Understanding Conversational Usage Patterns between English and Hindi

Nidhi Tarware
Dhirubhai mbani Institute of Information and Communication Technology
Gandhinagar, India
nidhi04here@gmail.com

Meet Mungra
D IICT
Gandhinagar, India
meetmungra22@gmail.com

Harshit Parmar
D IICT
Gandhinagar, India
harshit2801parmar@gmail.com

Yahs Chaudhari
D IICT
Gandhinagar, India
yashchaudhari4888@gmail.com

Kalyan Sasidhar
D IICT
Gandhinagar, India
kalyan_sasidhar@daiict.ac.in

***bstract*—Conversational agents have exploded in popularity over the past three years around the world. This paper focuses on mazon's conversational agent, lexa. Usage of conversational agents reached India four years ago and got adopted by the country with the Hindi speaking skills.**

This paper presents two studies researching the working of this conversational agent in English and in Hindi and the behavioral differences between the two. In the first study, we conducted basic surveys and interviews to obtain and understand the mental model of users. The device we used was mazon Echo Dot third generation. For the second study, we gathered thirty-two participants who belong to different regions of India and had them interact with the device. We found interesting revelations about the working of the conversational agent, lexa. We conclude with suggestions for improvements in future designs or redesigns of the product.

***Index Terms*—**
Conversational agents, lexa, regional accents

I. Introduction

conversational agent is a dialog system that processes natural language and responds to queries in human language. This interaction can be an informal chat or the device provides the user with relevant information corresponding to a specific task that a user asked to perform. This interaction presents an auditory feedback and sense to the user for performing many tasks ranging from query response to automating the turning ON and OFF of appliances.

The performance of these conversational agents is increasing exponentially in understanding the need of the user [1]. mazon lexa is a conversational agent that was released in the year 2014. It holds around 80% of market share by value in Indian market [2]. mazon released the device Echo Dot in Indian market in the year 2017 along with the ability of the agent to respond to queries in Hindi and Indian English. The device plugs into a normal electric socket and requires WiFi for functioning.

This paper explores the research question of how different languages impact the working of a conversational agent. Furthermore, we try to find if accents play a role in the interpretation and to what extent. s far as concerned, we did not find any such similar work in India. We first gathered data about the language the device is majorly used in and then obtained a perception of the mental model of users via interviews. mental model is a representation of someone's perception about something. This gave us the opportunity to curate a questionnaire that challenges the conversational agent's skills. We then conducted interactions with 32 candidates and supervised these interactions to observe and analyze the behavioral differences when a user interacts in English to when interacted with in Hindi. This mix of quantitative and qualitative methods allowed us to obtain a better perception of how people use lexa and why in the way they do. Fig. 1 depicts the client server architecture model of lexa receiving and responding to user queries.

Fig. 1. Information architecture: When a user makes a request, natural language processing is used for the speech recognition. The request is fed into server and a textual response is received which is then converted to speech in mazon cloud. [3]

II. Rel ted Work

Very few works have studied the ability of lexa to understand and interact in different languages. Work in [4] revealed how virtual assistants like mazon lexa could be used to learn the Japanese language for people having Japanese as a second language. They collected data from six participants from a private university in Japan and analyzed the data.

nother study [5] conducted in the US in 2018 showed how households use lexa for their daily tasks and activities. The authors gathered data from 75 participants and analyzed the data to understand the usage patterns.

Researchers in Ireland [6] tried to understand what people expect from their conversations with personal assistants. Semi-

structured interviews from that study help in the design aspect of the conversational agents.

III. Study Methodology

Fig. 2. Project Timeline

To understand how conversational agents interact in different languages, we engaged in survey analysis followed by a contextual experiment. We surveyed to understand the target audience and how they were using conversational agents in their daily routine and for understanding mental model of the lexa. mental model is a representation of someone's perception about something. We circulated a google form across various universities for a wider range of audience including students from non-tech background. fter the survey, we interviewed those participants who took part in the survey and are from our university. The survey helped us better understand our audience and their thoughts about conversational agents. The interviews welcomed space for open ended questions. We went into a bit of depth about their usage pattern. We tried to find some pain points that each of the participant faced while their regular interactions with the device. Using the responses to this survey, we curated tasks and questionnaire for the next part of the study.

fter the successful analysis of the survey, we moved on the the next phase of the study, phase two, i.e. the experiment. The experiment was conducted with university students aged between 17 to 25. Out of the 32 participants we gathered, 14 are from Western India and 6 each from Central India, South India and North India as seen from the Figure 3. Most of the participants have a mother tongue which is not Hindi or English (non native English speakers) and have an accent when speaking Hindi and English. ll of these participants have different accents. For instance, a participant from North India pronounces weather as *'whey-thur'* where as another participant from Western India pronounces it as *'way-thur'* with a slight emphasis on the letter 'a'. This diversity allowed us to test the device's abilities regarding the understanding of a language in different regional accents across various themes.

The experiment was conducted on mazon Echo in our research lab. It is shaped like a hockey puck and includes a visual cue shown in Fig. 4. The study environment was a lab having the lexa plugged in and connected via WiFi. The account connected to the device was reset to get the original quality of responses.

The participants were asked to interact with the device via a set of tasks and questionnaire. These tasks were divided across four themes namely, Common, Education, Entertainment and Technical listed in Fig. 5.

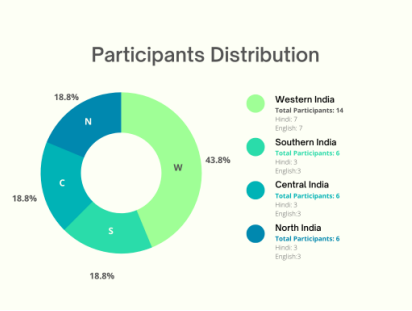

Fig. 3. Participants Distribution

Fig. 4. mazon Echo Dot 3rd Generation

IV. Findings

We conducted this research in mainly two phases. In the first phase, we conducted a survey followed by brief interviews, as mentioned in the study methodology, and then we conducted the experiments with 32 selected candidates. We supervised all interactions and made notes. The aim was to see how a conversational agent would respond in various ways.

. *Findings from phase one*

We received 62 responses from different universities. Participants who responded to the survey form were adults. mong all participants, 17.7% of students preferred Hindi as a language for conversation with virtual assistants, and 74.2% preferred English. The rest of the students preferred native languages as per their location. We observed that only 40.3% audience was satisfied with the conversational agents while interacting in their preferred language. We also tried to understand the mental model of conversational agents these participants have in their minds. From what we understood is that around 46% people having lexa in households consider lexa as a worker for them. The other 54% consider it as a family member. One of the participants we interviewed was a homemaker who lives with her working husband. She quoted *"Now that my kids left for college, it is nice to have her around. lmost feels like I'm talking to a human."* nother 20 year old university going participant said *"I ask her to open geek humor. She tells me jokes related to science and technology. I reuse these to crack them to my friends! It's fun."*

B. *Findings from phase two*

The purpose of including each of the mentioned tasks in the set is to test lexa's skills. To find if and how different

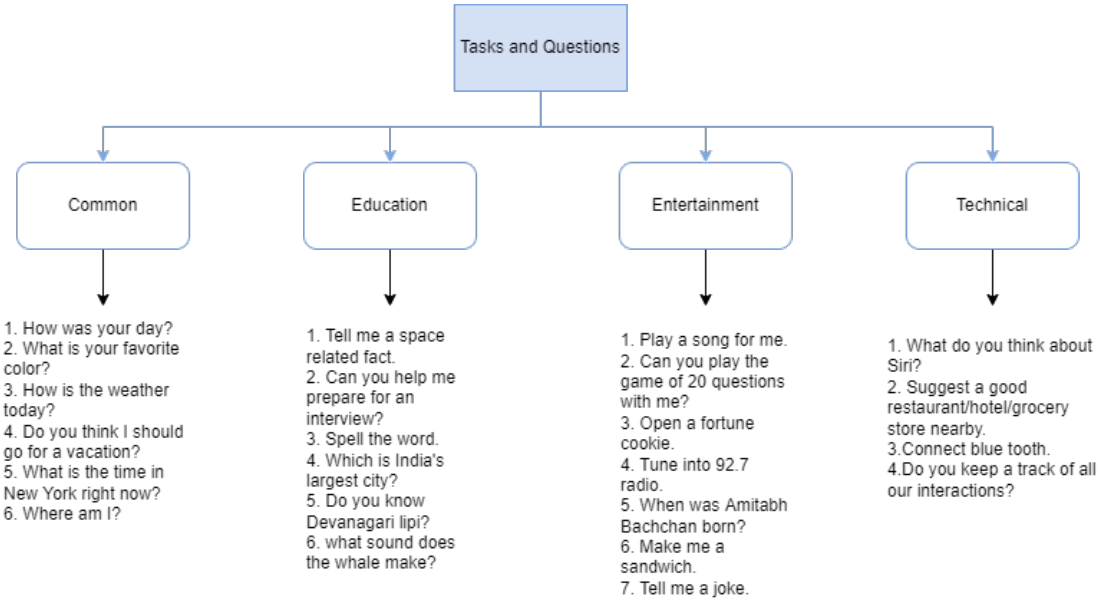

Fig. 5. Tasks were divided into four themes- Common, Educational, Entertainment and Technical

regional accents affect the quality of responses, lexa was tested in different aspects. When it was asked a basic question of 'how was our day?',it responds interactively in English but couldn't understand the same command in Hindi. There were no patterns or certain accents that it could not understand but the command itself.

n observation to make is that the conversational agent has a hard time trying to understand nested queries. For instance, upon asking it, 'Can you help me prepare for an interview?' , it responses with detailed steps to prepare for an interview from an article from the web. But when we slightly change the question to 'Can you help me prepare for a design interview?', it fails to interpret and says 'Sorry I don't know this'.

To induce a proper flow of conversation, we asked the participants to play the game of 20 questions which is an interactive game where one player thinks of a word in their mind, and the other gets 20 questions to ask about the thing. The goal is to guess the word correctly before the limit of 20 questions is reached. The observation was that this game is only designed to be played in English and not yet programmed in Hindi. Fig. 6 illustrates the accuracy of the conversational agent in responding to the questions in both English and Hindi.

ccuracy here is the total number of valid responses from the total number of tasks each participant performs across one theme. response is considered valid if a participant is satisfied with the response they received.

To sum up all interactions with a diverse set of participants, we can say that a lot of skills designed in English are not yet developed in Hindi.

V. Conclusion

The recent past has witnessed a tremendous growth in conversational agents such as lexa Google ssistant, Siri, and Bixby. The usage of these devices has also increased

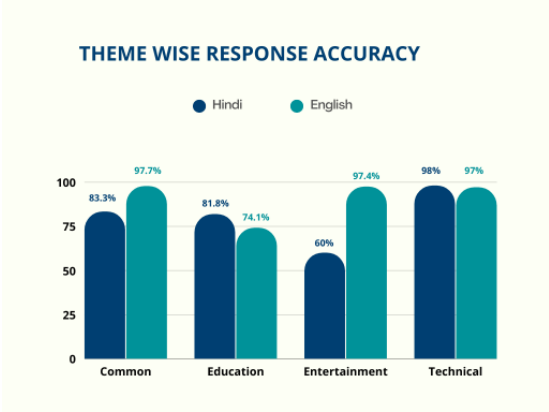

Fig. 6. Response ccuracy of lexa in Hindi is about 83.3%, 81.8%, 60% and 96% for the themes common, education, entertainment and technical respectively. For the same questionnaire in English, the accuracy percentages are 97.7%, 79%, 97.4% and 97.04% for common, educational, entertainment and technical questions respectively.

multi-fold across the world particularly, in the subcontinent of India. However the diverse languages across the country presents a big challenge for these devices and lexa seems to have overcome the challenge due to its growing popularity across households in India.

In this paper we conducted a study using a cohort of 32 students to see how lexa responds to different kinds of questions when asked in both English and Hindi, particularly, Hindi speaking people from different regions of India. Our hypothesis was that lexa would give similar responses when asked in either of the languages. However we found interesting insights after the study. The accent each participant has while speaking either of the two languages play quite a factor in testing interpreting skills that lexa possesses.

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