

“A User Study on Communication and Collaboration Mechanisms used by Visually Challenged Chess Players”

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Declaration

I declare that this document has been written by me in my own words and if some third party's ideas or words have been included, I have referenced the original sources. I also declare that this project report document has been prepared as per lab expectations and any policies of TCS Innovation Labs - Mumbai have not been violated during the preparation of this document.

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Approval Sheet

The Summer Internship Project titled "A User Study on Communication and Collaboration Mechanisms used by Visually Challenged Chess Players" at TCS Innovation Labs - Mumbai by Roopa Narayan Sahoo, Roll No: 126336001 is approved for partial fulfillment of the requirements for M.Des Degree in Interaction Design.

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Introduction

We conducted a user study on visually challenged chess players to understand communication and collaboration mechanisms amongst them. We also studied their chess playing mechanisms. We tried to identify problems, potential areas for development and have come up with possible solutions.

About the Team

The project team comprised of 2 team members - me, Roopa Narayan Sahoo, a student at IDC, IIT Bombay and Mr. Ankith Reddy, from TCS Innovation Lab under the guidance of Mr. Pankaj Doke, TCS Innovation Labs - Mumbai.

Project Brief

The goal of the project was to find out how blind people (particularly blind chess players) across different parts of India socially collaborate with others, how they access information and use communication technology and its use in blind chess playing. The aim of this study is to find out the problems that they face while doing this and the opportunities that may be there in designing better ICT systems for blind users.

About Blind Chess

Chess played by the blind is usually referred to as blind chess. In blind chess play, a specially designed chessboard and play-pieces are used. The play-pieces have pins at their base that fit into holes provided on each square of the chessboard. Additional projection is provided on the tip of all black pieces for tactual differentiation from the white pieces. The player needs to scan the board by touching all the pieces on the chessboard by hand, to understand the current layout. This helps the player determine the next move on the board. The rules and regulations of game play remain the same for blind chess as for regular chess.

There are many Blind Chess Associations in India at state and national levels affiliated by All India Chess Federation for the Blind (AICFB). At the international level organizations such as the International Braille Chess (IBCA) promote this form of chess among the blind.

Users

A total of 43 interviews were conducted in Mumbai and Hyderabad with blind (both partially and totally blind) users belonging to various places in India from the following profiles:

Demography Data: 43 Users

Age Group

10-14 Years	14-18 Years	18-30 Years	30-40 Years	40-60 Years	60 Years above
1	4	14	15	8	1

Gender

Male	Female
42	1

Education

Below 10 th Std	10 th Std	12 th Std	Graduation	PG	Above PG (PhD)
2	5	11	20	4	1

Occupation

Student	Employed	Self- Employed	Unemployed
15	11	14	3

Blindness: [Appendix – I]

Totally Blind	Partially Blind
25	18

Place of Residence

Places	Number of Users
Mumbai/Maharashtra	21
UP	1
MP	1
Delhi	1
Punjab	3
Orissa	6
Gujarat	6
WB	2
Karnataka	1
Tamil Nadu	1

Rated Chess Players (Elo Rating) [Appendix – II]

Rated Players	Non-Rated Players
10	33

Methodology

- User study
- Data collection
- Analysis
- General Findings from the user study – observations, insights, interpretation, design opportunities, design ideas.

The team conducted semi-structured interviews by using a questionnaire. During interviews, a partnership was developed with the user by casual conversation. It was made sure that the interviews were conducted with the users alone with no other people present who could influence the users' statements for the questions asked. Interviews lasted between 30 minutes to 1 hour. Audio Conversations were recorded with the consent of the users. During the interview notes were taken by one of the team mates.

Analysis

The recorded interviews were analyzed by team members in detail as soon as possible after the interview. For analysis, we walked through the audio recordings and noted down interesting user statements, observations, design insights and design ideas. The findings were then sorted as per their relevance to the focus.

Presented in the rest of this report are the findings from the user study and some design ideas that were generated during the process.

Findings

General findings from the user study are listed here. The findings comprise User Statements [US], Observations [OB], and Design Insights [DI].

Note – The User Statements [US] are transcribed from their regional languages to English.

Chess learning and practice behavior

User Statements

- [US]: There is lack of time and unavailability of suitable chess playmates/partners.
- [US]: Few of the chess players self-learned chess by listening to others playing chess and also by reading chess books.
- [US]: Some of players took an interest in chess only after losing their eyesight.
- [US]: For self-learning, all chess books should be available in Braille.

Observations

- [OB]: Most learnt chess from either their school teachers, friends or from family members (father, mother, wife, uncle, brother) at beginners' level. Very few chess players got professional coaching from professional chess

coach/international grand masters.

- [OB]: Most of the chess players were practicing during the time of tournament – just before the tournament or in between the matches. They had not been practicing at home on a regular basis.

Design Insights:

- [DI]: If tournaments are arranged on regular basis and more frequently, then they can get an opportunity to play and practice chess.
- [DI]: If centers with computerized chess-playing facilities are provided for the blind, then they can practice chess regularly.
- [DI]: If any remote collaborative dedicated platform for blind is available to play chess, then it could help those people who are technology/computer savvy.
- [DI]: If there is some platform to interact with expert/good chess coaches online or offline, it will help them to improve their skill in chess.
- [DI]: There should be more support given towards teaching chess to the beginner blind chess players and also arranging infrastructure for further improvement of blind chess in India.

Experiences and challenges in playing chess remotely

User Statements:

- [US]: For good communication during a normal game, players feel it mandatory to know all notations (used in Chess) properly.
- [US]: Experience is enjoyable while playing on phone. Players can memorize all the board steps by talking over phone. If players play remotely it helps them to visualize the board properly thus increasing visualization power.
- [US]: The blind chess players opt for either a voice call (mobile phone/telephone) or SMS to play remotely. Those that have access to internet on computer also plays via Skype or voice chat.
- [US]: During remote play, the player has to pronounce properly and loudly; otherwise he needs to frequently ask the opponent to confirm the step he played.
- [US]: Playing chess remotely involves the additional tedium of communicating the step through the communication device (usually over a telephone/ mobile phone) which adds to the play time, and involves the charged service of the particular network service provider.
- [US]: Due to network problems or hearing/listening problems, it might be difficult to understand the move played, and hence take more time to follow the step or it may lead to wrong steps.
- [US]: There are times when while playing on the internet, due to patchy internet connectivity, a disconnection results. However, since there is no form of feedback (apart from visual) in such cases, the blind players are at a loss and do not understand what to do.
- [US]: Blind people face the dual difficulty of being unable to see the virtual chess board as well as memorizing all the steps while playing on the internet. To resolve this, players use two boards - one for themselves and another for their friends (opponent) to simulate the steps the opponent player played online.
- [US]: In remote play, there are chances of cheating - say the person on the other end may refer to a book, find an appropriate move and then reply, which the opponent will not be able to know. Hence, in such cases, the game play may end up as 'book against book', resulting generally as a drawn match.
- [US]: There is a comfort zone when playing on Skype. They can play according to their comfort. But in face-to-face matches, the surroundings affect and the players need to adjust themselves as per situation.
- [US]: Computers generally make moves very quickly without much error in decisions. Players tend to feel nervous and confused when they play with computers. However, some players take this as a challenge that pushes them to better their game.

Observations:

- [OB]: Around 50% of those interviewed played chess remotely with other players staying in different places either by using mobile phone on mobile network, or PC on Internet.
- [OB]: The rest cannot avail this facility due to either being unable to afford the cost of Internet charges on mobile or wired Internet network or the cost of purchasing a PC, or are not technology savvy.
- [OB]: For practice, some of players prefer to play face-to-face with opponents while others train by listening and following the voice recordings of famous games played by famous chess players across the world. Also, some of the chess players play offline games on PC using PC as an opponent.

Collaboration and Communication Mechanisms

Apart from sharing chess related topics, the users also discuss about new technology, share photos, special quotes, day-to-day life experiences, happy and joyful moments, birth day, life problems as well as profession related topics, cricket, study, travel planning, current affairs and politics with friends on the internet/mobile phone. The following tables provide information on their mobile and internet usage behavior.

Mobile phones used by blind people:

Nokia	Samsung	Others	Non-users
28	6	8	1

Screen Reader software used by blind people:

TALKS	JAWS	NVDA	TTS
5	6	1	1

Preference of Accent used by blind people:

USA Accent	British Accent
18	8

PC Used by Blind:

Using PC	Not using PC	Internet on PC	Internet on Mobile phone
29	14	14	14

[Not using PC: It includes both PC literate and PC illiterate user]

Online Social networking service used by Blind users:

Using online Social network services	20
Not Using online Social network services	23

[Social networking services: Facebook, Twitter Etc.]

User Statements:

- [US]: It takes time to get used to new mobile phones. In the initial stages, a blind person faces problems in using a mobile phone but later copes by memorizing all the functions on the mobile. During the initial stages somebody needs to initiate them about the mobile's functions.
- [US]: During Internet buffering or loading of WebPages the computer screen reader JAWS is muted. At this moment the blind person does not know what is going on and what to do. Also, at times the mobile phones hang, and the mobile screen reader does not speak anything. In this situation, the blind person is clueless about what to do. If some buttons get pressed by mistake, and data gets deleted, then the cause cannot be figured out.
- [US]: Screen reader software cannot read Java applications in computers or mobiles. All chess application software developed in Java technology are not useful for blind people, because screen readers cannot read/understand these software.
- [US]: Mobile banking is not accessible by screen reader software, which is a major drawback. However there is a screen reader called as Mobile Speak, which can be used for mobile banking. So, both software, Talks and Mobile Speak need to be installed on the mobile phone.
- [US]: There is screen reader software called Lekha in Hindi language for mobile/PC user. NVDA (Non Visual Desktop Access) for PCs is an open-source screen reader software used by the blind people. NVDA offers support for Indian languages such as Punjabi, Hindi, Urdu and even Nepali for free.
- [US]: Social networking sites help in communicating and getting suggestions from others. It kills loneliness. We can communicate with friends without phone calls, which does save money. It is easy to communicate with anyone by sending message on Facebook or Gmail.
- [US]: Advantage of social network site is, a person sitting anywhere in the world can share anything with anybody.
- [US]: All software made available for the blind should also support other Indian languages, apart from English.

Observations:

- [OB]: Most of the screen reader users prefer USA accent because it sounds clearer to them than the British accent.
- [OB]: 25 users use screen reader software like Talks on mobile and JAWS on PC, while the rest of the users do not use any screen reader software. The screen reader software called Talks provided by Nuance on Nokia phones is costly and it is not affordable by all blind people. JAWS, the screen reader software for PC by Freedom Scientific, is also costly. It is difficult to purchase these software online and to install in devices. Because for this they still need to depend on a sighted person for help.
- [OB]: Blind people use most of the features in mobile phone except video shooting and photo capturing by mobile camera.

They use features like SMS, phone book, writing SMS, saving SMS in drafts, listening to music, managing files in folders, voice recorder, alarm and reminder.

- [OB]: It was observed from the field survey data that 50% of the internet users access Facebook, Gmail, Internet, YouTube and Google Search on mobile even if internet access on mobile is costlier than wired Internet connection.
- [OB]: Most of the blind people do not prefer to customize their mobile phone. However, few of them had set specific ring tones for each of their known callers, for easier identification of the caller.
- [OB]: Without screen reader software, it is difficult to operate mobile phones and also to select menus in mobile phones. It is difficult for partially blind to read text on mobile screen.
- [OB]: Social networking sites help them in making new friends, sharing knowledge, sharing information about competitive exams, photos, chess games, sending birthday wishes, holding discussions and opinions on current affairs, political issues, etc.
- [OB]: Blind people use Skype, Twitter and Facebook - mostly for chatting and posting day-to-day experiences. One of the users had connected his Twitter and Facebook accounts to enable his Twitter posts through Facebook.
- [OB]: Blind people prefer listening to news on TV, Mobile radio, and FM radio set.
- [OB]: Some of them prefer radio because radio can be used

personally, but TV is watched by many people. Few of them access Internet to watch News channels, to read e-newspapers and to listen to online radio.

- [OB]: Blind people love to make friends with everyone. But they prefer to share about life experiences only with blind people because a blind person has more sympathy towards people of same group. Blind people do not like unnecessary sympathy towards them.

Support Technology /Tools for Blind

User Statements:

- [US]: Blind users living in remote areas feel that the government should collaborate with the mobile network service provider to provide toll-free numbers or make mobile charges free of cost to facilitate chess playing among themselves through collaboration and communication.
- [US]: Reading for the blind is restricted to Braille or screen readers, which can read only text, but not images and diagrams. In chess related books, various moves and their positions cannot be understood by reading. Textured (3D) diagrams or images could describe the moves better. There is a new technology called FEN [Appendix – II] format that describes the correct positions of the chess pieces.
- [US]: Blind should be able to play chess on the Internet. Internet surfing and technology should be available at low cost and be easily accessible. Every blind person cannot go to the cyber-cafe and play. If possible, they can get a donor who would donate computers to the top players.
- [US]: One of the blind users said that, due to unavailability of blind-friendly study material for chess he had not got an Elo rating even though he had been playing for so many years.
- [US]: Another blind users suggested a calculator-like device with 12 switches, which activates Braille-like needles which

can help in recording the chess player's steps quickly. Later the player can transfer this data into the computer and analyze the steps. Also, during the recording, it could give some voice feedback as to what was recorded and play it back. The chess board itself can record and speak all steps played by the player.

- [US]: It would be helpful if a calendar software is made available with date, place, and time of the chess tournaments for blind.
- [US]: When travelling by bus, there should be voice feedback to announce the name of the bus stop and the bus number.
- [US]: In foreign countries, special training is given to dogs for assistance in blind persons' mobility. Somebody or some agency should learn from other countries about special training for dog to assist in mobility of blind persons and made available such things for blind in our country.

Observations:

- [OB]: All software and technology for blind can be voice enabled, user friendly, easy to operate and need minimum training. Software like JAWS computer screen reader software is useful for blind to operate any software on a computer. Such screen reader software could be compatible with all software platforms. All software and technology should be available for blind at low cost and should easily be available and reliable to use.

- [OB]: Whatever services and software are available, should be developed such that the same service/software can be used by the blind as well as the sighted, without further customization. E.g.: Facebook, G-Talk, do not support screen readers fully while mobile version **m.facebook.com** is user friendly for the blind.
- [US]: The blind users felt that the dependency on another person to assist them while writing exams could be removed through technology. Even if screen reading software like JAWS exist, they are not yet available in local Indian languages. They feel that the government gets more actively involved in encouraging the development of such tools/software for the blind.

Design Insights:

- [DI]: Design a special speaking chess board for blind which would give voice feedback of all moves and activities by both players during the game on the chess board and also record all the moves. Later, a blind person can follow the played game for further practice and cross check moves in case of any doubt.
- [DI]: Communication technology should be platform and device independent. The technology should be available in all Indian languages and at an affordable price. In every mobile set there should be free screen reader software for blind.
- [DI]: Chess Software should be developed in regional languages. It should be easy to learn and use. It should analyze the steps played by player and suggest best solutions. It would help in analyzing the moves played by the blind users and suggesting alternate possible moves. It will help them in rectifying their game.
- [DI]: Mobile is a useful device for blind. If chess playing software is available in all mobile phones then it will be very useful for blind chess players.
- [DI]: Blind people should be able to play chess on computers without hassle. Adequate familiarization with computers as well as chess playing software is essential. For this, training should be provided to the blind users on regular basis.
- [DI]: A special talking Braille keyboard should be designed for Blind people. This will aid in typing, without depending on additional computer screen reader software like JAWS.
- [DI]: There should be a talking clock for chess. If they would know time by themselves, they can manage their game within the time limit. Many times, the totally blind are out of time while playing and do not realize that time is over and end up losing the game.
- [DI]: Speaking book - Daisy Reader format books enable the blind to listen to printed book content. MAGic software enables users to zoom text (text magnifier). It helps in reading text on computer screens. Major course study books should be available in the form of voice books. Also, all other international chess players' games should be available in voice format.

- [DI]: There should be a good search facility optimized for use by the blind on the Internet and smooth text zooming facility for the partially blind.
- [DI]: Some technology should be incorporated into blind person's stick, or a talking stick can be developed which can give voice feedback about different places, locations, buildings, objects, and surfaces and can guide them during any movement.
- [DI]: An ATM can be designed for the blind that can be operated by using voice commands.
- [DI]: While crossing roads or walking on the streets, there should be some voice indicators on the road.
- [DI]: A multi-functional torch-like instrument can be designed, which can scan the barrier ahead and alert the blind about any obstacle. This device can further scan and read out content of printed matter like books, newspapers, etc. in any Indian language.

About GappaGoshti®

GappaGoshti® is a telephone based communication system being developed by TCS Innovation Lab, Mumbai. Through this system, one can create a group and that particular group can exchange their voice, text, images, and video comments among themselves on particular issues. We believe the voice part could be especially useful for the blind and therefore discussed the application to some detail with them and got valuable inputs.

User Statements:

- [US]: It can help us share sensitive social matters with peers and get rid of loneliness too. A shy blind person can share his/her issues with others without any hesitation. It would help us discuss about life and career problems and also share happy and joyful moments with others. A blind person can share about marriage life and family life with others
- [US]: It would help in converting a chess hobby into a serious career for the blind.
- [US]: Through GappaGoshti®, people living in remote areas can explore new things, receive new information and exchange knowledge.
- [US]: A user who is also a music teacher suggested that with the help of GappaGoshti®, he would be able to teach and learn musical notations by collaborating with others.

Observations:

- [OB]: Currently most of them use mobile network service for communication purpose. Therefore, if this service is provided toll-free or at a low cost then more blind people will opt for it.
- [OB]: It will be useful only for blind people who are somewhat comfortable in using a mobile phone.
- [OB]: Once posted, since all users in that particular group can access it and as the data is kept as long as the originator wishes, information sharing is simple, non-repetitive and inexpensive, unlike SMSs.

Design Insights:

- [DI]: Login into this application should be voice based for blind. The privacy should be maintained by the system. User can decide whom he wants to share his/ her voice message. In this application should have one to one communication, many to many, one to many and many to one - communication capability.
- [DI]: This application should work on both the mobile phone as well as the computer. It can be used by both sighted and blind people. The interfaces for blind and sighted are different, but the content and data information should be same.
- [DI]: In this application there should be buffering facility for downloading and listening to the voice posts later by users.
- [DI]: It should support local language, chess related and other general information.

Persona – Prachuriya Kumar Pradhan

Profile:

Prachuriya Kumar Pradhan, 16 years old, from Sundargarh, Orissa, India is a 10th standard student. He is totally blind. He is an Elo rated chess player. He has an Elo rating of 1589

Usages of technology:

He is a technology savvy. He operates the computer by using the screen reader software Jaws, and operates his mobile phone, a Nokia E-5 series handset by using the screen reader software TALKS. The screen reader software also helps him type without any difficulty on either device. He prefers to access the internet on the mobile as well as on PC.

He is familiar with social networking sites such as Facebook and Twitter. For Facebook he uses m.facebook, the mobile Facebook version. He also uses Skype to connect to others. For accessing news he uses TV, Radio, and the BBC radio website.

Understanding graphics and pictures on screen is impossible for blind today, as the screen reader is capable of 'reading' only on-screen text. Then again, when the mobile or PC hangs he becomes clueless as the screen reader software do not give any response/feedback in such cases, that a blind person can understand.

Social Behavior:

He has more friends from among the blind than the sighted. With friends he shares chess related information, study notes, career related information, information about new technology for blind, and also prefers to put out his opinions and comments on Facebook on varied social and political issues.

About future Technology:

According to him, there was a time when the blind stick used to everything but now, it is technology that is like 'eyes' for the blind. "Technology is like a servant; you are not the servant of technology" he says. He strongly believes that technology can envision the blind and one can develop and adopt technology for the fulfillment of one's requirements.

Note - The entire conversation was recorded in English as the user was speaking in English.

Conclusion

The blind do not have eyesight, but technology can give them vision. Since ages, the walking stick has represented both the dependence of the blind on it as well as the power it equips them with, to walk forward, independent. To me, there seems a ray of hope and optimism that this symbol will be replaced by ICT innovations in the near future. This report reveals a lot of opportunity gaps and design possibilities towards improving the life of the visually challenged in India.

I enjoyed a lot in the 'learn and do' and 'do and learn' process followed here. It was a truly enriching learning experience for me, and an invaluable stepping-stone for my career.

Once again, I deeply thank all the people who helped me in this project.

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Abbreviations

[US] - User statements

[OB] - Observations

[DI] - Design Insights

NVDA – Non Visual Desktop Access

TTS - Text to Speech

FEN - Forsyth-Edwards Notation

AICFB - All India Chess Federation for the Blind

IBCA - International Braille Chess

[Appendix – I]

*“**Blindness** is the condition of lacking visual perception due to physiological or neurological factors. Various scales have been developed to describe the extent of vision loss and define blindness. Total blindness is the complete lack of form and visual light perception and is clinically recorded as NLP, an abbreviation for "no light perception." Blindness is frequently used to describe severe visual impairment with residual vision. Those described as having only light perception have no more sight than the ability to tell light from dark and the general direction of a light source.”*

- Wikipedia

Blindness is defined by the **World Health Organization (WHO)** as vision in a person's best eye of less than 20/500 or a visual field of less than 10 degrees. This definition was set in 1972, and there is ongoing discussion as to whether it should be altered somewhat.

By the 10th Revision of the WHO International Statistical Classification of Diseases, Injuries and Causes of Death, low vision is defined as visual acuity of less than 20/60 (6/18), but equal to or better than 20/200 (6/60), or corresponding visual field loss to less than 20 degrees, in the better eye with best possible correction. Blindness is defined as visual acuity of less than 20/400 (6/120), or corresponding visual field loss to less than 10 degrees, in the better eye with best possible correction.

[Appendix – II]

*“The **Elo** rating system is a method for calculating the relative skill levels of players in competitor-versus-competitor games such as chess. Elo rating system used in chess to calculate an estimate of the strength of the player, based on his or her performance versus other players. It is named after its creator Arpad Elo, a Hungarian-born American physics professor.”*

- Wikipedia

*“**Forsyth–Edwards Notation (FEN)** is a standard notation for describing a particular board position of a chess game. The purpose of FEN is to provide all the necessary information to restart a game from a particular position.*

FEN is based on a system developed by the Scottish newspaper journalist, David Forsyth. Forsyth's system became popular in the 19th century; Steven J. Edwards extended it to support use by computers. FEN is an integral part of the Portable Game Notation for chess games, since FEN is used to define initial positions other than the standard one. FEN does not represent sufficient information to decide on a draw by threefold repetition; for that, a different format such as Extended Position Description is needed.”

- Wikipedia