"I Use YouTube Now in COVID": Understanding Technology Adoption of Indigenous Communities during COVID-19 Pandemic in Bangladesh

Indigenous communities in Bangladesh are comparatively disadvantaged and face several barriers regarding rights. Access to technology as well as ICT can help the indigenous communities by opening new dimensions in economic, political, and social aspects. The recent COVID-19 pandemic necessitated the adoption of technology for routine use which is equally important for indigenous communities, but their technology adoption scenario remains unexplored in HCI research. Considering the research gap, we interviewed n=36 (Female 26 and Male 10) indigenous people from six different indigenous communities from Chattagarm and Sylhet division in Bangladesh. We found their communities scenarios that are strongly connected in communities, have independent technology access and have no gender differences. They have a strong interest and eagerness to learn available technologies that help them in their professions, enrich their technical skills, communication, social participation, and expand the business. The study also revealed some challenges while using technology, but that did not negatively impact their usage. The study also discussed the community-centric strengths that helped them to fight against the COVID-19 crisis and work for their development. This research makes a footprint on HCI literature revealing the technology adoption scenarios of Indigenous communities in Bangladesh.

CCS CONCEPTS • Human-Computer Interaction • Empirical Study

Keywords and Phrases: Indigenous Communities, Technology Adoption, COVID-19 Pandemic, Bangladesh

1 INTRODUCTION

Indigenous communities in Bangladesh are underrepresented in HCI research where around 54 indigenous communities live in Bangladesh [28]. These communities have their own set of traditions, cultures, and cultivation techniques that has been discussed in previous research [13, 15, 16, 17], but their technology adoption, usage behavior, and challenges remain unexplored. Through this research, we probed to comprehend their technology adoption, how it comes with benefits during the ongoing COVID-19 pandemic, and challenges faced while using technology along with understanding the communities.

Indigenous communities face several challenges. Their political and economic rights remain neglected, and they live in comparatively remote areas in Bangladesh making them disconnected as minority groups [28]. Several measures were taken to mitigate their challenges, but they remain disadvantaged [18]. There are scholarly articles that focus on the indigenous communities, presenting that technology is important to mitigate challenges and open up opportunities in the field of education, business, and health for them [14, 24]. Recent quantitative research by Hasan et al. on indigenous communities of Bangladesh shows that integration of ICT helps in their development and improve the quality of life mostly from economic, political standpoints, and social participations perspective [18].

The recent COVID-19 pandemic added a new set of challenges for all where there were several instances of nationwide government-imposed lockdown and that changed the education and working system from traditional to online [27, 29]. That is why people need to adopt technology options for their regular applications as Rony et al. presented how the COVID-19 pandemic transforms low-income to high-income communities digitally and transcend in digital independence through the adoption of technology [30]. Considering previous research works, it is important to know the impact of technology adoption and challenges among the indigenous communities in Bangladesh through understanding the communities which is a gap in HCI research [14, 18, 24, 30]. We aimed to work on these aspects and it will be important for HCI researchers to think forward for these underrepresented communities for their development.

We contribute to HCI literature by exploring n = 36 (Female 26, and Male 10) indigenous people from six indigenous communities such as Rakhine, Chakma, Marma, Tripura, Bishnupriya Manipuri, and Khasi in Bangladesh. We studied them qualitatively to understand how technology adoption among indigenous communities impacted their lifestyle during the COVID-19 pandemic, along with facing challenges by understanding their communities. The study reveals that their communities have equal rights among genders. and the participants have independent access to mobile phones. We found participants are eager to learn available technology-based options that help them in their professions through acquiring development skills. Additionally, it also showed, technology platforms enable social participation that helps them raise their voice to get support against injustice during the pandemic. Accordingly, technology-based communication channels open avenues for remote communications and particularly work as a driving force to continue the traditional business through online platforms. However, a few participants have shared that they faced some challenges while using technology, but these do not decrease their technology usage. Along with the technology behavior, the communities are strongly united and work for their development in a community-centric manner and mitigate the COVID-19 crisis. Through the findings, this research creates a route for the HCI researchers to explore the indigenous communities in developing countries, to come up with contextualized technology design opportunities in the future.

2 INDIGENOUS COMMUNITIES OF BANGLADESH

The indigenous communities of Bangladesh are the ethnic minorities who are living mostly in southeastern Chattagram hill tracts, northeastern of Sylhet, west of Rajshahi, and north-central part of Mymensingh divisions [13]. Their population in Bangladesh is more than two million and many of them have their own traditional cultures and languages [13]. This research explored six major indigenous communities: Rakhine, Chakma, Marma, Tripura, Bishnupriya Manipuri, and Khasi. *Rakhine Community* is a Southeast Asian ethnic group from Arakan state and migrated to Chattagram and Barisal divisions in Bangladesh in the 16th century. They practice the Burmese language of the Arakan state [7]. *Chakma Community* is the largest indigenous community in Bangladesh which migrated to Arakan from the Magadha Kingdom of Bihar, India, and expanded its territory to the Chattagram division in Bangladesh. They practice Chakma Language which is closely related to the Bengali language [8]. *Marma Community* is another ethnic group, previously known as Maghs, they migrated from Rakhine State to Chattagram Division between the 16th-18th centuries. They also practice the Burmese language [9]. The *Tripura community* migrated to the Chattagram division from the Tripura state of India. Their language is named Kok-Borok, but in Bangladesh, they mainly practice the Bengali language [10]. A major Indo-Aryan indigenous community *Bishnupriya Manipuri* migrated from Central Asia to South Asia, in the second millennium BCE. They mostly live in the Sylhet division of Bangladesh and have an active practice of the Manipuri language [11]. Lastly, the *Khasi community* is one of the major matriarchal indigenous communities in Sylhet, Bangladesh. They migrated to Bangladesh about five hundred years ago from Meghalaya, Assam, having their own Khasi language [12]. All these communities are relatively fluent in speaking the Bengali language and traditionally the communities are Buddhists, Hindus Christians, and animists [13].

3 RELATED WORK

The existing research articles have explored the adoption of new concepts, such as cultivation techniques, by indigenous communities to improve their lives [15, 16, 17]. The recent work by Xiao et al. presents the technology adoption among indigenous entrepreneurs in China where Government support was positively enforced in the digitization and economic growth process which was enhanced by the collective effort of the community in a study conducted in China [34]. Diaz et al. show the unique way of using technology among indigenous communities that aligns with the collectivistic cultural norms in a study based in New Zealand [35]. However, research on technology adoption and access by indigenous communities from the South Asian region remains scarce. This study focused on understanding technology adoption by indigenous communities in Bangladesh during the COVID-19 pandemic and shed light on opportunities it stemmed during this period. This research on relatively unexplored dimensions adds value to the HCI literature.

There were some attempts to address the challenges of other communities, unlike the indigenous community. Therefore, they are comparatively at a disadvantage [18]. The importance of technology in development is solidly indicated by the increasing volume of studies on this aspect focusing on indigenous communities [24]. Exploring the role of mobile technology on indigenous communities across the globe sheds light on its challenges and opportunities. It provides a fluid mechanism for sharing creative works but poses problems like low network connectivity, device availability, etc. [14]. Furthermore, Coelho et al. found that access to ICT provides an opportunity for individual development, which facilitates

the indigenous communities to achieve development goals [19]. Additionally, Dyson et al. highlighted the unique challenges and opportunities faced by indigenous communities and outlined a unique usage pattern of technology through their interactions with various websites [23]. Moreover, social media as a technology platform provides freedom to the youths of indigenous communities and technology-enabled financial opportunities can connect a large number of unbanked population from the indigenous communities [25, 26].

Bangladesh is operating several projects for minor communities encompassing education, health, social development, etc. with the help of ICT [20]. Consequently, indigenous communities moved their traditional business to e-commerce, the students are using technology for education, etc. bringing a significant change in their lives [21, 22]. Hasan et al. conducted an in-depth quantitative study on indigenous communities in Bangladesh and showed that ICT usage has a strong relationship with Sen's capability approach which aids in their development and quality of life [18, 31]. In line with the research interest of these scholarly explorations, our research focused on exploring qualitatively in-depth understanding among diverse indigenous communities to understand how the adoption of technology impacts the communities, and what challenges they face while using during the global pandemic.

4 METHOD

This research explored the indigenous communities in the Chattagram and Sylhet divisions of Bangladesh. We conducted the qualitative study during the ongoing COVID-19 pandemic; between Aug 21 - Oct 21. We recruited n = 36 indigenous participants (Female = 26 and Male =10) for 7 focus group discussions. The participants belonged to various professions - business owners, school teachers, service holders, and students. We asked open-ended questions to understand their demography, technology adoption, usage, and challenges faced while using technology during the COVID pandemic. We maintained COVID -19 safety protocols during the discussion as elaborated in section 4.4.

4.1 Participant Recruitment Process, and Study Moderation

4.1.1 Participant Recruitment: We reached out to participants through key informants in each division. For the Chattagram division, a local non-government organization (NGO) that works with the indigenous community connected us with the participants from Khagrachari and Cox's Bazar. The NGO supported us in recruiting participants from Rakhine, Chakma, Marma, Tripura communities (Group 1-5, n=26, F=16, M=10). For the Sylhet division, a local resident assisted in recruiting participants from Bishnupriya Manipuri and Khasi communities (Group 6-7, n=10, F=10). It required a trusted connection to recruit participants from the marginalized community. The majority of the participants were female as many of the indigenous communities are headed by women.

4.1.2 Study Moderation: The study mostly focused on understanding the communities, their technology adoption scenarios, learning aspects and challenges while using the technology. Participants have answered a few questions regarding technology such as how do you start using technology, and how do you use them? How technology adoption impacts your daily life and professions, and what are the scenarios during COVID pandemic? What are the technology usage experiences? etc. Moreover, we tried to understand their scenarios of technology involvement through some of these questions.

We had focus groups discussions in small groups consisting of all female or all male participants in a group. The discussion location was chosen according to the participants' preference to ensure their comfort. Each discussion took around an hour and was audio-recorded with multiple recording devices to reduce missing data. The discussions were conducted in the Bengali language, based on the participants' comfort. A total of 6 hours of audio records were transcribed into English by the researchers for coding analysis.

4.2 Content Analysis

The thematic content analysis was conducted using Atlas. ti software [5]. The content analysis started after the first discussion as it provided better context-based understanding, which was mutually apprised with the following data [1]. We followed the inductive content analysis method [2,3] and open coded transcripts individually. After the first round of coding, we generated codes related to technology usage and adoption. Then, we generated a coding sheet in shared Excel by gathering all the codes. We worked together to refine the codes and grouped similar codes. Finally, through the discussion (including agreement and disagreement) among the authors regarding the codes, we generated the key themes of the findings.

4.3 Research Ethics and Incentives

This research was IRB approved. The participants were adults and provided informed consent after the researchers clearly explained the research objective and interview process. The participants were aware that they could leave the discussion at any time without forfeiting their incentives. Each participant received a monetary incentive of BDT 1000 = USD 12 and one meal package.

4.4 Safety Protocol

All the discussions maintained social distancing and personal safety guidelines provided by the World Health Organization [4] and the Ministry of Health, Bangladesh [6]. Researchers provided face masks and hand sanitizers and made sure that all researchers and participants were placed at a safe distance through the discussion.

Table 1. Participant Details

Region	Group no and Name	Participant Count	Education and Occupation	Income Level (World Bank)	Phone Type	Internet	Social Media
Cox's Bazar, Chattagram Division	Group 1 Rakhine Community Men	P1	No Education Business	Upper Middle Income	Smart Phone	Yes	Yes
		P2	Graduate Veteran Doctor	Upper Middle Income	Smart Phone	Yes	Yes
		P3	HSC Student	N/A	Smart Phone	Yes	Yes
		P4	HSC Business	Upper Middle Income	Smart Phone	Yes	Yes
		P5	HSC Service	Upper Middle Income	Smart Phone	Yes	Yes
	Group 2 Rakhine Community Women	P6	HSC Business	Upper Middle Income	Smart Phone	Yes	Yes
		P7	No Education Tailor	Low Income	Smart Phone	Yes	Yes
		P8	Class Eight Tuition teacher	Low Income	Smart Phone	Yes	Yes
		P9	No Education Business	Upper Middle Income	Smart Phone	Yes	No
		P10	SSC Teacher	Upper Middle Income	Smart Phone	Yes	Yes
Khagrachari, Chattagram Division	Group 3 Mixed indigenous Community Men	P11	HSC Service	Low Income	Smart Phone	No	No
		P12	Graduate Business	Upper Middle Income	Smart Phone	Yes	Yes
		P13	Undergraduate Business	Upper Middle Income	Smart Phone	Yes	Yes
		P14	Undergraduate Business	Upper Middle Income	Smart Phone	Yes	Yes
		P15	Undergraduate Service	Upper Middle Income	Smart Phone	Yes	No
	Group 4	P16	No Education	Upper Middle	Feature	No	No

	Chakma Community Women (Vegetable Seller)		Business	Income	Phone		
		P17	No Education Business	Upper Middle Income	Feature Phone	No	No
		P18	No Education Business	Upper Middle Income	Feature Phone	No	No
		P19	No Education Business	Upper Middle Income	Smart Phone	No	No
		P20	No Education Business	High Income	Feature Phone	No	No
		P21	No Education Business	Upper Middle Income	Feature Phone	No	No
	Group 5 Chakma Community Women (School Teacher)	P22	Undergraduate Teacher	Upper Middle Income	Smart Phone	Yes	Yes
		P23	Undergraduate Teacher	Upper Middle Income	Smart Phone	Yes	Yes
		P24	Undergraduate Teacher	Upper Middle Income	Smart Phone	Yes	Yes
		P25	Undergraduate Teacher	Upper Middle Income	Smart Phone	Yes	Yes
		P26	Undergraduate Teacher	Upper Middle Income	Feature Phone	No	No
Sylhet, Sylhet Division	Group 6 Bishnupriya Manipuri Community Women	P27	Graduate Student	N/A	Smart Phone	Yes	Yes
		P28	No Education Business	Upper Middle Income	Smart Phone	Yes	Yes
		P29	No Education Business	Upper Middle Income	Feature Phone	No	No
		P30	No Education Business	Upper Middle Income	Smart Phone	Yes	Yes
		P31	HSC Business	Upper Middle Income	Smart Phone	Yes	Yes
	Group 7 Khasia Community Women	P32	Undergraduate Student	N/A	Smart Phone	Yes	Yes
		P33	HSC Student	N/A	No Phone	N/A	N/A
		P34	Undergraduate Student	N/A	Smart Phone	Yes	Yes
		P35	Diploma Student	N/A	Smart Phone	Yes	Yes
		P36	HSC Student	N/A	Smart Phone	Yes	Yes

5 FINDINGS

The findings focus on the technology adoption aspect, exploring how technology-related skills are developed, how technology enables social connectivity and the impact of technology in business during the period of the COVID-19 pandemic in the following sections.

5.1 Understanding the Indigenous Communities

In this study, we have studied participants from six different indigenous communities. The participants unanimously shared they have remained connected in the community, supporting each other during the COVID-19 pandemic and the authority-imposed lockdown. The communities supported each other in difficult times by continuously checking on each other while enforcing strong safety measures with the strong leadership of the indigenous communities. The participants shared about their voluntary effort to support elderly and sick community members regardless of the Government or local authority support.

For a better understanding of the communities, the information about participants from different communities is presented in Table 1 reflecting upon the education level, income level, and access to technology. A close look at Table 1 shows the

majority have access to smartphones, social networks, and their income level is within a similar income bracket. In particular, we have found educational variability among communities. For example, among the Chakma community living in Khagrachari, the participants who were school teachers have completed their undergraduate degrees while the Chakma vegetable seller participants were not educated at all. The participants from the Bishnupriya Manipuri community and Khasi community living in Sylhet had few highly educated (Diploma, and Undergraduate). The Rakhine male and female community participants were slightly educated.
In the following sections, we have presented community details shared by the participants that give us an understanding of the communities.

5.1.1 Rakhine Community Men and Women (Group 1 and 2): In this study, we studied five men who were self-sufficient, and living in their closed community with their families. We found that this group was technology-friendly which helped in their development. They mentioned as they are living in a closed community, separately from others; technology helped them learn and serve differently than previously. They all mentioned that particularly mobile wallet-based financial transactions helped in continuing their transaction flow for them as they are living in the closed community and during COVID they personally locked down their community that restricted their mobility. Accordingly, they were using social media to communicate with their distant relatives in other regions.

Similarly to Rakhine men, we interviewed five Rakhine women separately from the same area. All of them were working and living with their families. They mentioned that in their community both men and women are equally working and contributing to the family. These women are also technology-friendly and use smartphones frequently. We found they are comparatively low-literate than men (Table 1), but this does not work as a barrier in their technology use. They are recently very much active in social media and the internet for learning new things. Also, they are very comfortable in mobile-based financial transactions learning from self-interest.

5.1.2 Mixed Indigenous Communities Men (Group 3): In this study, we studied a working men group from mixed indigenous communities such as Chakma, Marma, and Tripura, living with families. Their communities have equal rights between genders. We found that they live in the hilly lands and different communities are living in the same place. They shared that their communities often get neglected and have a few challenges such as in their living areas, they still have cellular connectivity issues. They added that the medical support inside their communities is very low because ground communication is challenging. However, these participants were comfortable using smartphones and they mentioned that their family members are also technology-friendly. The majority of the participants were using the internet for agricultural tutorials, and distant learning for their families as, during the COVID pandemic, they could not move from their community.

5.1.3 Chakma Community Vegetable Sellers and School Teachers (Group 4 and Group 5): We have studied six Chakma community vegetable sellers and five school teachers separately who were also living with their families. Vegetable sellers had their own vegetable selling business at the central marketplace. We found that they did not have quality education but it is mentioned that in the Chakma community, usually both men and women work and contribute to the families. They had independent access to using mobile phones and they were using them mostly for communication with relatives and dealers.

Similarly, the Chakma community school teachers also live with their families. They mentioned that they are independent in their job sector. The majority of the participants were using smartphones and the internet for teaching, learning, and financial operations. It is noted that all the teachers had received ICT training from the government that helped in their skill development. They mentioned that their kids are also connected online for educational purposes.

5.1.4 Bishnupriya Manipuri Community (Group 6): In this research, we have interviewed five Bishnupriya Community-women, who mentioned that they live with their families and are socially living with other communities. We found that they have their own traditional business as every Manipuri community houses, they have traditional handloom. They shared that all the females learn to operate handlooms from their early childhood. This results in many of the women in their community usually weaving traditional dresses. They also shared that their community has equal rights among genders. We have found these participants are selling their traditional dresses online that they started recently during COVID, adopting the technology options.

5.1.5 Khasi Community (Group 7): Lastly, we interviewed five Khasi community female students who stayed in the city areas for educational purposes but their families were living in their community areas. According to their voice, their community is generally conservative, where they usually do not interact much with the people from different communities. They shared that their community has equal rights among genders and the community's leading profession is agriculture. In this study, the majority of the participants were tech-savvy, they were frequent in online shopping and financial transactions. They mentioned that now their family members are using technology more during the COVID pandemic as it brings necessities of remote communication and financial transactions.

Moreover, through the above discussion, we have understood the indigenous participants' communities through their lenses.

5.2 Technology Adoption: Learning, Communication, and Online Business

Understanding the communities in the previous section, we found technology adoption has a positive impact in their lives that helped in their growth. The following subsections discuss the positive footprints of adopting technology.

5.2.1 Development and Learning of Technology Skills: During the pandemic, the indigenous participants were curious to learn the use of mobile phone operations and financial operations as it adds multifarious values to their lives. Some of them went through advanced technology skills training which aided them during the pandemic. For example, the educators had to learn online teaching mechanisms, consequently, the government schools provided computer training for teachers. One indigenous Chakma female teacher, P24 shared as follows:

> *"To be honest, I couldn't do it before (smartphone use). The training really helped a lot. That training was totally academic. Since a new subject was introduced the training was mandated to the teachers immediately. We learned how to make presentations, how to use a laptop etc. It really helped a lot."* -P24, Group 5, Female Teacher, Chakma Community, Khagrachari, Chattagram.

Learning of technology skills also brought new dimensions during the COVID-19 lockdown where movement restrictions opened up opportunities for digital skill-sets enhancement. An indigenous veterinary doctor P2 shared that he provided remote treatment and suggestions to indigenous and local farmers using online platforms during the COVID- 19 lockdown. He added that local indigenous people adopted technology significantly for its benefits during this period. Also, we found digital literacy has motivated participants to innovate as a Rakhine male indigenous participant shared how he learns about the latest designs using Youtube and applies them to add edge to his business:

> *"I use youtube now in COVID, because of design, as I am a tailor. I get every new design on youtube. The more I can do the design the more customers I will get. I follow the new things from there. When a customer comes, I show the design to him or her. If the customers like it, then I make it for them."*- P1, Group 1, Male, Rakhain Community, Cox's Bazar, Chattagram.

Analogous to the findings of Coelho et al., we observed that ICT adds value and aids the development of indigenous communities during the pandemic [19].

5.2.2 Social Participation and Communication: As we have seen, during the pandemic, technology helps indigenous participants in developing and learning skills, it also aids them in social communication and solving local problems. The majority of the indigenous community live far away from the lowlands. They shared that it is challenging for them to avail themselves of emergency support and basic local services when facing occasional oppression and injustice. An indigenous Marma male participant, P12, shared that technology-based communication platforms enabled them to share their opinion against oppression and injustice in the public forums that resulted in gathering for a strong protest to avail services as follows:

> *"From our past, we are developed now. We are now developed in technology. In the main region, there are no issues. We have student groups like Marma Unnoyon Songsad, Tripura Student forum. They protest against all our problems as a student group now at this moment everything is improving."* -P12, Group 3, Male, Marma Community, Khagrachari, Chattagram.

Technology-based communication is important for some of the indigenous female participants. They shared that, as indigenous females, they stayed far away from home and sometimes felt uncomfortable going outside in the city area. Also, going back to families was challenging during the pandemic. That is why social media-based communication platforms opened up avenues for them to connect closely with family and friends. One particular indigenous Khasi female student, P32 shared that communication increased through social media, she shared her voice but was vigilant in connecting people on social platforms:

> *"We use them for communication as we stay outside (from family), and do not move around that much. We posted lots of pictures and statuses but we did not face any problems. We have Bengali friends who are studying with us. We know them. Other than that, we do not add unknown people to our Facebook."* - P32, Group 7, Female student, Khasi community, Sylhet.

We found that technology aids the indigenous community to communicate better and in line with the findings of Rice et al., provides freedom to the young members of the indigenous communities [25]. It is a means to shift from the disadvantaged situation portrayed in previous studies [18].

5.2.3 Connecting People with Indigenous Products through Online Business: Technology adoption during COVID helped in expanding business for some participants. They shared that in each indigenous community they have several traditional products such as clothes, handicrafts, ornaments, etc. Technology helps the participants to sell their products to clients in different regions. In this particular aspect, the indigenous Bishnupriya Manipuri community shared how they expanded their traditional handloom products countrywide through technology adoption during COVID. They shared that it is easy to sell products online rather than the local market and their payment system is only through mobile wallets (e.g., bkash, nagad, etc.). An Indigenous Manipuri female, P30 shared that she uses all social platforms and sells traditional Manipuri handloom products to clients by sending pictures in WhatsApp or video calls:

> *"Now, I use everything. Whatsapp, IMO, Facebook, youtube, I use everything. When I select the color, design for the clothes, if I make the design I send the design on WhatsApp. I make direct video calls to show products."* - P30, Group 6, Female Businessmen, Bishnupriya Manipuri, Sylhet.

The adoption of technology by indigenous communities of Bangladesh during the COVID-19 pandemic initiated new dimensions of learning and acquiring skills, communication, and expansion of business beyond their locality. Technology was a matrix for improvement for the indigenous communities during this period.

5.3 Challenges Faced while using Technology

As we have seen technology positively impacted their lifestyle, but they also have faced challenges while using technology related to online education, COVID-19 allowance receiving, and online shopping scams. We describe these aspects in the following sections.

5.3.1 Challenges relating to Education: Access and Addiction to Technology: During the COVID-19 pandemic, the educational institutions were closed and required students to join classes online. An indigenous Chakma community school teacher, P24 mentioned that there are challenges among the majority of the school students in accessing online classes where many students were unable to join for lack of devices. She shared that the teachers came up with alternative ways of teaching for the students without devices by providing students with a bulk of homework over a once-a-week visit to the school. It must be noted that the device unavailability was not the problem for all the students from that area. Accordingly, another indigenous school teacher, P22 from the same community shared her concerns about her son's internet addiction due to online classes and that is why she does not support online classes, thinking of others as follows:

> *"I don't support online classes. Due to this students are not learning anything. They are getting excuses to have phones for playing games. My son uses my phone. But he spends more time on games than studying. But the school teachers gave in to pressure so I bought another smartphone for his studies. He often creates issues for having the mobile."* - P22, Female Teacher, Chakma Community, Khagrachari, Chattagram.

5.3.1 Difficulties in COVID-19 Government Allowance Receiving for Misinformation: The Government of Bangladesh has provided an allowance to various communities during the COVID-19 pandemic all across Bangladesh through mobile wallet-based financial services [32, 33]. The participants from group 3 shared their struggle to receive money provided by the Government as the intermediate agents misguided and provided misinformation to the recipients. A participant from the Tripura community, P13 shared that the indigenous recipients were asked to purchase new phones and sim cards to receive the allowance, recipients have spent most of the money they have received which was not required. The participants added that this happened due to a lack of information and awareness among rural indigenous communities as quoted below.

> *"They asked to buy a new sim card. Union Parishad sent a list for allowance, but then they asked for a new mobile number and new phone, so people needed to buy a new phone and sim card to get an allowance for the first time. They only do it to sell sim cards….There is no need to buy a new phone"* - P13, Group 3, Male, Tripura Community, Khagrachari, Chattagram.

The misconduct in allowance receiving was shared in one community while we found that a few participants from other indigenous communities received the same allowance without any such problems.

5.3.1 Scam in Online Shopping: In this study, we found a glimpse of scams online that were common in recent days; covering the Khasi community and Rakhine community mainly. One indigenous student from the Khasi community, P32 shared that she was scammed while buying a gift product for others. She also added that, for this incident, she is losing her trust in online shopping after feeling tricked by the online store shared as follows:

> *"Once, I fell in a trap from a shoe store. It was not for me, for my brother. I saw a product they sent me another product. I called them but their number was off and I sent a message on messenger. They block me from there. It was a Facebook page."* - P32, Group 7, Female student, Khasi community. Sylhet.

The number of challenging experiences with technology impacted them negatively but they did not limit their technology usage as technology has a more positive impact on their livelihood, mentioned by the participants.

6 DISCUSSION

We have studied n=36 (Female 26, and Male 10) indigenous people from six different indigenous communities in Bangladesh to understand their communities, how technology adoption improves their lifestyles and what are the challenges they face while using technology. It is identified that technology adoption opened several opportunities for many of them during the ongoing pandemic, along with facing a few challenges. A few existing studies have explored how access to ICT helps indigenous communities in their development [18, 21, 22, 24, 25, 26], this study also reveals the convenience of technology for indigenous communities in Bangladesh, particularly during COVID-19 along with the understanding of the communities.

The research findings show the background of the communities through participants' lenses, where they shared about their families, and technology adoption and usage scenarios. Other than the student participants, all were working, among the communities, there are no gender differences. According to income level, they are in the upper-middle-income bracket. It is understood that the majority of the participants have independent access to technology and they use them as their own. These facts give positive insights, living in the patriarchal region where women commonly face barriers in technology access [37, 38]. Accordingly, their technology adoption helps them in learning, development, and professional purposes, which increased during the COVID pandemic. The participants shared that technology adoption through government-initiated programs helps in developing and learning technology skills that ease their professional activities [20]. Indigenous teachers can operate computers and prepare presentations that help in online teaching as during COVID, schools, colleges, and universities continue teaching on online platforms [27]. Similarly, indigenous and rural farmers received medication for animals from veteran doctors online when COVID-19 lockdown restricted movements. It is interesting to us when an indigenous participant showed his eagerness in learning new dress designs online, which shows that access to the ICT unlocks opportunities for self-development [19, 21, 22]. Furthermore, technology adoption helps in community development.

We have seen in our study that technology platforms help in social participation to fight against oppression and to avail emergency support. It shows access to technology platforms provides space where their voices are heard. Existing literature shows, there were a few steps that have been taken to incorporate challenges faced by indigenous communities [18]. Rice et al. showed social media provides freedom to Australian young indigenous people [25], and in this research, we found the same for the indigenous communities in a low-income region during the pandemic which results in solutions. This particular aspect also aligned with previous research by Hasan et al. and from a political viewpoint, access to ICT mitigates indigenous communities' unfreedom, creating new opportunities and possibilities for social participation [18].

The COVID-19 restrictions limited the movements of the citizens, whereas access to the technology opened virtual communication channels for all and also helped indigenous communities shift from traditional business models to online-based markets. This shifting helped such indigenous communities survive as their livelihood depended on selling traditional products. Our study showed a particular indigenous community expanded their business from the local area to distant areas through a communication platform with the customers. Also, during the lockdown, when everything was shut down, it was an opportunity for them to connect with remote customers, continue their business, and stay financially solvent. Accordingly, they used mobile wallets as a payment mechanism that shows digital financial inclusion among the indigenous communities, growing rapidly during the pandemic. Hasan et al. has observed that online-based markets and digital transaction systems increase economic growth, contribute to national GDP, and create social opportunities for indigenous communities [18]. The research findings also show similar insights that are also true during the COVID-19 pandemic.

Along with the opportunities, the participants have shared a few of the challenges while using technology which was raised during the COVID pandemic. A participant has mentioned that online classes have increased the addiction on-screen and mobile devices among young students which often reduces concentration on studies. Similar issues were also highlighted in another research by Rony et. al. where it was mentioned that COVID has affected kids badly and made them dependent on devices [30]. Research shows maintaining screen time is possible through specific design approaches [30] which will help in reducing the problem in this context, as online classes are ongoing for the pandemic. Also, we have found that some indigenous people have faced problems receiving the COVID emergency aid through the digital financial system provided by the government where misinformation by the local intermediaries guided them negatively. The spreading of misinformation is problematic in Bangladesh, as Haque et al. discussed that in the context of Bangladesh, misinformation through social media results in chaos and unrest in the society [36] where people get hampered. According to their research, they suggested collaboration in fact-checking, specific technology design, and development in infrastructure can mitigate the misinformation-related problems [36]. In our research context, recalling these approaches is helpful for these communities that will improve their awareness level. Similarly, for online shopping fraud, an increased level of awareness regarding finding the authentic product selling sources, and analyzing their selling histories will help users to deal with the problem.

Moreover, though the indigenous communities have faced a few problems with technology usage, technology adoption helps them to improve lifestyles from the previous. It adds value in developing skills, social participation, and expanding business opportunities significantly, particularly during the COVID pandemic. We have additionally found how they deal with all situations in a community-centric process where they helped each other. According to the Rakhine communities' perspective, during the lockdown, they personally locked their community, maintained all safety protocols, supported each other, and sometimes conducted awareness campaigns inside communities maintaining social distances. They have set an ideal example of quarantine which was later appreciated by the local government and maintained a near-zero COVID infection rate. We discussed that indigenous communities fight together against oppression for their development. The study reveals that community engagement strengthens the capabilities to work together towards growth and development. We, as HCI researchers, are continuously working to explore other indigenous communities in Bangladesh. This research shows HCI researchers pathways to explore indigenous communities comprehensively in the context of developing countries that remain unexplored, opening new technology design opportunities in the future.

7 Conclusion

In this research we have explored n=36 indigenous participants from two different regions in Bangladesh. We tried to understand their communities, their technology adoption scenarios, and their experiences while using technology during the ongoing COVID pandemic. This research has revealed that the participants' communities are usually strongly connected where they always look after each other. Some of them are living in close communities which helped them maintain proper quarantine during the pandemic. The participants were independent in accessing technology where this technology adoption helped them in the development of their skills and learning that results in their personal growth. Also, through using online platforms they could continue distant communication and raise voices on public platforms to mitigate the social problem. During the COVID pandemic, they started doing business online which helped them connect people across Bangladesh to their traditional products. Alternatively, through the research, we have seen participants have faced a few challenges that are relating to access and addiction problems to technology, misinformation in receiving COVID allowances, and fraud issues in online shopping. However, technology adoption helped them to improve lifestyles, adding value during the pandemic with having such experiences in technology. This research opened up dimensions to understand more about the indigenous communities in the context of Bangladesh and introduced the pathways of new technology design opportunities.

ACKNOWLEDGMENTS

The authors would like to thank all their participants for their great support.

REFERENCES

[1] Barney G Glaser and Anselm L Strauss. 2017. Discovery of grounded theory: Strategies for qualitative research. Routledge.

[2] Elo S. & Kyngas H. (2008) The qualitative content analysis process. Journal of Advanced Nursing 62(1), 107–115 doi: 10.1111/j.1365-2648.2007.04569.x

[3] The shadow of COVID-19 lingers over Bangladesh's economy. Accessed on March 2020 from, https://www.eastasiaforum.org/2020/11/07/the-shadow-of-covid-19-lingers-over-bangladeshs-economy/

[4] World Health Organization, Bangladesh, https://www.who.int/countries/bgd/ , Accessed on March, 2021

[5] https://atlasti.com/, accessed on December, 2021

[6] Ministry of Health and Family Welfare, http://www.mohfw.gov.bd/, Accessed on March, 2021

[7] Rakhine People, Accessed from, https://en.wikipedia.org/wiki/Rakhine_people

[8] Chakma People, Accessed from https://en.wikipedia.org/wiki/Chakma_people

[9] Marma People, accessed from, https://en.wikipedia.org/wiki/Marma_people

[10] Tripuris, accessed from, https://en.banglapedia.org/index.php/Tripuris,_The

[11] Bishnupriya Manipuri People, Accessed from, https://en.wikipedia.org/wiki/Bishnupriya_Manipuri_people

[12] Khasi People Wiki, 2021. Accessed from, https://en.wikipedia.org/wiki/Khasi_people

[13] Indigenous people in Bangladesh, Accessed from, https://en.wikipedia.org/wiki/Indigenous_peoples_in_Bangladesh

[14] Dyson, L. E., Grant, S., & Hendriks, M. A. (Eds.). (2015). *Indigenous people and mobile technologies*. New York: Routledge.

[15] Wildayana, E., Adriani, D., & Armanto, M. E. (2017). Livelihoods, household income and indigenous technology in South Sumatra Wetlands. *Sriwijaya Journal of Environment*, *2*(1), 24-29.

[16] Muga, D. A. (1987). The Effect of Technology on an Indigenous People: The Case of the Norwegian Sami. *The Journal of Ethnic Studies*, *14*(4), 1.

[17] Hossain, M. A. (2010). Indigenous technology for adapting to water logging situation for sustainable livelihood security in low-lying areas of Bangladesh. *Soil Resource Development Institute, Ministry of Agriculture, Krishi Khamar Sarak, Farmgate, Dhaka-1215, Bangladesh*.

[18] Hasan, N., Bao, Y., & Miah, S. J. (2021). Exploring the impact of ICT usage among indigenous people and their quality of life: operationalizing Sen's capability approach. *Information Technology for Development*, 1-21.

[19] Coelho, T. R., Segatto, A. P., & Frega, J. R. (2015). Analysing ICT and development from the perspective of the capabilities approach: A study in South Brazil. The Electronic Journal of Information Systems in Developing Countries, 67(1), 1–14.

[20] Miah, S. J., Hasan, N., Hasan, R., & Gammack, J. (2017). Healthcare support for underserved communities using a mobile social media platform. Information Systems, 66, 1–12

[21] Hasan, N., Ashraf, M. M., Abdullah, A., & Murad, M. W. (2016). Introducing mobile internet as a learning assistant for secondary and higher secondary students. The Journal of Developing Areas, 50(5), 41–55

[22] Rahman, F. N., Khan, H. T. A., Hossain, M. J., & Iwuagwu, A. O. (2021). Health and wellbeing of indigenous older adults living in the tea gardens of Bangladesh. PLOS ONE, 16(3), e0247957

[23] Dyson, L. E., & Underwood, J. (2006). Indigenous people on the web. *Journal of theoretical and applied electronic commerce research*, *1*(1), 65-76.

[24] Du, J. T. (2017). Research on Indigenous people and the role of information and communications technology in development: A review of the literature. *Journal of the Australian library and information association*, *66*(4), 344-363.

[25] Rice, E. S., Haynes, E., Royce, P., & Thompson, S. C. (2016). Social media and digital technology use among Indigenous young people in Australia: a literature review. *International journal for equity in health*, *15*(1), 1-16.

[26] Godinho, V., & Singh, S. (2013, September). Technology-enabled financial inclusion and evidence-based policy for the underbanked: A study of remote Indigenous Australia. In *CPRsouth8/CPRafrica2013 conference*.

[27] Alamgir, M. (2021, January 19). Education During Pandemic: Digital divide wreaks damage. The Daily Star. https://www.thedailystar.net/frontpage/news/educationduring-pandemic-digital-divide-wreaks-damage-2030637

[28] Bangladesh IWGIA. Accessed from, https://www.iwgia.org/en/bangladesh.html
[29] Dubey, A., Tripathi, S., (2020). Analysing the Sentiments towards Work-From-Home Experience during COVID-19 Pandemic - Letter from Academia, Journal of Innovation Management, www.open-jim.org, 8(1), 13-19.
[30] Jahangir Rony, R., Shabnam Khan, S., Sinha, A., Saha, A., & Ahmed, N. (2021, May). "COVID has made Everyone Digital and Digitally Independent": Understanding Working Women's DFS and Technology Adoption during COVID Pandemic in Bangladesh. In Asian CHI Symposium 2021 (pp. 202-209).
[31] Sen, A. (1999). Commodities and capabilities: Oxford University Press.
[32] The Daily Star, (2020). 50 lakh poor households to get cash aid through MFS from May 14, Accessed on February, 2022,https://www.thedailystar.net/business/news/50-lakh-poor-households-get-cash-aid-through-mfs-may-14-1901455,
[33] The Daily Star, (2021). Mobile money in the COVID-19, Accessed on March 2021, from https://www.thedailystar.net/supplements/mobile-financial-services/news/mobile-money-the-covid-19-pandemic-2028889
[34] Xiao, X., Tan, B., Leong, C., & Tan, F. T. C. (2021). Powered by "Qinghuai": The melding of traditional values and digital entrepreneurship in contemporary China. *Information Systems Journal*, *31*(6), 769-802.
[35] Díaz Andrade, A., Techatassanasoontorn, A. A., Singh, H., & Staniland, N. (2021). Indigenous cultural re-presentation and re-affirmation: The case of Māori IT professionals. *Information Systems Journal*, *31*(6), 803-837.
[36] Haque, M. M., Yousuf, M., Alam, A. S., Saha, P., Ahmed, S. I., & Hassan, N. (2020). Combating Misinformation in Bangladesh: roles and responsibilities as perceived by journalists, fact-checkers, and users. *Proceedings of the ACM on Human-Computer Interaction*, *4*(CSCW2), 1-32.
[37] Sambasivan, N., Checkley, G., Batool, A., Ahmed, N., Nemer, D., Gaytán-Lugo, L. S., ... & Churchill, E. (2018). " Privacy is not for me, it's for those rich women": Performative Privacy Practices on Mobile Phones by Women in South Asia. In Fourteenth Symposium on Usable Privacy and Security ({SOUPS} 2018) (pp. 127-142).
[38] Sambasivan, N., Checkley, G., Ahmed, N., & Batool, A. (2017). Gender equity in technologies: considerations for design in the global south. interactions, 25(1), 58-61.