnosis (Chang *et al*., 2022)

Since medical Chatbots are a new technology before becoming common among the population they must be recognized as efficient and able to answer correctly to the question and is given to them, the intention to use this type of service is also influenced by how the Chatbot interact with the human.

The biggest challenge this technology has to face is the concern of the population about privacy and the acquirement of data, to make the medical Chatbots more acceptable more research is needed until it is safe to say that privacy and data breach it's not something to be worried while using this service (Sestino & D'Angelo, 2023).

Recent research studied various characteristics about Chatbots such as a study made by Sestino & D'Angelo, (2023) showing how empathy and human-like interactions can affect positively the consumer intention to use the service, the study showed that consumers consider non-verbal communication (Empathy, emotional understanding) very important in real doctors and even more in medical Chatbots (Sestino & D'Angelo, 2023).

Chatbots operating of a completely artificial manner are shown to perform worse and make consumer skeptical towards the technology indeed Perceived Anthropomorphism in Chatbots creates a more effective interaction in many fields (Roy & Naidoo, 2021).

The graph below shows how important is AI for healthcare right now and how important it will be in the future with an estimated market size of 187.95 billion dollars by 2030 (Fig.1) (https://www.precedenceresearch.com/artificial-intelligence-market)
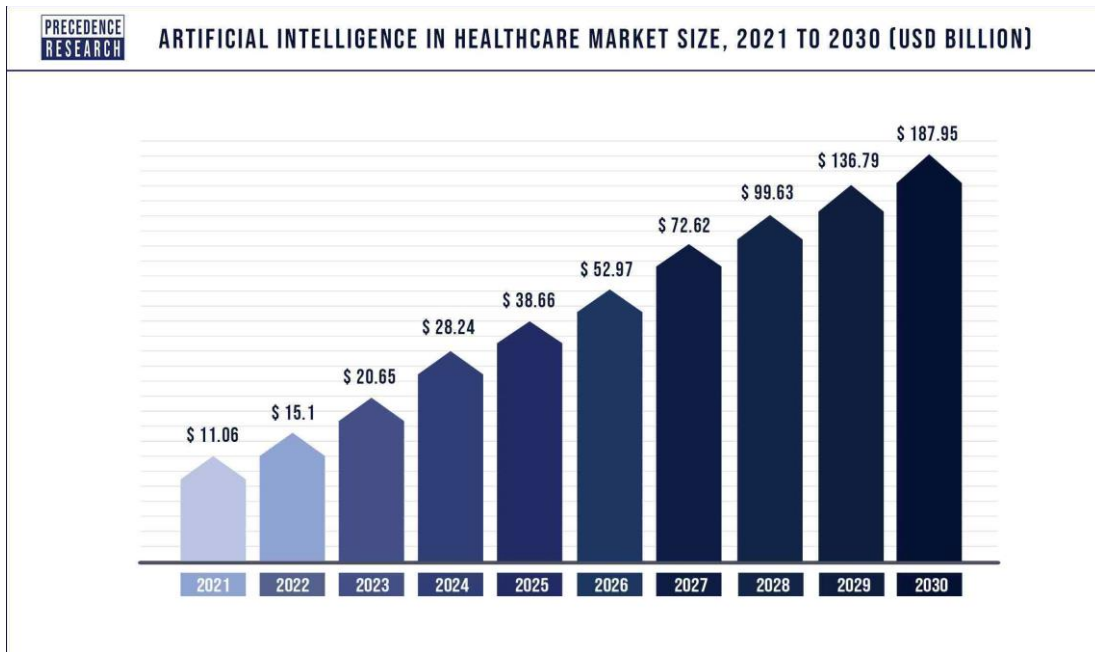

Figure 1. AI in healthcare market size from 2021 to 2030 (USD Billion)

By considering previous literature this thesis would conversely explore the role of the chatbot tone-of-voice (formal *vs.* unformal) in the healthcare setting, and specifically regarding a medical Chabot facing with the final users (patients).

Chapter 2.

Theoretical background

2.1 The use of medical Chabot in the healthcare setting

With AI being implemented in the healthcare industry we are starting to see how useful and powerful this technology really is, it is only a matter of time before it become a staple in every healthcare department (Yu *et al.,* 2018).

This event will open many doors for the use and innovation of medical Chatbots that are already starting to being used for diagnosis, health education and mental health (Nadarzynski *et al*., 2019).

As said in the previous passage Chatbots are automated systems which try to emulate the conversation as if the user was talking with a human being, in the healthcare setting the most famous examples of Chatbots are "Endurance" which is an AI created in order to support people that have developed Dementia or "MedWhat" another AI that is able to answer basic questions about health (Bhirud *et al.,* 2019).

In the near future technologies such as these will be a must in the healthcare industry since with the constant growth of the population, we are destined to experience some type of health crisis in the future, we have already seen with the pandemic how fast the health system can collapse when unprepared (Bhirud *et al.,* 2019).

The graph below shows the Chatbots percentage of use in different field of the healthcare industry, the Psychiatry field is the one with the most usage out of every field being 19% higher than the second one Preventive medicine (Fig, 2) (Budler *et al*., 2019)
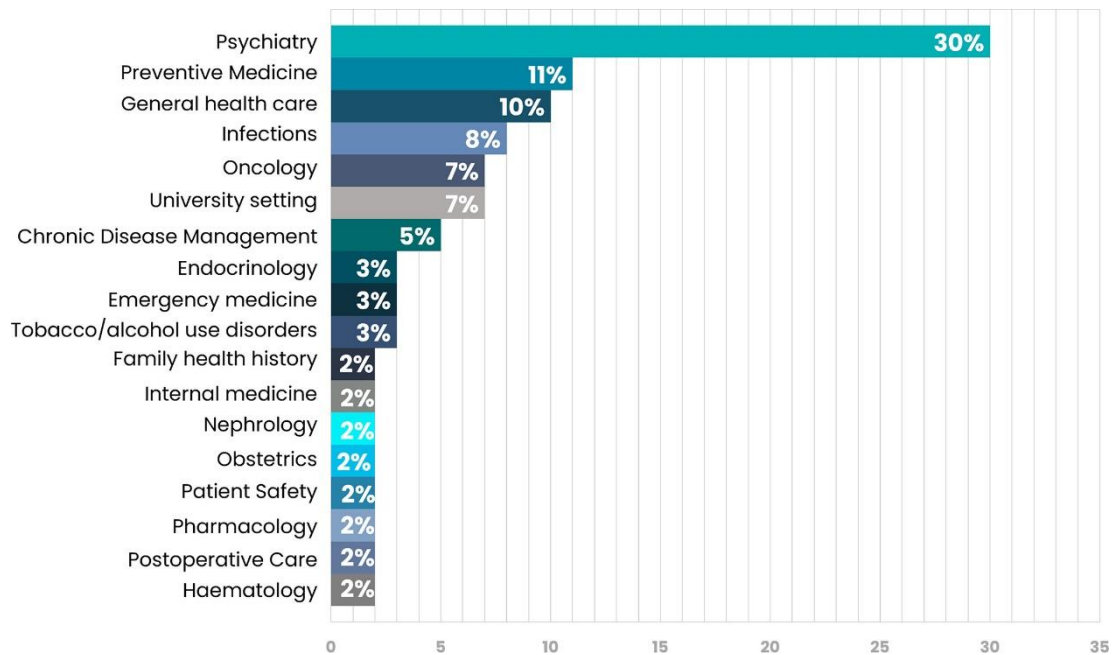
Figure 2. Field of application of conversational agents.

2.2 The role of the chatbot tone-of-voice

AI systems in healthcare utilize large datasets to enhance decision-making and analytical processes, imitating human cognitive functions (Jiang *et al*., 2017), this is done especially in the healthcare industry to create a sense of familiarity between the Chatbot and the Consumer making the conversation as human-like as possible.

Different Chatbots will have different way of talking and so different types of tone of voice, depending on what was intended for the Chatbot to sound-like.

For example, the biggest distinction would be a formal/informal tone of voice with the former being more human-like and warm while the latter more artificial and colder.

It has been purpose of debate which of these two types of tone of voice are the most efficient and overall, more performing, a study made

by Wei Tsang Ooi and Samuel Rhys Cox tried exactly to see how the consumer would react to health-related questions made a formal vs an informal Chatbot (Cox & Ooi, 2022).

They made two different studies, the first one was tasked to see which of the two tons of voice would encourage the consumer to disclose sensitive health information, and the second study to investigate the quality of utterances made by the user.

The results of the study were slightly different from the one we will discuss further into the paper, in fact the results showed that people were not affected by the tone of voice when disclosing standard questions but when they were confronted with more personal and sensitive questions about medical history the formal Chatbot was more likely to get the consumer to disclose sensitive information with an higher quality and also people that did not have and healthy behavior provided higher quality of utterances when the conversation was more formal (Cox & Ooi, 2022).

The result of this study can't be applied to all aspect of healthcare since the research was about the disclosure of information and not on the use of the Chatbot on field, for example a strictly formal approach might have worked for this type of study but for mental-health research might have had completely different results.

Further research is needed to comprehend which type of tone of voice in Chatbots is to be used in the various subject and fields of the medical industry.

2.3 The role of Chatbot warmth

One of the many struggles that AI technology is facing is the mistrust of people on the subject and how some of them are wary about this new technology, the solution to reduce this skepticism might rely on how the

consumer feels when talking to the Chatbot and this can be done with two social components one being warmth and the other being competence (Kervyn *et al.,* 2022).

Warmth is set to create an emotional trust in the consumer towards the Chabot (Aaker *et al.,* 2012) while Competence influences the rational trust of the consumer (MacInnis, 2012).

Which of the two is more effective on the consumer has been studied by Alexander J. Kull, Marisabel Romero, Lisa Monahan, the research they made was set to discover how warmth and competence impact the brand engagement, results showed that both warmth and competence influence the consumer and that both are a staple of social perception (Kull *et al.,* 2021).

After three experiments it is shown that the initial messages wrote with warmth managed to reduce the distance between consumer and brand, it also increased the engagement in comparison with competence (Kull *et al.,* 2021).

The feeling of warmth is better experienced with an unformal type of language and tone of voice.

2.4 The role of anthropomorphism in chatbot design

Anthropomorphism regarding Chatbots is a characteristic that implies human-like feature in the AI, some of them can relate to the traits and pattern of speech of the Chatbot like emotion, empathy or informal language even with a bit of humor.

Other characteristics can also be visual and auditory, such as talking to an AI represented as human-like avatar with a human-like voice (Han, 2021).

Anthropomorphism in the healthcare setting has been revealed to be a key-factor when interacting with patients, so much so that transmitting emotion in a digital environment might affect the intention to use of the technology, the perceived anthropomorphism can also be amplified with the use of a digital avatar that resembles the features of a human being instead of a plain Chatbot (Sestino & D'Angelo, 2023).

According to a previous study about perceived anthropomorphism The Uncanny Valley Theory says that highly anthropomorphic avatars have to possibility to stimulate psychological warmth in the patient (Kim *et al.*, 2019), in the healthcare industry this is particularly relevant especially because the Chatbot will be dealing with people that present some type of struggle and so warmth might be the key to help the technology success.

Thus, based on the reasoning above, we reason that:

Hypothesis. The medical chatbot tone of voice (unformal *vs.* formal) positively influences individuals' perceived anthropomorphism through the effect of the perceived warmth.

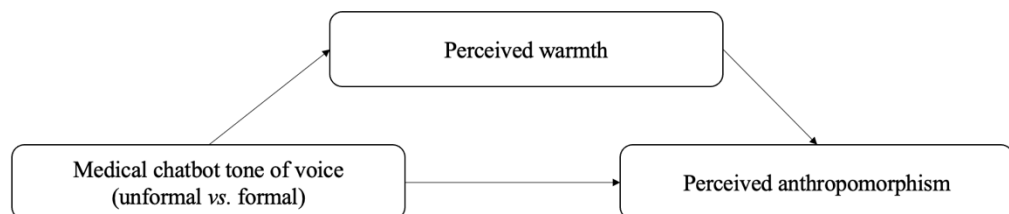The hypothesis is also shown in the figure below (Fig. 3)

Figure 3. The proposed conceptual model: The mediator effect of warmth

Chapter 3.
Methodology

3.1. Methods

In order to prove our hypothesis, we made a survey Via Qualtrics and sent the link to compile it to 150 participants, the questionnaires were fully anonymous and the answers were based on personal believes without right or wrong answers.

The survey was divided in 2 parts, in the first one the questions were about general health concerns and emotional receptivity without any type of scenario involved but after that every participant would be assigned one of 2 distinct scenarios randomly, one where they were presented with a conversation with a medical Chatbot with a formal tone-of-voice while in the other one the Medical Chatbot had an unformal tone-of-voice.

We asked participant to indicate their perceived anthropomorphism by using the scale proposed by McLean & Osei-Frimpong (2019), on the basis of four items (i.e., "When I communicate with the digital doctor, it feels like someone is near me", "The interaction experience with the digital doctor is close to that with a human being", "During interactions the with the digital doctor, I feel like I am communicating with a human", "I interact with the with the digital doctor in a way similar to how I interact with people"). Then we asked them to rate their perceived warmth based on their believes, the scale used for this task was made by Aaker, Vohs, & Mogilner (2010) based on five items (i.e., "I believe that the medical chatbot has good intentions toward customers", "I believe that the medical

chatbot is warm", "I believe that the medical chatbot consistently acts with the customers' best interest in mind", " I believe that the medical chatbot is kind", " I believe that the medical chatbot is generous".

The answer ranged on a scale from 1 to 7 (1= "Strongly disagree") (7= "Strongly agree").

The type of analysis used in this study is the Statistical mediation model, it consists in researching how variables can be influenced by other variables, in depth the model works with three components: (X), (Y), (Me) these being in order the independent variable, the dependent variable and the mediator.

(X), in our case "Chatbot tone of voice formal and unformal", is the variable that is being manipulated in order to study their effects on (Y), "Perceived anthropomorphism", the role of (Me)," Perceived warmth" which is influenced by Y, is to functions as the link between X and Y.

The Statical mediation model is seen through a regression equation, to study the relation between the variables X, Y, if their relation is significant, it means that the mediator explains the interaction.

In summary, the purpose of the analysis is to study how changes in the independent variable affect the dependent one with the use of a mediator between the two (MacKinnon, 2012).

Chapter 4.

Results

4.1 Results

For the sake of testing the conceptual model (Fig.1) we decided to use the Model 4 of PROCESS, by considering three variables during this process: The first one as the independent variable (i.e., "Chatbot tone of voice"); the second one, acting as the mediator (i.e., "Perceived warmth"), and finally, the third one as the dependent variable (i.e., "Perceived Anthropomorphism").

Results of our statistical analysis showed how the Perceived Anthropomorphism was enhanced when the person was confronted in the scenario where the Medical Chatbot had an unformal tone of voice (b = -.122, t=-.191, p=.002) because of perceived warmth, influencing their final perception of the interaction (b=.666, t=10.268, p=.000).

From this study we can assume that tone of voice does in fact influence the perception of the consumer and how in the medical settings an unformal and human-like language can positively influence the consumer into feeling comfortable using this technology.

Dependent variable: Perceived Anthropomorphism (*Y*)	b	*SE*	*t*	*p*
Constant	.466	.263	.177	.005
Chatbot tone of voice (unformal *vs.* formal)	-.122	.103	-.191	.002
Chabot warmth	.666	.054	10.268	.000

$R^2 = .434$, MSE = 1.552,

$F(2, 147) = 56.301$ $p = .000$

Note. $N = 150$.

X = Chatbot tone of voice (independent variable); Me = Chatbot warmth (mediator);

Y = Perceived Anthropomorphism (dependent variable).

Table 1. Results of the mediation analysis (Mod. 4).

Therefore, the results presented above provide strong empirical backing for our initial hypothesis: They clearly illustrate that the manner in which a chatbot communicates (and thus the "type of chatbot tone of voice"), whether it adopts a formal or informal tone, significantly influences how people perceive its human-like qualities, in terms of individuals' perceived anthropomorphism.

Furthermore, these results highlight that the extent to which individuals perceive a chatbot as having human-like traits is closely tied to the chatbot's perceived warmth. In other words, the level of friendliness or approachability attributed to the chatbot plays a pivotal role in shaping its anthropomorphic qualities in the eyes of users.

This conclusion is supported by the observed relationship between the chatbot's tone of voice and its perceived warmth, indicating that the choice of language and communication style directly impacts users' perceptions. When a chatbot adopts a more formal tone, it tends to come across as less warm and personable, potentially diminishing its anthropomorphic qualities. Conversely, when the chatbot uses an informal tone, users are more likely to perceive it as approachable and friendly, enhancing its human-like characteristics.

This insight provides valuable implications for designing and implementing chatbots in various applications, such as customer service or virtual assistants. By carefully considering the tone of voice and warmth conveyed by a chatbot, developers and businesses can optimize users' experiences and the chatbot's effectiveness in engaging and assisting users. Moreover, understanding the nuanced interplay between language style, warmth perception, and anthropomorphism sheds light on the fascinating dynamics of human-technology interaction, with potential applications in fields ranging from psychology to human-computer interaction research.

Chapter 5.

Discussion and implications

5.1 Overall discussion

As previously anticipated, with the technological progress that has been made in the recent years it is only a matter of time before every aspect of the work environment will get influenced by the new technologies.

AI, also known as artificial intelligence, is constantly in a state of evolution, the traditional work as we know it is starting to experience a transition in many fields and the implementation of AI is going to take over at some point and facilitate new frontiers.

These new frontiers range to a lot of different fields of work, for example education, environment, finance and the topic of this study, healthcare.

These settings are all very different from one and other, but this only proves how powerful and useful this technology really is, being able to be applied in many fields and revolutionizing them to be less man-reliant and more automated.

The focus of this study is solely on the healthcare system and the possible improvements that can be made through AI and the use of Chatbots.

As detailed before, AI and Chatbots are being already implement in the healthcare system but with the technology being still new, the full potential of it, is yet to discover and it is far from being optimized.

The Healthcare field it's not the same the Industrial field, it is not working on the development of a product, but it is based on the human

interaction, the product is the medical treatments and the consumer is the patient, based on this knowledge we can say that the improvement of the AI can't be only focused on his performance but it must consider also the fact that is interacting with human beings.

This study will in fact focus on this last section, how to improve the interaction between the Chatbot and the patient with the help of various tools such as tone of voice, perceived anthropomorphism and warmth while discovering the potential role of these variables in specific scenarios.

5.2 Theorical implications

Literature about Chatbots in healthcare is getting more attention as the years pass, previously, in this thesis was explored the previous literature regarding the topic of this study.

This paragraph will consider the discoveries of this thesis and implement them to the previous literature to enrich it.

It has been debated which type of tone of voice a Chatbot has to use to deliver a better service to the consumer, a study made by Cox & Ooi, similar to the one of this thesis, tried to prove how people, in a health-related setting, were more inclined on giving away sensitive information to a more formal Chatbot (Cox & Ooi, 2022).

Our research demonstrated indeed that when people are confronted with a more friendly Chatbot they feel secure, because to them it feels like they are talking to a human and this sense of security made through warmth can improve the overall experience of the patient.

In a healthcare environment this might be the preferred option since the Chatbot will be dealing with people that have problem and are seeking help.

Regarding anthropomorphism it is very important to understand how it can affect the interaction between the Chatbot and patient, a Chatbot can be coded to have human-like features and can follow patterns of language that have the goal to express feelings and empathy (Han, 2021).

A past research made by Kim *et al*., discovered that the perceived anthropomorphism is enhanced by warmth, this builds trust between the patient and the Chatbot that especially in a healthcare setting will improve the performance of the interaction (Kim *et al*., 2019).

With this thesis we can further implement this topic with more knowledge since we discovered that not only this is true but when adding an unformal tone of voice, the perceived anthropomorphism is enhanced and increases when the Chatbot is warm.

Skepticism is a big roadblock for AI, since it is a new frontier of technology many people don't want its implementation even though it could improve the system.

This feeling of skepticism might be related to the interaction of Chatbots and consumer which can create uneasiness when the conversation is too cold robotic, a solution could be the implementation of warmth in the patterns of language of the Chatbot (Kervyn *et al.,* 2022).

Alexander J. Kull, Marisabel Romero and Lisa Monahan studied this topic and made research about it, the results of which confirm that warmth increases brand engagement and reduces the distance between the consumer and the Chatbot (Kull *et al.,* 2021).

The results of this thesis indeed confirm this hypothesis and can add the knowledge that not only warmth helps with the overall experience but is a key factor because it makes the Chatbot more anthropomorphic thanks to the perceived warmth.

5.3 Managerial implications

From the results of this study is possible to make assumptions on the managerial impact that our discovery can have on the modern-age healthcare system, AI it's still not used to his full potential and in some places it's not used at all, this is destined to change in the future because of the constant evolution of the healthcare system which is very competitive, in order to not fall behind, every company will implement some type of artificial intelligence in their systems.

This research can help medical companies understand how Chatbots can improve the overall service that they can provide, we stipulated five possible implication that could be applied to the healthcare setting thanks to our results.

5.3.1 Product development

In a health-related setting the product stands for the treatments and diagnosis that are given to the patient that is the active consumer of the product, even though in this scenario it is appropriate to take a step back and focus on the development of the Chatbot itself, it is a must to engineer an AI that can mimic the human-like informal tone of voice desired in order to meet the requirements that enhance the perceived anthropomorphism through warmth so that the patient can actively perceive the emotional closeness that the Chatbot aims to radiate.

This will indeed let the patient feel like he is talking to a real human and make him feel more comfortable using the service.

5.3.2 Marketing implications

A good advertising it's essential in order to make a new product known to the general public but it can be quite a challenge especially in the case of AI applied to a healthcare environment, indeed this topic is a bit controversial even though it has been proven to be very useful.

Since it is a new frontier of technology, some people will be skeptical at first so the advertising must be done softly with the focus of the message not being related on the performance of the Chatbot or how it can improve the healthcare system but the advertisement should deliver the message that the Chatbot is programmed to be warm and make the patient feel safe when using it thanks to his human-like features.

In this age Chatbots are the ones helping with the advertisement of various product thanks to their automated system and fast interactions with consumers but when it's the other way around is rare to find example of a Chatbot being advertised.

In summary the key factor to a good marketing strategy for this type of technology is to focus on the fact that the Chatbot can act like a human and that especially in a healthcare setting this feature can help patients feel like they are interacting with a real person thus making the use of Chatbot more comfortable.

5.3.3 Market segmentation

This implication is a key factor for managers wanting to implement this kind of technology, knowing who your potential consumers are is a staple for every business, and healthcare is not different.

Market segmentation is helpful because it consists in dividing a large group of consumers into smaller ones, dividing them by many

characteristics in order to understand who would be more interested on using this type of service, since AI is a new frontier of the healthcare industry, we can assume that people of older age might not be interested as much as young people, because they won't accept the reality of giving the responsibility of their health to and Artificial Intelligence.

This is only a speculation; further studies might confirm or deny this hypothesis.

Another possibility of the Market segmentation will regard the type of patient and healthcare setting this Chatbot would fit best, since the core aspect of this AI are its capabilities to act like a human and be warm toward the patient, the most fitting setting could be to help people who struggle mentally and whom would feel better if the Chatbot talked in a way that transmits positivity and warmth while giving some kind of empathy toward the patient, instead of an AI that just speaks completely formal and can only answer with cold and informative responses.

5.3.4 Business strategies

AI is already being implemented in a lot of businesses and its usage it's different in every one of them, Chatbots are mostly used to gather data and function as guidance for the consumer.

Regarding the healthcare setting there are four business strategies that could be applied thanks to the use of this Chatbot in order to get competitive advantage over the competitors.

The Chatbot through its first interaction with the patients is able to divide the different needs of each patient and assign them to the most appropriate health department that can provide the best treatment for their symptoms.

Since the first diagnosis is made by the Chatbot via online texting, it's an improvement both for the consumer and the clinic.

The patient benefits by saving a lot of personal time since he doesn't have the need to take an appointment, wait a few days and then go the doctor in person, instead, he can receive the first diagnosis with the Chatbot and then go to the clinic to confirm his diagnosis and then get the treatment needed.

The clinic on the other hand benefits massively from the reduction of structural costs since the first diagnosis is made by the Chatbot and from the overall improvement of the services.

Having a medical Chatbot available at every time for your potential consumers increases the value proposition of the clinic by a lot, particularly, in comparison with the competitors that don't provide this type of service at all.

With the implementation of this technology, the clinic can profit from a business model that is completely online, reducing costs and always making the service available for everyone in every place.

5.3.5 Legal implications

From the beginning of its creation, the biggest challenge AI had to face is the problem with privacy and data breaching.

AI and Chatbots are completely automated and work with a massive amount of data, in order to function properly the AI is scripted to follow pre-determined algorithms and every interaction provides him with personal information of the consumer that gets stored into system.

Data privacy, regarding the use of AI, is the most important topic especially for the healthcare system, since every information about the patient is sensitive and should never be of public domain.

This is a big problem because there isn't a strict regulation about this topic yet so the consumers are not fully protected, because it is a new frontier of technology the legislation is yet to be completed and also it can't just focus on the legal aspects but it's must to establish a strict ethic guideline to protect the consumer for any type of data breach and privacy leaks.

Chapter 6.

Conclusions

6.1 Conclusion

In this study, our primary focus was to delve into the realm of artificial intelligence (AI) and its various applications, with a particular emphasis on its role in the healthcare industry.

Chatbots are revolutionizing various aspects of the healthcare industry ranging from providing information about symptoms and treatment options to maintaining and updating patient medical records, additionally, they contribute significantly to enhancing the overall patient experience, making healthcare services more accessible and convenient.

However, even though these advancements are very promising, persistent concerns surrounding data privacy and security continue to pose a challenge to this technology that needs to be addressed before Chatbots can be used safely by the consumers.

The goal of this research was to gain a deeper understanding of how to optimize the implementation of chatbots in healthcare settings. Our specific focus was on examining how the tone of voice used by these Chatbots can either positively or negatively affect the patient experience.

This thesis went into details on previous literature regarding Chatbots and the variables we used to conduct the experiment, tone of voice (formal vs unformal), perceived anthropomorphism and warmth.

This was the hypothesis on which this study was based:

"The medical chatbot tone of voice (unformal vs. formal) positively influences individuals' perceived anthropomorphism through the effect of the perceived warmth."

In order to gather enough data, we submitted a survey that via Qualtrics to 150 individuals of different age and gender.

Each participant engaged in two distinct scenarios, interacting with a Chatbots that used either an unformal or formal tone of voice, in order to analyze the data, we used the Statistical mediation model.

The results of the study indeed confirmed this hypothesis, demonstrating a significant connection between the tone of voice used by the chatbot and the perception of anthropomorphism, mediated by the perception of warmth.

In summary, the study found that when the chatbot used an unformal tone of voice, it created a greater sense of warmth in users, which, in turn, led to an enhanced perception of anthropomorphism. This outcome signifies the importance of the chatbot's conversational style that is able to influence the perception and the interactions of the AI assistant.

It also highlights the potential for Chatbots interactions to create a more human-like and empathetic experience in a healthcare setting, ultimately improving the effectiveness and acceptance of these AI tools.

6.2 Limitations and future research

Despite of the promising results of the experiment presented in this thesis, this study has its limitations, which can suggest some important implications for future research.

Firstly, even though the results were very useful, this research, is far from being done, in order to implement a medical Chatbot as efficient as possible a lot more studies on the subject are needed.

Secondly, future research might want to investigate other variables such as the intention to use the Chatbot or how it can be influenced by socio demographic variables such as the age of patient, for example it can be studied how the recent generation is more inclined on implementing Chatbots in healthcare and using them for their own health problems while elderly people might not respond in the same way and be more skeptical about the subject.

Thirdly, the same thought process could be applied for the grade of education of each person, who has more knowledge might understand better how Chatbot is truly helpful and can save a lot of money and time while the people that have little knowledge on the subject would never replace a human with a machine.

In summary, this are all speculations but it's only a matter of time before future research will find a lot more aspects to enhance the use and the performance of AI in the healthcare setting.

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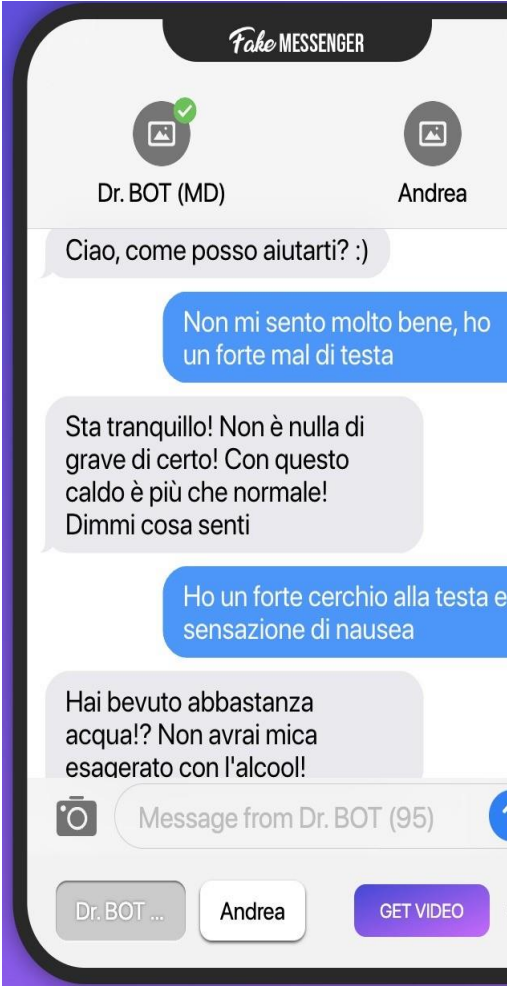
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Appendix

Medical chatbot tone-of-voice (x) (Unformal *vs.* Formal)	
Formal	*Unformal*

Warmth

Source: Aaker, Jennifer, Kathleen D. Vohs, and Cassie Mogilner (2010), "Nonprofits Are Seen as Warm and For-Profits as Competent: Firm Stereotypes Matter, "Journal of Consumer Research, 37 (2), 224-237

Items:

- I believe that the medical chatbot has good intentions toward customers
- I believe that the medical chatbot is warm
- I believe that the medical chatbot consistently acts with the customers' best interest in mind
- I believe that the medical chatbot is kind
- I believe that the medical chatbot is generous

Perceived Anthropomorphism (Y)

Source: McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa… examine the variables influencing the use of artificial intelligent in-home voice assistants. *Computers in Human Behavior*, *99*, 28-37.

Items:

- When I communicate with the digital doctor, it feels like someone is near me

  The interaction experience with the digital doctor is close to that with a human being

- During interactions the with the digital doctor, I feel like I am communicating with a human

- I interact with the with the digital doctor in a way similar to how I interact with people