INTERACTIVE VOICE RESPONSE AND RADIO FOR PEACEBUILDING:

A MACRO VIEW OF THE LITERATURE AND EXPERIENCES FROM THE FIELD

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ABOUT THIS REPORT

This report is part of a larger project, "Amplifying Peace: Testing Mobile Interaction in Rwanda," funded by a grant from the United States Institute of Peace and is meant to supplement the research for this project which explores IVR's ability to amplify the reach of peacebuilding radio programs as well as streamline and enhance the monitoring and evaluation of that programming.

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ABOUT CGCS

The Center for Global Communication Studies (CGCS) is a leader in international education and training in comparative media law and policy. It affords students, academics, lawyers, regulators, and civil society representatives the opportunity to evaluate and discuss comparative international communications issues.

Based at the Annenberg School for Communication (University of Pennsylvania), CGCS provides research opportunities for graduate students, organizes conferences and trainings, and provides consulting and advisory assistance to academic centers, governments, and NGOs.

The Center's interdisciplinary research and policy work address issues of media regulation, media and democracy, monitoring and evaluation of media development programs, public service broadcasting, and the media's role in conflict and post-conflict environments.

EXECUTIVE SUMMARY

Initially used for customer service and public health survey work in the United States in the 1970s, Interactive Voice Response (IVR) technologies in more recent decades have come to play an increasingly important role in international development efforts around the world, including in peacebuilding work in post-conflict contexts. IVR technologies—the broad term used to describe automated systems that allow humans to interact with computers through phones using voice—range from traditional automated messages to newer talk-to-text applications on smartphones, like Siri on Apple phones or Cortana on Windows phones.

Alongside continuous technological advancements, IVR is being deployed in increasingly innovative and constantly evolving ways, ranging from connecting diaspora communities to their home countries to supporting Ebola awareness in Sierra Leone. In a wide range of development work, IVR is most often used in conjunction with radio—a key medium in post-conflict and developing regions—and particularly by NGOs working with community radio stations to help improve interactivity with their listeners and to reach remote and illiterate audiences.

For instance, in Ghana, Farm Radio International uses an IVR system to help their partner radio stations provide content on demand, collect audience feedback, and conduct listener surveys. In Somaliland, a 2012 project called Ila Dhageyso used an IVR system to connect the public with government officials using a discussion forum accessible online and through mobile phones. Hirdonelle USA, an NGO which uses IVR to disseminate radio content, plans to begin using IVR technologies to raise funds from diaspora groups for local radio stations in post-conflict regions in West Africa.

Yet despite growing interest in and uses for IVR in development projects, there is a surprising lack of research on how practitioners and users in these contexts are implementing IVRs, particularly in the context of peacebuilding work in post-conflict environments. A majority of existing scholarship focuses on single case studies; none, according to our review of the literature, offers a macro assessment that maps how IVRs are being used in broader international development efforts.

To address this research gap, this report provides a broad overview and assessment of how IVR systems are being implemented in international development work with an emphasis on the particular role IVR can play in peacebuilding work in post-conflict contexts. In order to narrow the scope of research, this study focuses primarily on the usage of IVR in conjunction with radio for development projects in different crisis and post-crisis zones in Africa and India, as operationalized within the larger international development contexts.

This report offers a review of the existing literature about IVR applications in non-Western contexts, supplemented by primary research based on interviews with practitioners who are using or designing IVR systems in the field. Many of the individuals interviewed work at organizations that have conducted their own impact evaluations of the new technologies they are using. This study aggregates these assessments.

We identify some of the key IVR systems, highlighting the unique nature of post-conflict peacebuilding settings and briefly contextualizing the evolution of IVR in developing countries. While our focus is on a particular kind of technology, we are careful to avoid a techno-functionalist or techno-utopian approach that often pervades research about ICTs for development. Instead, we are interested in contextualizing how IVR is used in practice based on the experiences of those who are implementing different IVR

systems, including NGO workers, radio station employees, and those designing and developing new IVR applications.

The literature review and primary research conducted for this report reveals both important advantages and limitations of IVR in international development in post-conflict contexts. Such advantages include the technology's ability to help reach illiterate communities, its functionality allowing radio stations to produce programming that may be more interactive and responsive to listeners, and its potential as an efficient tool for survey data collection. It was also found to be particularly useful in countries like Mali with a strong oral culture where voice-based technologies were often easier to use than text-based ones, or in dealing with taboo topics like domestic violence in which being discreet may be essential.

Our research also highlights key limitations of IVR that both researchers and practitioners say are restricting its use in international development, and that often particularly restrict its usage in countries emerging from conflict. These include the high costs associated with implementing an IVR system, in particular the cost of placing a phone call for an end-user, the cost incurred by an organization wishing to make IVR calls free for end-users, or the cost when local telecommunication companies are unwilling or unable to collaborate. Our interviewees also described how IVR, as an unfamiliar technology, can at times be difficult for end-users to figure out or can be labor intensive for organizations to implement, particularly in communities where content needs to be produced or analyzed in multiple languages.

Finally, we conclude by summarizing expert insights about the future of IVR technologies in development work, with a particular emphasis on the implications for peacebuilding work in post-conflict contexts. These range from improvements in the usability and automation of IVR that could make it more efficient and responsive to its possible wholesale replacement by technologies like mobile applications in contexts where smart phones are becoming more popular or where internet infrastructure is becoming more established.

1: IVR APPLICATIONS (1970 – PRESENT) - FROM PUBLIC HEALTH TO INTERNATIONAL DEVELOPMENT

IVR usage initially took off in developed countries, primarily the United States, in the 1970s and 1980s as a tool to make customer service interactions and public health survey work more efficient. While IVR has perhaps become most associated in the public mindset of the United States with frustrating impersonal customer service systems, their usage has taken off in developing countries in many more innovative and positive ways. In the early 2000s, the mobile health sector ('mHealth'), in particular, was leading the way in adopting IVR systems to support development work.[1] The implementation of IVR systems has since been diversifying, used by different NGOs for different goals as their functionality improves. In particular, IVR systems today are increasingly used by NGOs working with community radio stations to help improve interactivity with their listeners and to reach rural populations with low literacy levels or lack of access to radios since IVR enables listeners to access radio content through mobile phones on demand (Sullivan, 2012).

Alongside technological advancements, the many uses of IVR systems in developing countries are also expanding. Freedom Fone, an open source telephony platform popular with international NGOs since its launch in 2011, is the subject of the largest number of existing studies on IVR systems in developing country contexts (Clark & Burrell, 2009). Other systems such as IVR Junction, VOTO Mobile, and AudioNow, are also increasingly popular. IVR Junction, originating out of Microsoft Research India, has recently received attention for its ability to create interactive voice forums. Citizens can contribute to the forum by accessing the website or by calling IVR Junction and leaving a message, and can also listen to the content recorded by others. Inspired by a project called CGNet Swara in India as a means of broadening citizen journalism (Mudliar, Donner, & Thies, 2012), IVR Junction has been used in Somaliland, among other places, to encourage public discussion about the presidency (Gulaid & Vashistha, 2013). U-Call, the IVR program built to raise community awareness in rural northern Uganda, is an example of how IVR and discussion forums are being applied to aid peacebuilding work (Rostami, 2014).

AudioNow, a for-profit start-up, is particularly popular for radio and TV stations looking to reach diaspora populations, many of whom reside in developed countries after fleeing conflict. It was created during the 2010 earthquake in Haiti as a means of helping the Haitian diaspora access news and updates from the remaining radio stations that were still broadcasting after the earthquake. Many of the other IVR systems are also for-profit, including Zeno Radio, VOTO Mobile, Vocantas, Technobrain, EngageSPARK, Gram Vaani, and Awaaz.De. But like AudioNow, despite being for-profit, VOTO Mobile was created to assist in international development efforts by offering a platform to improve communication between government and citizens in Ghana. There are also a number of local start-ups in developing countries, such as CGNet Swara in India and Interactive Media in Rwanda, that are beginning to work in this area, with the potential to develop platforms that respond to local needs.

Finally, in areas where smartphones are becoming more affordable and internet penetration is increasing—as in the case of Rwanda or Kenya—other voice-based tools are beginning to compete with

[1] They have been studied in applications including premenopausal women (Prabu, et al., 2012), stress and alcohol consumption (Andersson, Soderpalm Gordh, & Berglund, 2007), primary care (Willig, et al., 2013), maternal health (Rotheram-Borus, Tomlinson, Swendeman, Lee, & Jones, 2012), AIDS (Shet, et al., 2010), and for the collection of health data in rural settings (Ashar, Lewis, Blazes, & Chretien, 2010).

traditional IVR applications. For example, mobile applications like WhatsApp or other tailor-made applications have the potential to serve the same function as a traditional IVR but with greater affordability as they carry information over data rather than the more expensive airwaves.

C4D APPLICATIONS: IVR AND RADIO PROJECTS

Within the larger field of international development, the sub-field of "communication for development" (C4D) has carved out its own niche focused largely on the role of information dissemination in effecting social change (McAnany, 2012). Whether change relates to health behavior (Schiavo, 2013), democratization (Paula, 2011), or inter-ethnic attitudes in post-conflict contexts (Skuse, Rodger, Power, Taurakoto, & Friguglietti, 2011; Hoffmann, 2014), the focus has often been on providing access to information so people can make more informed choices, predominantly with the aid of community radio.

A newer trend in this sub-field explores how new technologies, typically those associated with mobile phones, can help to make these C4D radio stations and programs more interactive and responsive to listeners (Girard, 2003; Nassanga, Manyozo, & Lopes, 2013; Gilberds & Myers, 2012). Software like FrontlineSMS, which enables radio listeners to communicate with stations through text messages (Srinivasan, 2014), is the most prominent in this area. Short message service (SMS) in general has been the most widely used for improving a radio station's interactivity, due largely to SMS's affordability and ease of use (Tuttlebee, 2003; Myers, 2009; Chiumbu & Ligaga, 2013) for both listeners and radio operators.

IVR is still relatively new to this area, but is broadly being used in three different ways:

1) *Collecting data* from listeners, whether gathering feedback about shows, survey data, or crowdsourcing content that is used in radio programming;
2) *Distributing data,* including making programs available to listen to on demand through mobile phones; and
3) *Connecting listeners* to other opportunities, like to NGOs offering guidance or assistance about health, or to payment options for supporting the radio station.

IVR AND PEACEBUILDING PROJECTS[2]

Post-conflict settings pose unique challenges, distinct from those in average developing countries. Such societies are often sharply divided, with many individuals who have suffered severe trauma as a result of conflict (Scharbatke-Church, 2011). In such contexts, information dissemination can play a pivotal role in

[2] While there are many different ways in which 'peacebuilding' is conceptualized, the purpose of this report is not to deconstruct its many meanings; that is a worthwhile endeavor that has been approached elsewhere (Barnett, Kim, D'Donnell, & Sitea, 2007, for example). Instead, in order to keep the focus on IVR, we have adopted the definition of peacebuilding chosen by the United Nations Development Program (UNDP). For them, peacebuilding "involves a range of measures targeted to reduce the risk of lapsing or relapsing into conflict by strengthening national capacities at all levels for conflict management, and laying the foundations for sustainable peace and development" (UNDP, 2015). Work characterized as 'peacebuilding' in this sense is a smaller part of the larger field of international development work, in that it typically excludes work in communities that have not experienced conflict and work aimed primarily at economic development. For example, much of the agricultural work that FRI does would not be considered peacebuilding because it is aimed at development for rural communities in countries that are not immediately recovering from conflict.

either helping to unite communities (Jeong, 2005) or further divide them (Bhavnani, Findley, & Kuklinski, 2009). International development NGOs and local activist organizations that are working to promote peace in these contexts often focus on the role of information in facilitating reconciliation, social cohesion, disarmament, and renewed legitimation of a united political system (Paris, 1997). In short, in such environments, perceptions of the political leaders, of other ethnic communities, or of the peacebuilding efforts themselves are key factors that impact the process and success of post-conflict reconciliation (Menkhaus, 2004).

The role of radio in information dissemination has been the focus of much post-conflict work (Zorbas, 2004; Curtis, 2000; Bratic, 2008), particularly as a means of preventing future conflicts. This is largely because hate speech on radio stations is believed by many to have played an incendiary role in the Rwandan genocide (Thompson, 2007), and because of the importance of radio in reaching remote and illiterate communities (Sullivan, 2012). Radio C4D projects are frequently used to support peacebuilding objectives in various African countries—including in the Democratic Republic of the Congo (Staub, Pearlman, Weiss, & Hoek, 2007), Burundi (Hagos, 2001), and Rwanda (Curtis, 2000; Bilali & Volhardt, 2013), as well as Afghanistan (Adam, 2005; Rodriguez & Cadavid, 2007) and Colombia (Rodriguez & Cadavid, 2007). Such projects have often been led by international development NGOs focusing on the role of media in post-conflict regions, with projects like Radio La Benevolencija, Search for Common Ground, Fondation Hirondelle, and BBC Media Action.

2: LITERATURE ON IVRS AND PEACEBUILDING

Academics did not begin studying the uses of IVR until 1989, with a large expansion of such studies in the 1990s. According to a meta-analysis of 54 peer-reviewed articles that examined IVR applications from 1989 through 2000, IVR systems were primarily used "in health areas – for example, alcohol and drug monitoring – and for survey applications to non-health areas" (Corkrey & Parkinson, 2002, p. 343).

While there is a substantial body of research on how text-based technologies like SMS and text messaging are used to aid international development around the world, there is scant literature on the use of IVR for these same purposes. The lack of research is most striking in peacebuilding contexts; there are only a handful of existing studies mentioning the use of IVR in projects intended to help communities recover from violence or to negotiate peace. Additional studies look at the role of ICT or new technologies more broadly in peacebuilding projects, but even this was limited when compared to contexts like humanitarian aid and health in particular.

Sara Koltzow, author of one of the few published reports on ICT and peacebuilding, notes that the peacebuilding community seems to have fallen behind the development and humanitarian communities in the use and innovation of new media and new technologies to help their work (Koltzow, 2013). As an illustration of the marginalization of IVR in the literature on peacebuilding, in Paul and Rath's study on the key ICT resources for peacebuilding, including Ushahidi, Skype, and Ning, IVR was not addressed (Paul & Rath, 2014). Yet, as this report will show, IVR systems that locate voice content at the center may be particularly useful in peacebuilding contexts where intended beneficiaries may be illiterate or information may be taboo or sensitive but where dissemination or collection is essential.

There are only three academic studies that look specifically at the role of IVRs in peacebuilding work. Moyo (2012) focuses on the role of a pirate radio station in Zimbabwe, showing how IVRs are being used

to help the stations disseminate information, however the radio station, rather than IVR, was the primary focus of the report. Gulaid and Vashshta (2013) explore the role of IVR Junction, a free, open-source cloud-based voice communication tool, in creating a public forum in Somaliland to improve information transparency between the government and the rural public. And in 2014, Asreen Rostami and his colleagues from Linnaeus University in Sweden conducted an interesting intervention that involved both designing and then assessing an IVR reporting system in northern Uganda, a region that had been recovering from a history of violence (Rostami, 2014). The researchers developed an IVR solution called U-Call, aimed at improving how rural populations in Uganda could access online platforms. U-Call expanded on an existing project called "People's Voices" developed by the Women of Uganda Network (WOUGNET), an NGO that used the online platform Ushahidi to map reports of corruption and problems with public service delivery. While the People's Voices played an important role in raising public awareness about the problems of corruption in the region and in pressuring government officials to respond more quickly, a lack of computers, electricity, and internet connections in rural areas hampered the process of entering data onto Ushahidi. As a result, WOUGNET organizers had to travel to rural communities to manually gather reports, and later enter the data.

To combat some of these problems, U-Call was designed to use voice to help load data to Ushahidi faster and more conveniently. It allowed members of the community to submit incident reports by calling a number on their own, using a system called 'flashing', which eliminated the cost for the callers. This reduced the need for field visits by WOUGNET staff, giving them more time to interpret rather than simply collect the data. U-Call also provided a separate number for administration of the project so that WOUGNET staff could call in, listen, and organize the submitted reports using semantic tagging from their phones, even without internet access. The administration function of the U-Call system also allowed them to select reports that should be published on Ushahidi and those that should be discarded, all using basic mobile phones (Rostami, 2014).

Studies on the use of ICTs beyond IVRs in peacebuilding efforts are more numerous. These include: Koltzow's study of the role of ICTs in monitoring and evaluation of such projects (Koltzow, 2013); Paul and Rath's overview of the philosophical implications of ICTs in peacebuilding (Paul & Rath, 2014); two projects from UNICEF, one looking at the role of in-situ technology innovation in peacebuilding (Llamazares & Mulloy, 2014), and another that maps C4D efforts in peacebuilding with a focus on education and children (Spadacini, 2013); and Stauffacher's 2005 book on the role of ICT in responding to conflict. Studies of ICTs in peacebuilding also include narrower case studies such as Sheldon Himelfarb's (2010) report that reviews the role of mobile phones in the United States Institute for Peace (USIP) projects in Afghanistan, and Martin-Shields & Stones' (2014) work on smartphones and inter-ethnic cooperation in Kenya after the post-election violence.

Although IVR use is not a central focus, these reports contain useful findings about the important roles such technologies can play in combating a range of problems, including illiteracy and lack of communication infrastructure in rural communities. For example, Himelfarb's report found that the IVR system implemented by M-Paisa, the Afghan mobile payment platform modeled after Kenya's M-Pesa, enhanced USIP's work because of "the inability of so many farmers to read text messages" (Himelfarb, 2010, p. 8). Furthermore, research on the utility of ICTs in peacebuilding is helpful to consider, even if not explicitly referring to IVR. For instance, in a 2014 UNICEF study, Llamazares and Mulloy conclude that new technologies could be helpful "to connect constituencies across geography and socio-economic divides, give voice to excluded or marginalized groups, create or support dynamic advocacy platforms, and

promote collaborative partnerships between the private and public sectors and interest groups to generate 'peace capital'" (Llamazares & Mulloy, 2014, p. 109).

3: BENEFITS OF IVR SYSTEMS

Studies on IVR often highlight its utility in development work, especially in projects involving radio. Research shows the advantages of IVR in reaching low-literacy populations (Patel, Chittamuru, Jain, Dave, & Parikh, 2010; Sharma Grover, Stewart, & Lubensky, 2009), as well as its potential to increase audience interactivity, the ability to gather feedback for the radio stations through surveys (Bon et al., 2012; Koradia & Seth, 2012; Sullivan, 2012), and the possibility of using an IVR forum to replace expensive and difficult-to-maintain radio stations (Mudliar & Donner, 2015)

Practitioners we interviewed largely agree with these assessments but also provide a richer illustration of other ways in which IVR systems are useful. These methods are described in more detail below.

REACHING ILLITERATE POPULATIONS

Numerous studies on the role of IVR systems emphasize the technology's ability to access illiterate communities. While this may seem obvious given that IVR systems use voice-based rather text-based technologies, all of the experts we interviewed emphasized the importance of this function. In many projects, IVR systems are used to replace or supplement SMS systems. For example, in a report published by Farm Radio International (FRI) in 2011, FRI found SMS to be less effective in many of the rural areas where it worked than in urban areas due to higher illiteracy rates in the rural communities. As a result, they have successfully implemented IVR systems to enable listeners to interact with stations in rural locations in Ghana and Uganda (Farm Radio International, 2011).

However, Anne Bennett of Hirondelle USA observes that in West and Central Africa, illiteracy rates are lower among mobile phone users. According to Bennett, the most disadvantaged populations are those with both low literacy and low mobile phone ownership—often women in rural villages. In these contexts, neither SMS nor IVR technologies have been adopted, though Hirondelle has experimented with other mobile-based functions such as Bluetooth, which she reports are showing promise. Overall, broadcasts on FM and short wave radios continue to play a central function in Hirondelle's work with women and girls affected by armed conflict in West Africa, helping them to provide information to these otherwise hard-to-reach populations.

Bill Thies, who was part of the team that developed the popular IVR Junction system, emphasizes the key advantage of IVR in reaching illiterate communities in the post-conflict community in central India where IVR Junction's forerunner, CGNet Swara, was developed. CGNet Swara has helped many illiterate citizens in this community participate in conversations about local politics in a way in which they had not previously been able. As Thies points out, because the internet is a predominantly text-based medium, it is therefore not useable for illiterate populations. With CGNet Swara, local residents can use the internet through their phones, by listening to and then contributing content with voice messages. Thies notes that enabling illiterate citizens to participate in internet discussions and create online content is an important advancement in the global accessibility of the internet.

INTERACTIVE PROGRAMMING

Facilitating interactivity and content creation is another advantage of IVR, as identified both in the existing literature (Koradia & Seth, 2012; Ndwe, Dlodlo, & Mashao, 2008) and by many of our interviewees. This is especially true within the field of C4D; practitioners we interviewed highlighted IVR's ability to help improve how a radio station interacts with listeners.

Interactivity allows a station to better tailor programming to its audiences, especially those stations targeting hard-to-reach populations (Sullivan, 2012). Likewise, how information is created, disseminated, collected, and monitored can be central to the success of peacebuilding projects in post-conflict communities. While the tone and framing of content aired on community radio stations can play a large part in shaping public opinion (Hemer, Tufte, Eriksen, & de Ciencias Sociales, 2005), improved interactivity also enables stations to adjust programming based on needs, which can play a more central role in inter-group mediation—often a key component of peacebuilding efforts following inter-ethnic violence (Oyero, Joshua, & Aduradola, 2013).

The example of an ongoing radio program in Uganda produced by Farm Radio International (FRI) about orange sweet potatoes illustrates the importance of interactivity in development projects. The program focuses on the nutritional benefits to humans of orange sweet potatoes as an effort to counter Ugandan stigmas about sweet potatoes being primarily food for animals and encourages farmers to adopt the crop for public consumption. One of FRI's partner radio stations that aired the program used VOTO Mobile to conduct a survey along with the broadcast to determine what the farmers had learned. Survey participants were selected from listeners who had flashed the radio station's IVR system in order to register.

"Flashing" is a form of phone call that is common in many poor communities in Africa, in which the caller hangs up before the recipient answers preventing any charge from being incurred but allowing the station or other recipients to retrieve the caller's number and call them back (Donner, 2007). Levi Goertz explained that VOTO Mobile often uses flashing—or what he calls "the poor man's toll-free line"—in their survey projects, as this encourages responses by preventing respondents from incurring any charges. Because registration for the survey was voluntary, response rates to this and other surveys FRI administered through their IVR system were higher than average survey response rates.

Rostami also details how "flashing" was used in the peacebuilding project he worked on in northern Uganda, allowing community members to report corruption and problems in the community toll-free over U-Call: "People wanting to use the system simply need to make a call to the system and the system will then record the user's number and hang up with a call to eliminate the air time cost. The system then calls the reporting user back, meaning the user does not pay for the call to make or obtain a report" (Rostami, 2014, p. 3).

Improving a radio station's interactivity can also allow greater access to radio programming over mobile phones, particularly for citizens without physical access to a radio. According to Bennett, while some of the most disadvantaged citizens may not have phones, in other situations people have no access to a radio. In Somalia for example, Al Shabaab militants periodically target radio broadcasters in order to restrict access to diverse radio content (BBC Monitoring World Media, 2010). By contrast, mobile phones— comparatively cheap and widely available in the unregulated telecom market of Somalia (infoasaid, 2012) —are both easily hidden and too numerous to target. In conflict and post-conflict areas

like Somalia, where radio access may be less reliable, radio programming on mobile phones may therefore be particularly useful in providing information to hard-to-reach populations.

According to Bennett, an IVR system like AudioNow can also help people access programming from Hirondelle's partner stations, like Radio Tamani in Mali, which provides a discussion platform for the country's post-conflict reconciliation efforts. While a physical radio may be difficult to access, particularly during the exact time a program airs, a mobile phone, even a communal one, is often more available. When a radio station uses IVR to enable 'call to listen,' audience members can listen over their mobiles to programming according to their own schedule or even multiple times, as Bennett noted many of their listeners are doing. Hirondelle is now trying to extend 'call to listen' programs to local populations (not just diaspora), although the organization has encountered challenges in working out agreements with local telecom service providers, a common issue this paper discusses later.

Listening to radio content through mobile phones appears to be increasingly popular in sub-Saharan Africa. A study conducted in 2013 by Balancing Act, an African telecom consulting firm, found that 53 percent of Ghanaians and 57 percent of Kenyans listen to the radio through their mobile phones (Balancing Act, 2014). In addition, many phones popular across the continent, such as LG's GB110 and the popular and inexpensive Nokia 5030 and X2-00, come with a built-in FM radio. Nonetheless, data on such trends is often not systematically tracked in conflict and post-conflict regions.

Studies have found that built-in radio systems are easy to use (Ford & Batchelor, 2007), and as such, may serve as an alternative to IVR for audiences who wish to listen to radio over their phones. Still, while built-in FM radio technology may be more user-friendly for listening to radio than IVR—which would require placing a call—with the built-in FM system, users must listen to programming at the time of the transmission, which restricts some of its utility. IVR therefore has the advantage of allowing users to call in and listen at their convenience. In post-conflict settings where public opinion and discourse may be an important component of preventing further conflict, the ability for members of the community to listen to pro-peace radio programming aided by flexibility of IVR could mean that the content reaches a wider audience.

CONVENIENCE AND EASE OF USE

Although interpretations of convenience and ease of use vary, many interviewed for this report link the convenience of IVR to its oral nature and to the flexibility it provides users. As Goertz notes, a significant advantage of IVR is that it "puts the power in the hands of the end-users" by allowing the audience to consume information or participate in a survey at their convenience.

According to Thies, systems like CGNet Swara offer a simple interface requiring users to call a single number and then to simply press either #1 or #2 depending on whether they want to contribute or listen to content. For instance, Theis explains that in India, where opening a radio station requires significant start-up capital or may be politically sensitive particularly in regions prone to conflict, an IVR discussion forum might be easier to launch than a traditional radio station. This example may be particularly relevant for post-conflict peacebuilding projects where the capital and the infrastructure required to establish and to operate a radio station are often lacking. Coupled with the interactivity highlighted in the previous section, an IVR discussion forum may better accommodate the needs of local communities, particularly for collating and disseminating information in post-conflict regions, compared to a traditional radio station.

For White at AudioNow, convenience is measured by how easy the AudioNow system is for the organization's client radio stations and listeners to use. AudioNow works directly with TV and radio broadcasters, including during the initial installation of the technology. According to White, many stations have given positive feedback about how easy the system is to use once the set-up is complete, even for radio stations with very limited in-house technical ability. White also believes that AudioNow is convenient for end-users, as listeners can call in to listen to radio content with a single number saved on their phone.

While many of these diaspora communities in developed countries now stream radio content online, streaming is still a nascent trend in many developing and post-conflict countries where internet penetration rates, internet speeds, and access to computers are traditionally much lower. Without a computer, accessing websites through mobile phones, particularly the feature phones that are far more popular than smartphones in many developing countries, can be cumbersome and unintuitive. In these contexts, IVR makes content available over the most basic mobile phone. Although the ICT infrastructures in post-conflict regions vary widely—Rwanda's internet penetration, for example, is rapidly increasing, facilitated by the country's small size, high population density, and recent economic growth—in many locations where infrastructure is lacking, implementing an IVR system can be much easier for a rural radio station than setting up a website with streaming content. Likewise, IVR can also make consuming a radio station's content more convenient for both local and diaspora audiences.

ANONYMITY

Another key benefit of IVR according to our interviews is its discreteness as compared to other technologies, as users are able to listen to radio programming with a greater degree of anonymity than with traditional media. While this aspect of IVR has not received much attention in the literature, many sources interviewed for this report emphasized it.

For instance, Hirondelle's media and partner radio stations target women audiences in Western and Central Africa, producing content that is perceived as taboo in some settings, such as programs about sexual violence. Many of the women they are hoping to reach live in households where, if they have a radio, it is controlled by their husbands. In such an environment, calling in during a private moment to listen to content about sexual violence can be much more discreet than receiving the same information via an SMS message, which could be read by someone else or could arrive at an inconvenient moment. Furthermore, Goertz points out that unlike SMS, IVR does not leave any content trail on the user's phone that someone else might retrieve later.

Similarly, CGNet Swara, used for reporting corruption, allows the public to work through a local CGNet Swara volunteer who acts as an intermediary, recording a person's message on their behalf in cases in which someone is uncomfortable making a report directly using their own voice. Through this intermediary, members of the community are able to report corruption when they would have otherwise felt unsafe to do so. Moreover, even when individuals call in themselves, the content is still anonymous and not tied to a particular phone number as an SMS would be. For these reasons, IVR may have an advantage over SMS in terms of anonymity and discreetness. In the process of a post-conflict truth and reconciliation commission, for example, this may be particularly helpful for encouraging more members of the community to report corruption or violations that occurred during conflict.

ACCESSIBILITY FOR ORAL CULTURES

Experts we interviewed also spoke expressly about IVR systems being important methods of interaction in oral cultures. By oral cultures, we do not mean simply cultures with high levels of illiteracy, but rather cultures with a strong tradition of passing on information orally (Olson & Torrance, 1991). In Mali, for example, *Griots* are central figures, poets and musicians, who have a long history of being repositories of knowledge and local cultural history (Kaschula, 2001). In Somalia, oral verification of information is often considered much stronger than written verification; many who listen to the Somali language radio or television stations will call into the stations immediately afterwards to verify the information they just received (Moehler & Marchant, 2014). Claude Migisha explained that in Rwanda, people are much more accustomed to communicating orally than in the West, for instance citing the popularity of a phone call rather than an email to confirm a meeting. In such cultures, the ability to interact with information orally, as IVR allows, can be much more effective than in a culture like the UK where the formality of written documents is more common. Migisha also believes that in Rwanda, where many peacebuilding projects are in operation, content conveyed using an IVR system may be more accurate than with an SMS platform, as speaking over the phone is a much more natural for Rwandans than typing on a mobile phone.

Many sources we interviewed also emphasized the important features of a voice message. For Thies, the importance of audio content in an oral culture is illustrated by the difference in quality and information relayed by voice as compared to written content. In developed countries, people may have become more accustomed to reading forums like Reddit online, but he explained that often emotions can be lost in text as opposed to a voice recording. This is even evident in a Western context where humor in a text message may be missed unless it is accompanied by an explanatory emoji. In the post-conflict community in central India where CGNet Swara operates, there can often be a lot of urgency involved when someone calls in to complain about not having power for days or other more contentious political issues—a sense of urgency that is much easier to convey through voice than text. This dimension of emotional voice content was also one of IVR's main assets highlighted by Goertz. For him, a unique feature of IVR is the fact that the 'voice' in a recording can be modified. By changing the qualities of the recorded voices that help users navigate through an IVR call – for example, the gender, accent, emotional intensity, or vocal pitch – the user's experience, and even their behavior, can noticeably change.

Roemersma spoke of the BBC Media Action's work with community radio stations in South Sudan to help them take advantage of the community's oral culture to engage their listeners through the Voice and Participation project. He suggests that the capacity of IVR to relay tone of voice could be very useful for early warning systems that help prevent future conflict. A platform like Ushahidi, which crowdsources information from the public during emergencies, or conflict violence, such as the 2007 Kenyan elections, could benefit from adopting IVR, which would enable the urgency of the reports to be recorded.

USE IN SURVEYS

As noted above, several studies demonstrate IVR's utility for conducting more efficient and automated surveys and reducing human labor (Asthana, Singh, Kumaraguru, Singh, & Naik, 2012; Couper, 2005). In Koltzow's study on the use of new technologies in monitoring and evaluation in peacebuilding projects, she concludes that new technologies are a great benefit for surveys, and an important component of project evaluations: "Since mobile digital technology allows skipping the step of manual data transcription and going straight from data gathering to its analysis, real-time accessibility of data is possible" (Koltzow, 2013, p. 9).

While experts we interviewed also spoke about the benefit of using IVR for administering surveys, many focused more on the qualities of anonymity and interactivity as discussed above. For Gilberds, the IVR systems played a central role in FRI's ability to gather information from their listeners in very remote locations and to assess the impact of their radio content. Similar monitoring and evaluation (M&E) assessments of radio content in rural locations can be extremely difficult to conduct systematically, where in-person interviews or focus groups are time consuming, labor intensive, and expensive. In contrast, IVR allows researchers to access audiences more cheaply and quickly. It also allows for more frequent monitoring and evaluation activities throughout the course of a project, enabling NGOs in the field to adjust their strategies and approaches more organically, as well as to implement changes more effectively, rather than waiting until the final end-of-project impact assessment survey.

While AudioNow operates primarily in developed countries for diaspora audiences, it also serves as a survey platform for organizations like the Knight Foundation and their research on the experience of immigrants applying for jobs in the United States. Likewise, the majority of VOTO Mobile's projects since its inception in 2012 have been survey based, often including open-ended questions that allow callers to provide voice answers. Guy Grossman, a professor in the political science department at the University of Pennsylvania, for example, recently used VOTO Mobile to improve the response rates to a previously administered SMS-based survey he conducted in Uganda to assess public opinions about governance.

As discussed in previous sections, IVR removes the human-to-human interaction from the survey process. In a post-conflict context like Rwanda, Migisha described how this is crucial to respondents' feeling comfortable to speak freely in a way that face-to-face surveys, phone surveys conducted by an interviewer, or even text based surveys where phone numbers are necessarily recorded could not provide. The anonymity afforded by IVR in surveys may be particularly important when the information exchanged is sensitive, as is often the case in work around post-conflict truth and reconciliation.

4: LIMITATIONS OF IVR

While IVR has many benefits, the technology is not without limitations. Despite being experienced with IVR systems, all interviewees acknowledged the limitations of IVR systems; even those who worked for companies that administer or design IVRs readily acknowledged it is not always the best solution in every context.

DIFFICULTY FOR END-USERS

Studies show the primary drawback of IVR in developing country contexts is its *difficulty* of use, primarily for end-users (Lerer & Amarasinghe, 2010; Koradia & Seth, 2012). According to a report co-authored by Thies and researchers at IIT Delhi and Microsoft Research India, many end-users targeted by different IVR-based projects had no prior experience with automated recordings and struggled to use the technology (Chakraborty, Medhi, Cutrell, & Thies, 2013). Thies explained how many callers to IVR often spoke as if they were interacting with a real person or simply re-stated the recording when prompted to leave a message. Likewise, Roemersma explained that while the 'call to talk' functionality of many IVR systems was relatively straightforward to use, he believed that 'call to listen,' where people could listen to shows on demand, was still relatively cumbersome and complicated to understand, particularly compared to FM radio features on some phones which are more familiar to those who already use a radio.

In post-conflict environments where people may have less experience with new technologies (though this is certainly not always the case), these kinds of difficulties may be hard to overcome. Likewise, facility with a new piece of technology, however 'user-friendly' the design, cannot always be assumed. For instance, when U-Call was implemented in northern Uganda, WOUGNET's employees responsible for using the more complicated administrative functions needed more detailed training.

Thies also acknowledged that even in places with a predominantly oral culture, and in places where people might be very comfortable with new technology, IVR's voice-based content can still be time-consuming to navigate. Compared to the ability to quickly skim text on a website, consuming content through an audio system is significantly slower, and depending on the quality of the recording, it may also be difficult to comprehend and decipher.

For administering surveys, Goertz pointed out that IVR is unlikely to be the best method if a really "rich interaction" is the goal. The more numerous and complicated the questions, the less likely users will be to finish a survey. Finally, for the often taboo and sensitive work Hirondelle does on sexual violence, they found that setting up in-person listening and discussion groups for women to listen to radio content together and then discuss afterwards was an effective way of reinforcing lessons learned from the program.

In peacebuilding projects, such listening groups may also play an important role in ensuring the efficacy of pro-peace message dissemination and comprehension (Spadacini, 2013). Bennett indicated that the trend of listening to IVR-enabled content over mobile phones could potentially encourage solitary listening where such discussion would be less likely. Moreover, the physical capability of the speakers on many of the feature phones popular in Africa still make group listening through IVR more cumbersome than through an actual radio. However, Bennett believed that the discreetness afforded by IVR, particularly in combination with peer-to-peer content transfer through Bluetooth is invaluable to Hirondelle's work on some of the most taboo subjects, and a useful supplement to, if not a wholesale replacement, of the traditional group listening, even if it was sometimes difficult for users to navigate.

As a result of these limitations, many of the existing studies recommend either end-user training (Elangovan & Arulchelvan, 2012; Koradia & Seth, 2012) or the development of new IVR systems through a more participatory process (Ndwe, Dlodlo, & Mashao, 2008). Yet as Thies explained, end-user training is not always straightforward. For those unfamiliar with automated systems, integrating training into the system itself (at the beginning of a call, for instance) may be of limited use, while in-person trainings can require a large investment of staff time and money. He nevertheless still suggested that most IVR systems could benefit from some form of training, especially for first-time users. He explained that unlike in developed countries, where this kind of time-consuming training would add to callers' frustration because they are pressed for time or accustomed to a faster pace of service, people in many developing countries often have different expectations and are less likely to get frustrated when reaching an automated customer service system, though they would be more likely to be confused by the interface.

However, the time-consuming nature of such training may be more problematic in the case of using IVR to supplement text-based platforms like Ushahidi, when individuals are reporting information during emergencies or conflict (when texting may be more discrete than IVR). In such situations, listening to a training message and having to leave an audio message may prevent the caller from leaving any messages at all.

DIFFICULTY OF USE FOR OPERATORS

Our sources indicated that usability is not only an issue for end-users but for IVR operators as well. Numerous experts we interviewed described how IVR systems could be more labor intensive on the back end than SMS systems. According to Migisha, the set up and maintenance of IVR systems in Rwanda often requires in-house technical expertise that many NGOs lack. Gilberds explained how the different IVR systems can have technical bugs, as well as differing internet or power demands.

Likewise, Donner and Goertz also emphasized the labor-intensiveness of some aspects of their respective IVR systems. For instance, content that CGNet Swara collected from the public needs to be translated from local languages into the main languages of Hindi and English. In general, text-based translation needed for SMS typically requires much less labor, and is therefore less cost intensive. Voice-based interfaces not only require translation but also a fluent speaker to translate and record content in different languages. VOTO Mobile's platform allows for open-ended questions in its surveys, but organizations still need to spend significant time coding responses on the audio files, which is more laborious than coding single responses from close-ended questions. While organizations VOTO Mobile works with are often excited about the added content quality of voice messages, Goertz explained they often revert to closed-ended questions after realizing how time- and labor-intensive processing voice messages can be.

For AudioNow radio clients, White explained that usability for organizations was less of an issue because AudioNow typically manages the installation and provides necessary technical support. While they work with many radio stations in many different languages, broadcast stations generally have personnel who can record the IVR messages fluently in Amharic and Somali—the primary languages of their broadcasts—since AudioNow has no in-house translation capabilities for these languages. AudioNow typically works with key people in the community who speak English as well as the local language, who can coordinate community outreach efforts as well as network with their partner broadcasting stations, in addition to helping with translations.

The demands of producing multilingual content is often more of a challenge for smaller organizations that work in multilingual societies like Uganda or South Sudan. Even for languages like Amharic, which use a script other than the Roman alphabet common on mobile phones, Gilberds believes that creating text-based SMS interfaces is still easier than IVR because of the time required to record the audio content.

The voice forums for CGNet Swara and IVR Junction present a different usability issue than for other IVR systems. As Donner pointed out, while users can call in to leave content on the forum, the forum must also be manually monitored and moderated. For example, CGNet Swara employs a dozen full-time moderators, as the forum aims to uphold high journalistic standards by verifying information provided by the public. While this is currently manageable for CGNet Swara, such labor costs can be prohibitive for larger-scale operations.

Thies explained that one solution might be experimenting with other less intensive ways of moderating, for instance using community-sorting mechanisms akin to Reddit, in which users can vote on content, with the most highly rated content becoming the most visible. Thies and his co-authors explored this option in greater detail in a study of a community-moderated voice forum in rural India called Sangeet Swara (Vashistha, Cutrell, Borriello, & Thies, 2015).

In conflict or post-conflict environments like Liberia, Cambodia or northern Uganda, moderation, verification, and response form an important part of systems like Ushahidi. While adding IVR to a system

like Ushahidi, as Rostami and his colleagues did with U-Call, may enable more people to submit reports, the labor and time required to process audio content could impede the ability of authorities to respond to emergencies or other situations in a timely manner. This was not the case with U-Call, as the system was replacing a slower, manual form of report collection, and the reports were not as urgent as those being reported during the post-election violence in Kenya when Ushahidi was initially created. But even in the case of U-Call, administrators still needed to review audio content in order to process the information, although the administrator function on U-Call allowed them to review content more quickly on their phones.

In post-conflict peacebuilding projects, where time may be more pressing and information more sensitive, end-user and operator usability may therefore be more problematic for IVR systems. Particularly in the case of crowdsourcing reports of violence, operators need to carefully weigh the potential increase in the number and diversity of contributors against the increased time it will take to process the data.

COST

While experts we interviewed cited trouble with user and operator friendliness, the most noted concerns were about high costs of implementing IVR compared to SMS platforms, for which IVR is generally seen as a replacement. In many developed countries, mobile phone users buy unlimited monthly packages, making these cost distinctions less relevant. But in many developing countries, especially in poor communities, pay-as-you-go mobile service is much more common, and text messages are much cheaper than voice calls.

White was a dissenting voice regarding the issue of cost, explaining that for AudioNow's diaspora users in developed countries, the cost of making a call very rarely seemed to be an issue. This is likely because even for poor communities in countries like the United States, unlimited monthly plans are fairly affordable and many carriers no longer require contracts that might be difficult for new immigrants to obtain. In contrast, for the poorest communities in countries like Mali and South Sudan, the cost of the phone call necessary to connect with an IVR system is often prohibitively expensive.

Indeed, the issue of end-user cost varies according to demographics contexts. Hirondelle, for example, often works with the most disadvantaged and conflict-affected communities, such as in Mali or Sierra Leone, with few resources to spare for making phone calls. When Hirondelle is unable to cover airtime costs, they receive many more calls from men than women because men typically have more disposable income in these communities. An existing study of work done by FRI integrating an IVR hotline into one of its partner radio stations in Tanzania likewise found that women were twice as likely as men to know about the hotline but about half as likely to use it (Sullivan, 2012).

As Bennett explained, NGOs wishing to connect with these communities need to find a way to minimize or eliminate call costs if IVR is to become a real possibility. Gilberds noted that FRI often found a way to cover the airtime within their program costs and to redirect call costs from users to FRI using the flashing system described earlier. However, this can be burdensome for many non-profits or organizations with fewer resources, which can limit the ability to access certain populations.

Some interviewees said that high set-up costs make IVRs less attractive for small NGOs. Migisha observed that local NGOs in Rwanda were adopting IVR at slower rates than for-profit companies, largely because of the initial cost of the system and its installation, personnel costs associated with providing voice recordings necessary for the IVR interface, and staff training. These costs differ depending on the specific

requirements of each IVR system; for instance, IVR Junction's interface involves minimal pre-recorded messages to navigate through the system. But if a radio station wishes to install IVR as a kind of automated answering machine that directs callers to different options, including connecting to additional information or to channels where they can leave comments, longer voice recordings are necessary. Depending on the context and which communities the organization are targeting, these recordings may also need to be in multiple local languages. BBC's Roemersma explained how different set-up costs could be associated with different IVR systems, particularly depending on the functionality needed. Freedom Fone, for example, seems more sympathetic to NGOs, as its software is open source and offers greater functionality and adaptability at a cheaper price. By contrast, proprietary IVR systems are often more expensive to implement, according to Roemersma.

One of the most frequently cited reasons why the cost of IVR was often an issue in developing countries was the burden of working with local telecommunications companies that may be unfamiliar with IVR. Many IVRs are implemented in the hopes of reaching a large audience, and call volume usually increases alongside project scope. In these cases, an arrangement with a telecom provider is necessary to help keep calling costs down. White acknowledged that even in developed countries, working with telecoms companies is a large part of AudioNow's work. Through their 2,500 different broadcast partners, they work with 130 nationalities and ethnic groups around the world. For every country in which AudioNow has partners helping broadcasters reach diaspora, they have to negotiate with the local telecoms in order to provide local calling numbers for the end-users in an effort to decrease call costs for users.

Negotiating these arrangements is one of AudioNow's major challenges in working in many Sub-Saharan African countries as many telecoms there are unwilling to bear some of the burden to help make the service affordable for local callers. Bennett similarly noted that Hirondelle USA had successfully approached telecoms like Orange in France to help gain access to IVR for communities in France. But even once an arrangement had been reached with Orange, in order to implement a similar system in a country like Mali with an ongoing conflict in the north, they would have to negotiate another deal with Orange's local subsidiary in Mali. These subsidiaries as well as other local telecoms are often reluctant to cooperate if the call volume is uncertain and they are often less familiar with IVR technologies than their counterparts in developed countries.

Small local organizations are in an even less favorable position than AudioNow or Hirondelle, as larger organizations may be able to leverage their large caller volume in negotiations with the telecoms. Migisha described, for example, how telecom intermediaries were a particular barrier to IVR adoption for small Rwandan NGOs.

Conflict and post-conflict zones complicate the telecom landscape even further, preventing sustainable growth of the industry. Lengthy negotiations with telecoms in such situations could be inefficient for an NGO if there is a chance that discussions will collapse or the infrastructure may be destroyed by violence. The particularly lengthy conflict in Somalia has prevented the government from exerting authority over much of the country, resulting in lax, if any, enforcement of regulations, and numerous telecom companies have emerged, duplicating much of the infrastructure. While duplication is helpful for reliability of services, it also means that many mobile phone users have SIM cards with multiple carriers for a variety of reasons.

In a context like Somalia, NGOs or other organizations interested in using IVR may have to negotiate deals with more than one carrier. Bennett's experience during the Ebola outbreak in Sierra Leone and Liberia is

another example of the wild card posed by telecoms. Due to the extreme emergency of the Ebola outbreak, Hirondelle found that the local telecoms were willing to help provide IVR access for free and provide toll free calls for end-users, particularly if the IVR system would help address the outbreak. Thies also described how CGNet Swara had come to an arrangement with the local telecom company that enabled them to provide toll free numbers for those calling into the system. However, stories of helpful telecoms are the exception, and most sources interviewed for this report found the telecoms' unwillingness to collaborate to be a major obstacle.

Interventions in conflict and post-conflict zones have additional barriers when it comes to cooperating with quasi-governmental organizations like telecoms because they are frequently critical of the government. Nonetheless, in situations in which the government may have an interest in helping disseminate peacekeeping messages or gathering information for truth and reconciliation commissions, governmental actors may be able to put pressure on local telecoms to cooperate, as was the case with Hirondelle during the Ebola crisis in Sierra Leone. Moreover, political elites in post-conflict settings often exhibit high levels of rhetorical unity and interest in peacemaking, such as in the post-election violence in 2007-2008 in Kenya (Moehler & Marchant, 2013), and governments with significant international involvement in peacemaking processes, like UN peacekeeping missions (Collier et al., 2008) or diaspora organizations (Cochrane, 2007), tend towards pro-peace behaviors as well. In such cases, even smaller local organizations may have greater leverage with the telecoms if their work is focused on supporting the peacemaking process or if it is backed by more influential international actors, including members of the diaspora.

A majority of interviewed sources agree that if IVR is to be a viable option for NGOs with limited resources, especially those trying to reach populations with even more limited resources, negotiating deals with the telecoms, or other ways of cutting costs, are necessary for more widespread IVR adoption. Particularly when compared to the low cost of SMS technology, the costs associated with IVR technology for end-users may either be a serious impediment or may require partners who are able to pressure the telecoms into collaborations, or innovative workarounds like the "flashing" approach implemented by VOTO Mobile and by U-Call in northern Uganda that transfers the cost to the administering organization.

5. LOOKING FORWARD: THE FUTURE FOR IVR SYSTEMS

The project contexts discussed by interviewees differ widely; indeed, what might be useful in India for example, may not work as successfully in Mali or other countries with different technology and different infrastructure as well as different political, cultural, or social norms or histories of violence. Nonetheless, the diverse array of experiences collected in these interviews, as well as in some of the literature, helps illustrate the broader IVR landscape, and the myriad ways in which IVR systems are useful in conflict and post-conflict settings, as well as in reaching remote or widely dispersed communities, women, and illiterate populations.

Our research shows that the anonymity and discreetness that IVR systems afford could also be useful for NGOs interested in disseminating or gathering controversial information to support reconciliation efforts in divided societies. A voice-based discussion forum like those facilitated by IVR Junction, for example, could potentially be very useful in facilitating post-conflict interethnic dialogue among diverse and geographically dispersed participants, or in gathering information for a crowdsourcing platform like

Ushahidi. CGNet Swara and U-Call have already served similar roles in the communities in which they work where access to information is otherwise limited

Past research and insights by experts also reveals the limitations of IVR under certain conditions. For populations with little prior experience with recorded voice messages, IVR interfaces may be confusing. Many of the small radio stations that might be key to accessing populations in divided post-conflict societies may not have the technical expertise or the personnel to set up and maintain an IVR system. Similarly, processing voice data about violence collected through an IVR-enabled crowdsourcing platform could be inconvenient and time consuming, potentially prohibiting timely and appropriate responses in urgent situations.

Beyond these limitations, the cost of IVR seems to be its most significant obstacle. Telecoms in countries with little prior experience with IVR may be unwilling to partner with small NGOs, making it difficult to keep the cost down for end-users. For many rural and poor populations, the cost of an unsubsidized phone call could be enough to prevent participation. Such cost issues will need to be addressed using innovative solutions, like allowing callers to "flash" stations to avoid incurring any costs, if IVR is to become more widely used in developing countries—but even with flashing the organization must be financially capable of covering the costs. The willingness of the telecoms in Liberia to work with the NGOs to provide free phone numbers for IVR platforms administering important information indicates that in certain situations, NGOs providing vital information and services may have sufficient leverage to negotiate appropriate arrangements, particularly in situations where governments may be willingT to help leverage telecom cooperation.

While IVR systems are still very much in an experimentation and trial-and-error stage in developing countries, there is much optimism about future avenues for development. This includes enhanced automation features that will enable easier and more diverse participation, greater functionality facilitating fundraising for radio stations in remote areas or in post-conflict areas with large diaspora populations, or more tailored content distribution based on a caller's needs. These advancements could be particularly important in post-conflict environments where limited resources restrict the amount of labor NGOs are able to allocate towards these tasks. An automated system that distributes rapid and tailored information could be vital in post-conflict countries where access to information is difficult but can play an important role in building peace.

Many practitioners we interviewed also agree that greater internet penetration and more affordable smartphones in developing countries may mean that mobile phone applications could begin to replace IVR systems in many places, particularly as the cost of placing voice calls remains relatively high compared to data transmission. This was largely seen as a positive development, as the same content would be able to be delivered more affordably this way. However, it is unclear to what extent improvements in internet and smartphone access will take place at similar rates in conflict or post-conflict contexts where infrastructure may develop more slowly or with less stability and reliability.

Sources we interviewed also anticipated an array of future developments for IVR, ranging from improvements in usability and automation to its possible replacement all together with more data-based technologies. Bennett and White highlighted the potential of IVR as a fundraising tool; it could help enable diaspora listeners to support a local radio station in their home country for example. In this way, IVR systems could potentially serve as an important revenue-generating resource, helping offset set up and

maintenance costs discussed earlier. This could be particularly helpful in crisis and post-crisis countries and conflict zones with large diaspora communities like Somalia and Lebanon.

In addition, Hirondelle is also currently exploring ways to use IVR to direct callers to other content. Typically, callers into radios stations affliated with Hirondelle are able to leave voice messages or to listen to content, but a system that could help direct pregnant women to more information about pre-natal vitamins or local NGOs that help administer maternal healthcare based on how they respond to questions over IVR could also be helpful. Similarly, in peacebuilding contexts, citizens who call a radio station which aired a pro-peace program could be automatically directed to the offices of a peace and reconciliation commission that is working on collecting community stories about experiences during a conflict.

Migisha believes this kind of responsiveness will become easier with more locally situated innovation around IVR, as in the case of the organization Interactive Media in Rwanda, or in the origins of CGNet Swara, which was locally focused throughout its development. Gilberds also described an FRI project in Arusha, Tanzania, which works to support the development of local IVR systems that are tailored to the specific needs of local radio stations. Similar evidence about the value of in-situ technology innovation can also be found in the literature, particularly in Llamazares & Mulloy's report on UNICEF's work in Uganda (Llamazares & Mulloy, 2014), and there is a growing body of broader literature about local technology innovation in Africa that might be a fruitful avenue for research around local IVR innovations. Given the distinctiveness of the many different kinds of peacebuilding contexts, IVR innovations that are better able to adapt to local contexts should be an important avenue of future development.

Gilberds pointed out potential future developments in the near future of smarter IVR platforms that use algorithms to help determine how callers should be directed based on how they answer survey questions. Currently, staff members analyze survey responses and later send callers appropriate information based on their answers. With advancements in automation, this process could become quicker and less labor intensive for survey administrators. Likewise, Thies stressed the importance of automation for the consumption of online content, like IVR Junction forums. He anticipates that new advancements in IVR technologies could include making voice interfaces simpler and easier to navigate, and that more sophisticated voice recognition technology will make interacting with the internet easier for low-literacy communities. Yet he cautioned that such technological advancements would likely happen more quickly for more dominant languages, like English.

Finally, our sources indicate that IVR systems that depend on phone calls may be rendered obsolete by other technologies in the future. Roemersma, for example, believes that as internet and smartphone penetration increase in many developing countries, IVR systems may be replaced by mobile phone applications, like WhatsApp or more tailor-made applications that provide similar functionality but cost significantly less, as they transmit information through data rather than using more expensive airtime. In a country like Rwanda, where broadband internet penetration is rapidly increasing, this may be a possibility in the near future. White explained how this is already happening at AudioNow, which has developed a mobile phone application that allows listeners to connect with their partner radio stations, in addition to the IVR interface. For AudioNow, digital solutions appear to be an important aspect of their future operations, even where they still offer voice calling.

However, IVR systems and their mobile app counterparts share many of the same functionalities for the end-user. The AudioNow app, used by international radio stations like Radio France International and the UN Radio, is audio-based in that it enables users to listen to radio content in much the same way as the

Stitcher Radio app does in the United States. Moreover, their app also provides a connection to a phone number if users prefer to listen to content that way, a feature that may be helpful for those with limited access to data. However, in regions where internet penetration remains low—as in communities with ongoing violence or under threat of violence, and where the cost of implementing the necessary infrastructure are higher—the replacement of IVR with newer smartphone applications may happen more slowly, if at all.

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