Chatbots and its impact on user experience

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ABSTRACT

Computer interfaces which can simulate a conversation with human, or chat, with the help of artificial intelligence are referred to as Chatbots. In this paper, the various user experience factors with reference to chatbots are reviewed and tested. Several different user experience and user satisfaction models and frameworks are described in the literature reviews which are used in the research.
A cross-sectional survey to analyze the user experience, as well as satisfaction, was used to understand the scenario. Data analysis is done using various machine learning techniques and AI algorithms & further study of the data can reveal that the use of chatbots have a significant influence on the user experience. This paper will conclude with the details about the major factors which have a significant impact on the nature of interaction with chatbots for a positive experience.

Keywords
User Experience, Chatbots, Artificial Intelligence, Machine Learning

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Introduction

The rapid rise of digitalization has been a propelling force leading to the change in which people communicate and look for solutions. The significant growth in the penetration of internet and mobile devices has also been some of the important factor in this revolution. The numbers of e-commerce and mobile platforms have been growing rapidly since the last few years and with that the customers are also evolving, looking for new alternate and more convenient ways of communication.
Today the journey of a customer is much more complex than it ever was. With multi touch points across various online as well as offline channels, the customer moves fluidly across all. What once felt like a difficult feat to achieve is a pretty simple task now a days. Chat bots are interfaces that are used to simulate a conversation between the users and provide the necessary information. Recently the trend has been changing and many of the companies are moving towards chatbots.
Like the several disruptions in technology there have been numerous external factors and development which have led to the rise of chatbots in the recent years. The advancement in Artificial intelligence and rising trend of messaging have been two major factors which have simulated the growth of Chatbots lately. Companies are evolving technically, and more and more efforts are being put into research in order to explore new possibilities.
Chatbots which can be implemented to improve the Omni-channel customer journey through a combination of artificial intelligence and machine learning have been getting traction since the last few years. From Haptik, to Ruuh to Yana to many more, companies are using chatbots to enhance the user experience.
The growing trend of digitalization it doesn't comes as a shock that chatbots have been on an upward curve. And with the addition of AI and machine learning Chabot's today can handle complex tasks while making the interaction with the user as human as possible. With the correct personalized solution, companies are being able to use the contextual data to create customized and personal experience in real time with the help of chatbots.
With the changing trend several companies including airlines, fashion brands, BFSI companies have all started providing services to their customers with the help of their messenger apps or websites. Airline companies today allow the travelers to check in, get information, and ask queries through Facebook messengers. Instead of calling or emailing or using any other mode of communication it is easier for a user to reach out to the company for more information.
The automated conversational agents or chatbots can automate the interaction between the customer and the company. It engages in a conversation by using the natural language as output. Chatbots have been around in the online web-based environments since a long time and are used to enhance the customer service. However, today chatbots are shifting towards mobile messenger interface. The fact that they can respond with messages, links, updates, recommendations and even call to action buttons, customers can even shop for products by just going through carousel.
The chatbots can recognize the intent of the buyers and refine the offerings according to the choices and preferences; today they can even facilitate the sale, order and also the delivery process. The use of chatbots has been extremely appealing to the companies because of the fact they shorten the buying process for the customer, and since chatbots are independent platform downloading a separate app or add on is not required.
But due to its novelty, there is currently a minimal amount of research being done on the acceptance and the experience it provides to the users. But it is extremely valuable to be aware whether potential users have the intent to use them. One of the best ways to measure how effective a technology is to check the user experience. And since chatbots are conversational interfaces, user experience plays a vital part.

This research emphasizes on the elements which impact the user experience of chatbots. To analyze the perception of the users towards chatbots we chose the following research question "Do chatbots enhance the user experience?"
The structure of the paper contains of five primary sections. The initial section includes discussion of the relevant literature followed by the research question and hypotheses. Thirdly we explain the methodology and the approach used to understand the results. Fourthly the results which are obtained from the survey are presented. And finally, the conclusion and recommendations are being provided.

Literature Review

The time has changed and the recent advances in the field of machine learning (Press, 2016) in alignment with the Artificial Intelligence have led to fast improvements in Chatbots. Recently there has been an explosion of chatbots in the market, with numerous companies (Knight, 2016) coming to the foray to provide the Chatbots of their own. The Chatbots have now started representing the companies during their conversation with the customers.
The first chatbot, ELIZA, which was created in 1966 laid the platform and ever since the goal is to convince the customers that they are interacting with a human and not a bot. And gone are days when Chatbots only performed as machines following commands, today they are much more than that and also possess human conversational skills (McTear et al., 2016).
All the recent developments have made the chatbot systems much more advanced and flexible in reference to understanding the wants and the variation of the same command by the customer. Apart from this the growth of cloud-based systems and Internet of Things has also been a major contributor towards it.
With access to Artificial Intelligence and Application program interface Chatbots have become smarter with access to higher amount of information and knowledge garnered through plethora of databases available. All the above-mentioned facts have been quite a reason behind the resurgence of Chatbots in the recent year, but all those won't be worth if they are not able to live the expectations of the customer.
Recently in a research conducted by Forrester found out that around 57% of companies have already implemented or are planning to add Chatbots to provide immediate services to the customers. Another research firm Juniper Research recently published a report about Chatbots which claimed that the advances in Chatbots will save the companies $8 Billion in the outlay in the next 5 years.
Since years personal meetings and discussion over phone calls have been considered the real mode of communication, but with the rapid rise of the internet many new options have surfaced including the likes of email, social media, apps, and much more recently, Chatbots (Dove, Halskov, Forlizzi, & Zimmerman, 2017).. A report published on Drift showed that people from all 195 countries around the world are using online chatbots to get details from businesses. This population is spread across demographics including people working at companies of every size, industry and sector. The report also revealed that 41% of the people using Chatbots were executives and decision makers.
The adoption of new technologies by users indeed takes time and education about it. Understanding the ways in which the systems can add value into the life of the users is the key to success. Paying attention to the key factors which can help in enhancing the user experience (O'Brien, 2017) of the customers interacting with the chatbots is extremely vital. The one thing which can be improved by constant efforts is how Chatbots are perceived by the customers.
Understanding the reason behind the Chatbots being only considered as computers and not as humans is the vital clog behind the revolution. Artificial Intelligence and Natural Language Processing (NLP) help the Chatbots to understand the language, but the other factors including that interactions are much more than just language understanding should also be taken care of to improve the perception of the users.
Humans have different characteristics, they have feelings, they have emotions (Kaushik, Jain, et al., 2014), and different personalities and behaviors have different influence on the mode of communication and interact with the users. Chatbots need to keep all of that in mind and incorporate the ability to stimulate the above skills, so that it can be considered more than just a bot. They need to be aware of the social as well as the emotional cues provided during human interaction and the behavior that drives them in to the action.
Since the primary objective of the company is to improve efficiency, effectiveness or satisfaction, Chatbots can be used by companies in order to improve significantly from the traditional systems. In this paper, we look at whether the user experience can be improved with the use of Chatbots. The aim is to develop the user experience with the help of chatbot interfaces by concentrating on the personality of the chatbot ensuring that the expectations are met in accordance with the brand image.
Earlier chatbots were considered as "Weak AI" which made them a system only used to complete repetitive tasks and analyzing information. But with the rapid strives being made in the field of technology Chatbots have become much more than just bots.Today through chatbots like Haptik, one can book flight, book movie tickets, check status, and get a lot of information on variety of subjects. But all this was not possible earlier because of the lack of technology. Just like Haptik, there are many other chatbots which are cropping up into the picture like Ruuh, which is designed by Microsoft, GupShup and many more. Earlier Chatbots used to have scripted rules embedded within them and the responses to users were given from a pre-defined set of stored response. This approach which is basically known as Stimulus response approach just matched the input of the user against a large set of pre-defined and stored patterns, which were then showcased as outputs. But in today's times there are retrieval-based models and generative models available. In retrieval-based models the Chatbot used store and predefined responses to provide the output, but the latter can make use of new inputs based on the input provided by the users. Though the first model is much simple and easier to implement it is the second model which makes the chatbots humane. Today one can see chatbots in education (Letzter, 2016), e-commerce (Chai et al., 2001), information retrieval (Shawar, Atwell, & Roberts, 2005) and services (MarutiTechlabs, 2017) and at many more places as recent advances being made in the technology including machine

learning, AI, and NLP providing them with better capabilities. Michael Mauldin coined the term "Chatter bots" in 1994 which was later renamed to Chatbots, referring to the robots which can chat and provide services to humans. Chatbots can also be termed as conversational user interfaces. And today with the emergence of voice recognition technology across mobile devices it is common for a chatbot to support voice input and output in order to allow more accessible interface. The definition of Chatbots have changed significantly over time, from a system to help users in performing tasks to virtual assistants on the web (Smiers, 2017)., chatbots have come a long way. They are used for multiple purposes like retrieving information, service, support, purchasing of product, or any other use. In addition to the companies even many messaging platforms have integrated Chatbots in their system; Facebook, Hike, & Skype are some of them.

Research methodology

Models:

The User Experience Model: User Experience is a recent concept and refers to all the emotions of the users such as beliefs, emotions, and preferences, physical and psychological responses that occur before, during and after the use (ISO 9241-210, 2010). The above factor showcases that there are various aspects which are affects the user experience. To further understand our study, we split user experience in to four factors including Utility, Usability, Desirability and Brand Experience.

Hypotheses

Hypotheses 01: There is no substantial difference on the user experience with the use of Chatbots.
Hypotheses 11: There is a substantial difference on the user experience with the use of Chatbots.

Equations

The TAM (Venkatesh 1999 2000) or the Technology Acceptance Model is used to check the user acceptance of the technology (Davis, 1985). Questions based to measure the perceived usefulness and the perceived ease of use can be determined through the questionnaire. The first half of the model uses questions to find out how useful the technology is while the second half measures the ease of use (Davis,1985).

Hypotheses

Hypotheses 02: There is no significant difference in the perception of the user about increase in utility with the use of Chatbots.
Hypotheses 12: There is a significant difference in the perception of the user about increase in utility with the use of Chatbots

Usability

Usability focuses on the extent to which a particular task is performed and is an integrated part of the user experience (Kaye, 2007). We use the UMUX (Finstad, 2010; Lewis, 2013) model (Usability metrics for user experience) to measure the usability (Brooke, 1985) of Chatbots. The use of highly correlated questions based on Likert scale give us the perception of the users towards the usability (Finstad, 2010). of the Chatbots.

Hypotheses

Hypotheses 03: There is no significant difference in the perception of the user about increase in usability with the use of Chatbots.
Hypotheses 13: There is a significant difference in the perception of the user about increase in usability with the use of Chatbots.

Desirability:

The desirability refers to the emotions which a user feels towards the system. To measure how desirable the chatbots are to user we used Heart framework (Rodden, Hutchinson, & Fu, 2010) by Google. The framework involves five different metrics, Happiness, Engagement, Adoption, Retention, & Task Success to measure how interested the user is to use chatbots.

Hypotheses

Hypotheses 04: There is no significant difference in the perception of the user about increase in desirability with the use of Chatbots.
Hypotheses 14: There is a significant difference in the perception of the user about increase in desirability with the use of Chatbots.

User Satisfaction and Experience:

The experience which the users have and the satisfaction (Kiseleva et al., 2016) level that they attain is usually assessed after they have used the system. And to perform the overall evaluation we use the Paradigm for Dialogue Evaluation System (PARADISE) (McTear et al.2016). The questions (Walker, Litman, Kamm, & Abella, 1997) are based on the task performance and task success which then is reflected by the metrics.

Hypotheses

Hypotheses 05: There is no significant difference in the perception of the user about increase in user satisfaction with the use of Chatbots.
Hypotheses 15: There is a significant difference in the perception of the user about increase in user satisfaction with the use of Chatbots.

Results & Analysis

The data was collected with the process of cross-sectional research methodology. Cross sectional study has always been regarded highly in comparison to the longitudinal study which repeats the same users repeatedly over a period. Thus, cross sectional studies are comparatively practical and cost- effective since they don't have any problem such as respondent attrition.

We received 163 responses for our survey which comprised of users across various demographics. Out of the total respondents around 59% were male and rest were female. Around 4% of the respondents were 0-18 and 35+, 51% were of 18-25 years of age whereas 44.4% were between 25-35 of age. The majority of the respondents were highly educated with around 55% holding a master's degree whereas around 40% of the rest holding a bachelor's degree.

The process of collection of data was through a questionnaire which was created on Google forms. The questionnaire was then forwarded to people from various demographics and the responses were recorded. All participants were clearly given details about the aims, and objectives of the research.

The study used IBM SPSS for analyzing the data. There was also some use of Microsoft excel for some operations. All the data was normally distributed, and the model and the hypotheses tested.

First, we analyzed the current situation and modes of communications which are being used by the users. The analysis showed that around 77% of the users have still been using telephonic mode of communication to communicate to businesses in the last 12 months. Talking about the frustrations faced will other communication channels about 60% of the respondents said that other modes of communication took too longer to find the solution and don't operate after the normal work hours.

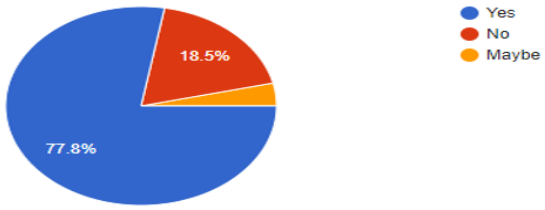

Figure 1. Have you ever used chatbots before

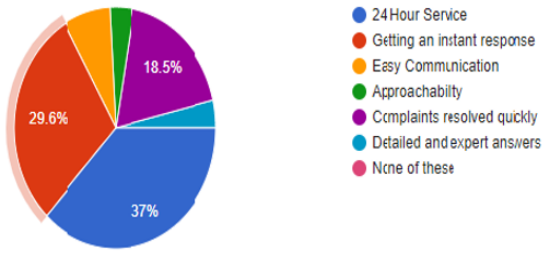

Figure 2. If chatbots were available (and effective) for the online services that you use, which of these benefits would you expect to nejoy?

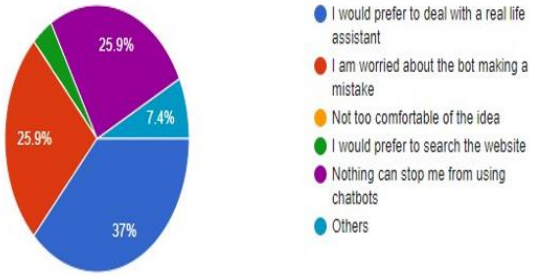

Figure 3. What would stop you from using a chatbot

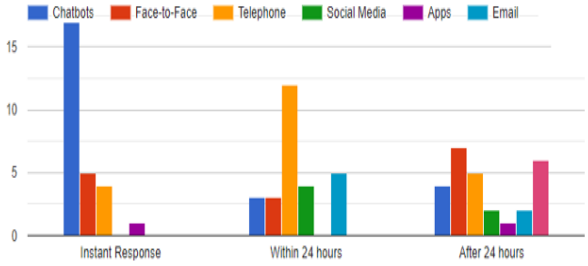

Figure 4. How soon would you expect a response from each of these communication channels?

From all the respondents around 77.7% of the users had used chatbots previously. Out of all the respondents who had used chatbots 37% used them to get 24-hour service while around 30% used it to get an immediate response.

When we checked the consumer perception about the response time for each channel, 70% of the users replied that chatbots are the best means to get an immediate response, while 40% preferred telephones to get response within 24 hours.

When asked about what would make them stop using chatbots 37% respondents said that sometimes they would like to interact with real life assistants while 26% were worried that the bots would make a mistake.

Utility

Question	Mean Difference	Sig. Value(2 Tailed)
Because of the Chatbot, you can quickly execute your task	2.374	0.001
It was easy to reconstruct the question when you were asked to?	2.222	0.003
Chatbots make tasks difficult to execute	2.045	0.0023
Using chatbots I can quickly think about my next action	2.444	0.0032
I am better informed by using a Chatbot	2.556	0.000
Were you able to get all the information you desired to from the system?	2.633	0.000
Do you think the system was able to understand your question?	2.333	0.001
Were you able to get the information you wanted?	2.436	0.000

Yes=3, No=1, May Be=2

The interaction with Chatbot is clear and understandable	2.370	0.003
There was not much of a mental effort required to interaction with a Chatbot	2.230	0.002
Chatbots are easy to use	1.360	0.000

Strongly Agree=1, neither agree nor disagree=3, Disagree=5

Usability

The Chatbot was able to meet your requirements	2.444	0.0001
Using chatbot is a frustrating experience	1.222	0.002
Chatbots are easy to use	2.741	0.000
Chatbots are fun to use	2.963	0.0043

Yes=3, No=1, May Be=2

Desirability

Using Chatbot is exciting	7.375	0.001
Using Chatbot is interesting	6.703	0.000
Using Chatbot is Enjoyable	6.884	0.003

Positive=10, Negative=0

Using chatbots fits my lifestyle	2.481	0.002
Using chatbots syncs perfectly with the way I like to engage in content	2.444	0.004
I think it is easy to learn about using Chatbots.	2.222	0.000
I think finding what I want via chatbot is easy	2.593	0.000
Assuming I had access to chatbots, I intend to use it.	2.330	0.003
Using a messenger chatbot seems fun	2.148	0.000
Messenger chatbots make online shopping more interesting	2.815	0.000
Using messenger chatbots seems a good idea	2.258	0.001
I would like online shopping with messenger chatbots	2.465	0.002

Yes=3, No=1, May Be=2

Satisfaction and user experience

Overall, were you satisfied with the chatbot system?	6.704	0.000
Was the pace of the interaction with the chatbot appropriate?	7.673	0.000

Positive=10, Negative=0

Do you think you would use chatbots again?	2.370	0.001
Was the chatbot slow in replying?	2.593	0.002

Yes=3, No=1, May Be=2

I would recommend chatbot to a friend	1.443	0.003
I am unsatisfied about chatbots	3.593	0.002
I intend to use chatbots shortly	1.556	0.000
I believe that my heed to use chatbots in the near future will increase.	2.259	0.001
I intent to use chatbots in the near future	1.446	0.003
I recommend others to use mobile messenger chatbots	1.407	0.001
I am very concerned about the information I share with the chatbots that it can be misused.	2.715	0.003
I am concerned about what others can do with the information that I provide to chatbots.	2.926	0.004
I am concerned about my information being used in way I did not foresee.	2.889	0.001

Strongly Agree=1, neither agree nor disagree=3, Disagree=5

We analyzed the data with the help of one sample t test in which the confidence interval was taken as 99% for higher accuracy. For all the variables $p<\alpha$ so we reject H0a i.e. null hypothesis and we can say that there is a substantial difference in the average perception of the consumers with respect to all the above factors.

Further we will check that whether the average perception is positive or negative for the significant variable. For that we will use descriptive statistics. From the mean difference we found out through the test we see that the perception is positive for most of the variables.

Conclusions

After examining the hypotheses and from the study it was evident that for all the four factors, Utility, Usability, Desirability, and Satisfaction, the null hypotheses were rejected which means that the use of chatbots has a significant positive impact on the user experience.

The rejection of all the null hypotheses of the sub variables leads us to our main research question which is whether the use of chatbots influence user experience. So, from the study we find that our main null hypotheses are also rejected which means that the use of chatbots has a positive effect on the user experience.

Through this research we have analyzed that chatbots do indeed have a significant effect on the user experience no matter whether it's a simple or a complex task. It proves that use of chatbots provides better utility, usability, satisfaction and credibility for the users. Some of the aspects were identified from the study which can help in further improving the experience.

a) Artificial Intelligence: The AI is one of the most important aspects when it comes to chatbots. Having an unintelligent chatbot is not what the user's want. Most of the users were unsatisfied because of the reason that the chatbots were not smart enough to handle their query.

b) Goal Chatbot: Having explained to the user about how he/she can use and get the desired action from the chatbot and what the main goal of the chatbot is important. All the important information's which are vital for the users to know should be present.

c) Quick Replies: As we saw most of the users preferred chatbots because they could get quick replies from the system and get their queries handled immediately. Maintaining that and giving relevant information in the supposed time should be of utmost importance.

d) User Interface: Having a good user interface is also important to keep the users engaged and not bored. Putting the important buttons at the prominent places of the page should be taken care of seriously.

e) Security: Security if very important to the users as we found out in our study that the respondents had a pretty neutral perception about the safety aspect, so providing them secure and safe way to communicate should be of high importance.

The popularity of Chatbots is increasing, however when using such a technology like Chatbots, it is very important to implement it effectively. A way to measure the effectiveness is to measure the user experience. Therefore, we had this study on the effect of use of chatbots on user experience. The research question is "Do chatbots enhance the user experience?" The corresponding hypotheses were:

Hypotheses 01: There is no significant difference on the user experience with the use of Chatbots.

Hypotheses 11: There is a significant difference on the user experience with the use of Chatbots.

After conducting one sample t test we found that there is a significant difference in the user experience with the use of chatbots. The study is not only beneficial for theory, practitioner but also for implications in industries. This will further pave our way for future investigations with respect to implication of use of chatbots.

Limitations

The study findings and related implications should be considered with alignment to the following limitations. Firstly, the data was collected in one specific region and it is suspected that the current findings may be different when other cultural or regional backgrounds are considered.

Secondly, the present study was focused on only psychological factors, other factors including personality attributes, and other aspects were not explored which could be taken care for. Similar studies can render a deeper comprehend understanding of other psychological factors.

Finally, self-reported data can be subjected to bias, so different techniques such as interviews, focus group discussion etc. can be considered. In future we can also consider including personalization of chatbots into our research.

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