

# Building Citizen Engagement into the Implementation of Welfare Schemes in Rural India

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## ABSTRACT

Citizen feedback on the implementation of social welfare schemes can help fine tune their design, understand problems, and assess the benefits and impact from these schemes. Such feedback loops however are singularly missing in most schemes in India, and are conveyed only indirectly via civil society and social audit organisations that try to serve as a bridge between citizens and the government. We leverage the deep penetration of mobile phones in India to design a suite of IVR (Interactive Voice Response) tools that can help capture community perceptions, improve awareness of the people, and verify official records directly by the beneficiaries themselves. In the context of a rural employment guarantee scheme, we evaluate these tools in a few villages in the state of Haryana and demonstrate that there is good scope for using IVR tools to serve as a citizen engagement channel for welfare schemes. Our contribution lies in outlining several use-cases for technology interventions, and uncovering nuances that should be addressed if such systems are integrated into the implementation of social welfare schemes.

## 1. INTRODUCTION

The central and state governments in India run various social welfare schemes like the National Rural Employment Guarantee Act (NREGA) and the Public Distribution System (PDS). However, the governments do not have any direct mechanism to understand public perception on these schemes, the level of awareness about these schemes and problems that beneficiaries face in the implementation. Studies [30, 8] show very low awareness on NREGA among the beneficiaries, and other studies show misuse of funds [31]. Systems like call-centre helplines set up by the governments are far under-utilised largely owing to a lack of awareness about these grievance channels and poor expectation by the people of seeing any resolutions come through, as a result of which these channels do not capture implementation insights well. For example, only 17 calls per day are made to the government call centre in the state of Telangana regard-

ing NREGA [32]. Governments have also set up large MIS systems to track minute details about the implementation of various schemes to bring more transparency, but these MIS systems are not directly accessible by the target beneficiaries due to low literacy and their inability to use the Internet, thus impacting ways in which the MIS data can be put to better use. There are provisions for conducting social audits but it is a resource-intensive exercise in terms of time, money and human resources. Moreover, independent social audit bodies are missing in many states of India.

Given the deep penetration of mobile phones in India [13], and the ability of even poorly literate people to use basic calling functions and voice communication, we argue that mobile phones can help citizens engage directly with governments to provide feedback targeted at improving the performance of welfare schemes. In this paper, we describe our experience of using automated voice calls via IVR systems to capture community perceptions and feedback, and involve the communities in verifying the reported status of activities done under these government schemes. Our objective is to verify broadly if technology can provide a scalable method for citizen engagement in a rural low-literacy scenario; at this stage we do not specifically look in detail at how the IVR system should be designed for better usability or best ways for integrating it with the MIS.

In this paper, we choose the flagship NREGA scheme to test our hypothesis because it has seen large nationwide roll-out and has an extensive MIS that is regularly updated in most areas. Our concepts are however general and can be extended to other similar social welfare schemes as well. We deployed three IVR (Interactive Voice Response) tools in the Mewat district in the north-western Indian state of Haryana by partnering with Alfaz-e-Mewat, a Community Radio (CR) station running in the region: one, an unstructured IVR platform on which the beneficiaries can record their feedback and listen to feedback of other members of the community (Mobile Vaani [11]); two, a structured survey using voice and DTMF (phone button press) inputs to gauge the level of awareness, the problems faced and the utilisation of the schemes (vSurvey [12]); and three, an IVR system to make panchayat<sup>1</sup>-specific verification calls to the beneficiaries to cross check records published on the official MIS website.

Over a period of six months, we received 1800 calls and 350 posts on the Mobile Vaani platform to collect unstructured voice feedback. Through these posts, beneficiaries were able

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<sup>1</sup>An administrative sub-division comprising neighbouring villages.

to highlight pressing issues they faced such as the lack of NREGA job cards, delayed wage payments, and incorrect payments. This qualitative feedback was used to design the quantitative data collection tool to survey respondents in more detail around specific issues. 130 users provided their feedback on the quantitative survey and local government officials verified that such data was useful to them to plan the implementation better. Finally, we received over 400 responses to calls made to users to verify work data as reported on the NREGA MIS, and evaluated the accuracy of this feedback. We found that such a tool holds the potential to uncover specific panchayats where corruption or violation of implementation might be more frequent and should be investigated closely.

Our work in this paper is confined to identifying use-cases and assessing their potential for a larger scale deployment. We have not placed a deep focus on exactly how the IVR should be designed to improve its usability, or how should it be integrated with the government scheme MIS to make critical pieces of information available to the beneficiaries, since these aspects will change with the context in which the system is deployed. Our pilot was done in partnership with a community radio station and the design of the IVR tools was partly governed with the data and resources available to us in the field. The contribution of this work therefore lies in outlining use-cases that are practically realisable to build citizen engagement in the implementation of government schemes.

The rest of the paper is laid out as follows. We discuss related work in Section 2. Background about the NREGA scheme and problems in its implementation are outlined in Section 3. We describe the design of the system in Section 4. In Section 5 we discuss insights gained from the experiments. Finally, in Section 6 we discuss how to extend the system and what factors could improve its usability.

## 2. RELATED WORK

In this section, we give an overview of the use of technology to improve governance and accountability, especially in the context of developing countries. Among various technology solutions, IVR as a tool has been used extensively for citizen and community engagement, and we also go deeper into specifically outlining IVR usability research and various projects where IVR has been used in innovative ways.

### 2.1 IVR projects in resource poor contexts

Perhaps the closest to Mobile Vaani [11] in terms of design is CGNet Swara [24]. CGNet Swara is a citizen journalism platform aimed at involving underserved communities in reporting about governance and social problems faced by them. Similar to Mobile Vaani, it runs over IVR where people can record messages and listen to others' messages. The content is primarily around grievances and problems in the implementation of government schemes, which the CGNet Swara staff attempt to resolve by influencing government departments through civil society partners. Avaaj Otalo [28] is another similar IVR platform to provide small scale farmers with a voice forum to share information and resolve queries in a peer-to-peer manner. It is structured as a question-answer forum where farmers can ask questions and respond to others' questions and answers. Other works such as GRINS [17], Gurgaon Idol [16] and Phone Peti [18] document the augmentation of Community Radio (CR) sta-

tions with interaction over IVR systems. Spoken Web [19, 3] is yet another project that envisions VoiceSites (similar to websites) being created by poorly literate users through IVR interactions, and which can even be interlinked through VoiLinks (similar to hyperlinks) to browse across VoiceSites.

In our work, we do not heavily innovate on the design of a new IVR system. We evaluate the existing Mobile Vaani tool and develop a separate work verification tool, with the aim to understand a few use-cases in which IVR can help poorly literate citizens engage with government departments in the implementation of welfare schemes. We also do not aim for a long term deployment like some of the above projects; we engaged with our partner CR station only on a short-term campaign basis to gain an understanding of how the use-cases would fare on the ground.

### 2.2 IVR usability

Several studies have explored in depth the design of IVR systems for poorly literate users. Avaaj Otalo [28] reported that users prefer to provide DTMF inputs over speech based input. Similar results were also reported in [27]. However, Lerer et al. [21] in their work on using IVR to gather feedback from rural teachers in Uganda on the use of sanitary and hygiene kits, reported better results with speech input than DTMF input. Without some amount of prior training, task completion rates were extremely low for DTMF inputs. Additionally they reported better response rates when the IVR prompts were recorded by a native speaker. Similarly, Sherwani et al. [33] in their work with low literate health workers in Pakistan reported that well-designed speech interfaces performed better than DTMF interfaces. Another Automatic Speech Recognition (ASR) based agricultural price enquiry system over IVR is reported in [14], where the innovation was to improve IVR usability by inferring whether or not a confirmation by the user of their response was required.

Other aspects of IVR design have also been studied in various contexts. Chakraborty et al. [7] reported evaluation of data capture accuracy of an IVR compared to a human being. It was shown that with a little loss in accuracy and speed, job interviews could be conducted over IVR at a lower cost. Another system, Gurgaon Idol [16], compared the ease of use of different DTMF voting methods through an IVR based singing contest and showed that cultural factors could play an important role in influencing the adoption of different kinds of voting methods.

In our work, we do not evaluate the usability of different IVR designs as such. We instead choose simple tools with the primary aim to understand the validity of the use-cases we are studying, and not the question of how such a use-case is best implemented.

### 2.3 E-governance, transparency and crowd-sourced data collection

The use of technology in e-governance has received considerable attention over the years, with one of the goals being to reduce corruption once all bookkeeping and interaction becomes digitised, and therefore auditable. Bertot et al. [6] analysed how ICTs could be used to improve transparency and to serve as anti-corruption tools. They described e-governance and social media tools that have successfully demonstrated that indeed corruption levels can be brought down and transparency increased. At the same time how-

ever they also highlight the importance of the government officials in being interested to use the system in the right manner and not circumvent the system, which influences the success rates and consequently the acceptance of the system by the citizens. They also point out that often the challenges in this space are not technological but rather low literacy and high technology access barrier of the citizens. Similarly, e-governance as an effective medium for reducing corruption is reported by Anderson [4] and Kim et al. [15]. [15] is a study of a particular system in Seoul. [4] reports an empirical study that if e-governance is increased from the 10th percentile to the 90th percentile, corruption-control moves from the 10th percentile to the 23rd percentile.

In developing countries such as India, Common Services Centres (CSCs) were envisioned as a route to provide rural citizens access to e-governance services through Internet kiosks [1] operated by a local entrepreneur who charged a small transaction fees to help citizens avail services such as birth and income certificates. Many of these initiatives however failed to take off either because they were not financially sustainable, or the users did not find value in the services being offered. Kumar et al. in [20] studied village Internet facilities in Tamil Nadu and reported that obtaining birth certificates and old-age pensions through the kiosk certainly saved the people considerable time and money, and reduced corruption in the delivery of these services. However the service eventually failed due to an increased turn-around time and lack of commitment at the local government offices. Mishra [23] compared the entrepreneurship model and the government service model for e-governance kiosks and had similar findings. He concluded that kiosk and entrepreneurial models of e-governance work well only when there is a good return on the investment, when there is citizen acceptance of the services and when more government services are included in the services being offered.

In the case of NREGA, the Indian government makes proactive disclosures on the NREGA MIS but the beneficiaries of NREGA are not able to access the MIS directly to keep track of their payment and work records because of obvious literacy challenges. We are not aware of any documented evidence where CSCs may have been used at scale to provide intermediated MIS access to NREGA workers. Singh et al [34] argue therefore for using mobile and landline phones (through both voice and SMS) to deliver e-governance services for NREGA and other schemes, as the Internet is not accessible by everyone. They suggest using a centralised call-centre to address all issues related to governance, and to introduce legislations which will empower these structures and make them a part of the system. Our work is on similar lines, of using IVR to evaluate a few use-cases for delivering e-governance services. In the current context, we have evaluated these tools as part of the civil society external to the government system, but we discuss later in the paper that such tools could in fact be integrated with the government MIS itself as a formalised way for citizens to access their records and verify the data.

In a similar way, there are many initiatives that operate as part of the civil society to impose checks and balances on government authorities, and press them for accountability. Web based platforms such as Wikileaks (<http://wikileaks.com>), or IVR based platforms such as CGNet Swara [24] and Mobile Vaani [11] are some examples. Ushahidi [26] is another crowdsourced data collection platform that was

heavily used in the Kenyan election crisis of 2007, where citizens could send and receive news on the election via the Internet or on their mobile phones. Ushahidi relied on SMS technology and the Internet to convey information. Our work is on similar lines, while being more directly aligned with the specific workings of a government scheme, rather than a generic platform for crowdsourcing information.

### 3. BACKGROUND ON NREGA

NREGA was enacted to reduce rural poverty and stem rural-urban migration. The Act guarantees a minimum of 100 days of work to every rural household willing to do manual labour. Job Cards are issued to households. The intention is for people to demand work to be done in their village, which is then discussed in a gram sabha, and approved by higher government authorities. Typical works include the construction of roads, toilets, water ponds, or planting of trees. No heavy machinery is allowed, and the work cannot be outsourced to contractors. An unemployment allowance is paid if a household is not provided the minimum number of guaranteed work-days. There is also provision for basic work-site facilities like drinking water and toilets. Wages must be paid within 14 days from the date of completion of the assigned work, otherwise a delay compensation allowance is paid.

The scheme suffers from several implementation problems. Many people do not have job cards and neither do they know that it is their right to have a job card and demand work [2]. There are also problems of fudged records, ghost assets and substandard quality of work. There are cases where works do not exist on the ground but the money has been spent. Other common problems include the hiring of heavy machines to accomplish the work, inflated accounts, favouritism in work allotment and wrong, delayed or non payment of wages [9, 29, 31].

Our work outlines ways to bridge these gaps using community driven and crowd-sourced reporting tools that can be used by the target beneficiaries even though many of them are poorly literate. Through structured and unstructured surveys to collect community feedback, the implementing agencies can understand the community's perception about the schemes, their level of awareness, and problems they face in accessing the schemes. Through crowd-sourced verification, the authorities can potentially even identify locations where corrupt practices are rife. This will help them to modify, plan and deploy the scheme in a better way and take corrective actions where necessary.

### 4. SYSTEM DESIGN

Figure 1 gives a snapshot summary of our work. We partnered with Alfaz-e-Mewat, a Community Radio (CR) station to pilot test our IVR tools. A Community Radio is a radio station operated and owned by the community they serve. They have a much smaller range (approximately 12 km) than mainstream radio stations. The stations are required to produce at least 50% programmes locally and are usually run by non-profit organisations and academic institutions. Our partner CR ran campaigns and live programmes on NREGA on their radio. The IVR tools tied-in with the radio programmes by providing citizen feedback that could be discussed and resolved by government experts who were invited to appear live on the radio show. The ex-

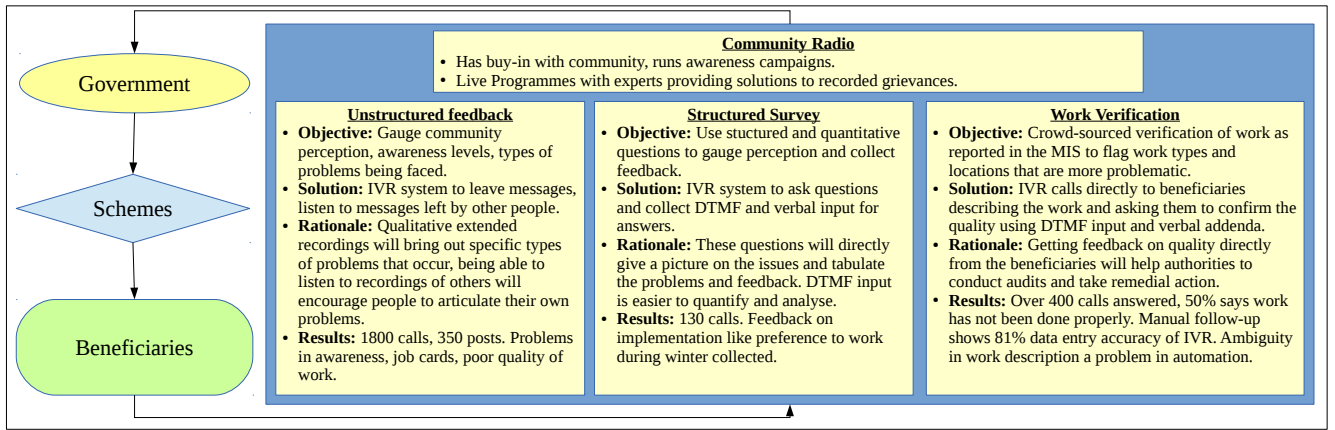


Figure 1: Snapshot of the work

perts were also consulted to get their views on the usefulness of the data to help them improve the implementation of the scheme. We next describe in detail the three IVR tools we used to demonstrate the need to collect bottom-up feedback on welfare schemes.

#### 4.1 Demographics of beneficiaries

We conducted this study in a district in the Indian state of Haryana, which was ranked a low 26 (out of 35) in providing NREGA work per capita rural population in the financial year 2013–2014 [25, 35]. The district has a population of 1,089,263 according to the 2011 census, with roughly 95% of the population living in rural areas. The literacy rate is a low 56% and the gender ratio is 907 females for every 1000 males. The population mostly belongs to a religious minority in India and the economy revolves around agriculture and animal husbandry. Telephone (mobile and others) penetration in the district is 71.3%<sup>2</sup>. Our partner radio reaches 183 out of the 431 villages in the district.

#### 4.2 Unstructured Feedback

In order to understand the community’s perception on NREGA, their awareness levels, and problems they face, we used an unstructured feedback platform called Mobile Vaani [11]. Mobile Vaani is a social media over voice platform developed by Gram Vaani (<http://gramvaani.org>), a community media startup based in India. It runs on IVR and can be accessed over mobile and fixed line telephones. Several instances of the Mobile Vaani platform are running across India. A Mobile Vaani instance is tied to a phone number. When a person calls the number of a Mobile Vaani instance, the call is immediately disconnected and the system makes a call back to that number. So, the caller incurs no airtime costs. During the call a person can record a voice post, listen to posts recorded by other users or comment on individual posts. A team of moderators listen to recorded posts and make a decision on whether to publish it or reject it, and the order in which the posts should be played to the callers.

The Mobile Vaani phone number was broadcast several times a day on the partner radio. The staff also made a few trips to the villages and conducted in-person publicity and demonstration events. Mobile Vaani was used to create discussions around NREGA. We asked the callers to say

<sup>2</sup><http://www.censusindia.gov.in/>,  
<http://www.devinfo.org/indiacensus2011>

#	Condition	Question	Answer Mode	Aspect of scheme
1		Please state your name	verbal	
2		Please state your village, panchayat and block	verbal	
3		Do you have a NREGA job card?	DTMF (binary)	utilisation
4	#3=Y	Have you worked under NREGA?	DTMF (binary)	utilisation
5	#3=Y	You can place work demands with your Sarpanch under NREGA. Have you exercised the right to demand work?	DTMF (binary)	awareness
6	#4=Y	Have you been paid the wages correctly and on time for your work in NREGA?	DTMF (binary)	problems
7	#3=Y	During which month or season do you prefer working in NREGA?	verbal	feedback
8		Are machines used for the work done in NREGA in your village?	DTMF (binary)	problems
9		How many days of guaranteed work is one entitled to under NREGA?	DTMF (MCQ)	awareness

Table 1: Set of questions in the structured survey, in order (wordings on the IVR were more detailed). Some questions were conditioned on the answers of other questions. The second column lists these conditions.

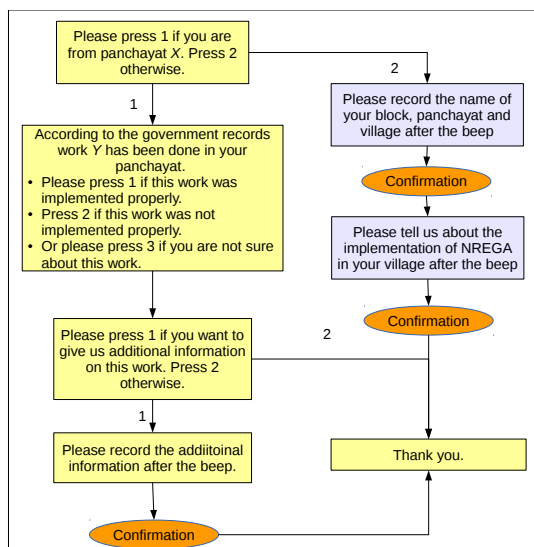
their name, village, panchayat and block<sup>3</sup>, and any feedback that they have on the running of NREGA in their village. The objective of this exercise was to collect a mass of issues that are faced by the beneficiaries, which the authorities can then inspect in depth. In addition, the CR used the posts on Mobile Vaani in four thirty minute live episodes where government officials and local public representatives were invited as special guests. They played out selected grievances recorded on the Mobile Vaani instance and asked the guests to provide solutions to them.

#### 4.3 Structured Survey

Having collected a mass of issues through Mobile Vaani, the authorities might like to probe them in depth through some structured and quantitative questions on these issues. For this purpose we used an IVR based survey tool called vSurvey [12] developed by Gram Vaani. vSurvey presents a set of voice questions over a phone call which can be answered using either DTMF key presses or by verbally recording the answers.

We developed the questionnaire for vSurvey with the help of an expert from the parent organisation of our partner radio station with inputs from the feedback coming into Mobile Vaani. For example, we formulated a question on machine usage in NREGA after we received the feedback on Mobile

<sup>3</sup>Administrative subdivision comprising a few panchayats.



**Figure 2: Flow of questions in the Panchayat Specific Work Verification (wordings on the IVR were more detailed)**

Vaani that in certain villages machines were being used instead of the workers being given employment. We asked a mix of yes-no (binary) questions, which could be answered using the DTMF buttons 1 and 2, and verbal answer questions which could be answered by recording the response during the call. The complete set of questions is given in Table 1. These questions are not exhaustive but are intended to showcase the utility of the platform to collect structured feedback which can be used to probe qualitative insights or community perceptions in greater depth.

#### 4.4 Work Verification

To ensure corruption free running of a welfare programme, the authorities need mechanisms to verify officially reported data through social audits. This typically involves social auditing agencies to visit work-sites and beneficiaries to ascertain the quality and quantity of work. The process is time and human resource intensive, so the auditors are often able to visit only a subset of the work-sites. Moreover the audit mechanism is not very robust in all states in India. In Haryana the implementing agency is in charge of the audit too. In such a scenario, having a scalable, crowd-sourced verification mechanism might help the authorities to decide which work-sites and panchayats require an extensive audit.

The use of an automated IVR to verify work done in a village suits well as it requires very little information about the user other than the phone number and the panchayat that she/he belongs to. In order to verify the data published on the MIS, we designed an IVR to make calls to the beneficiaries asking questions about the works completed in their respective panchayats. A custom Asterisk<sup>4</sup> based IVR system was built for this purpose since the vSurvey tool is closed source and could not be modified for this scenario. We then obtained from the partner CR station a pre-existing caller database that was tagged by panchayat. The public NREGA MIS was then crawled to identify works which were completed in these panchayats under NREGA. By feeding the phone number, the name of the panchayat and the description of the work into the IVR system, we made automated calls to the users. We wanted to confirm if

the described work was completed satisfactorily or not. This could either be done through verbal recorded inputs or by pressing buttons on the phone (DTMF). We conducted 12 trials in two villages varying DTMF and verbal inputs, and found that people preferred DTMF to give a binary answer but several of them also wanted to provide verbal details to qualify their answer. Reasons for people preferring a DTMF input included not wanting to reveal their identity and not wanting to antagonise the local political leaders by providing a negative verbal feedback.

Considering the feedback from the field trials, our final system used a mix of DTMF and verbal inputs. It first asked the users to confirm if they belonged to the same panchayat as tagged in the database, for accuracy. If the panchayat was confirmed, the system asked the user to confirm if the work was done satisfactorily or not by pressing 1 (yes), 2 (no) or 3 (unsure about the described work) on the phone. We then asked the users to indicate whether they wanted to provide any additional details on the work by pressing 1 (yes) or 2 (no). If 1 was pressed, a prompt asked them to record this additional information. All verbal inputs were played back to the user for confirmation, and questions were repeated to the users if no response was received within a time-out. The flow of the call is described in Figure 2. We began the call with a chime and a statement on the purpose of the call and that the call was automated. All prompts were composed and recorded by the staff at the partner community radio station. The language used was Hindi but a lot of the local vocabulary was used.

We called the users between 8 am and 9 pm. Not all calls were answered on the first attempt. If a call was not answered, we called the number once more immediately to cover accidental call misses, and if the second call was not answered either then we tried again 30 minutes later for up to a maximum of five times. The average number of pairs of tries before a call was answered was 1.89.

## 5. EXPERIENCES

We next present the results and insights we gained from trying out the three IVR variants.

### 5.1 Unstructured Feedback

We received 1873 *missed calls*<sup>5</sup> over a period of 6.5 months on Mobile Vaani (around 10 calls per day) from users listening to posts on the Mobile Vaani instance. Of these, there were 359 attempts to post a new message or comment on a message, 210 of which were either blank, incomplete, noisy or irrelevant (including song requests and canvassing for the forthcoming elections). In some ways this behaviour is consistent with behaviour on other content-based platforms like Youtube. Every minute 100 hours of video is uploaded on Youtube as compared to more than 1,39,000 hours of video viewed each minute [36]. We experienced peak call rates between 8 pm to 10 pm. The 1873 calls were made from 423 unique phone numbers. The peak number of calls made from a single number was 73 while the median was 2. Posts were made from 59 different panchayats. The highest number of posts from a single panchayat was 38 and the median was 2.

<sup>4</sup>An open-source VoIP server: <http://www.asterisk.org/>

<sup>5</sup>A euphemism for making a call and disconnecting while it is still ringing before the other party has answered.

Issues	Count
Users blame the sarpanch for absence of services	42
Users report that there is no NREGA work in their village	42
Users allege that there is corruption in NREGA in their village	22
Users report that they do not have job cards	16
Users want to know what is NREGA	15
Users want the community to provide solutions	13
Users report that machines are being used for NREGA work	9
Users report incomplete NREGA works in their village	6
Users report good performance of NREGA in their village	5
Users allege that bribes need to be paid to get work done in their village	2
Users mention problems with wages payment in their village	2
Users want to know what it the procedure for demanding work	2
Users mention other problems (electricity, water, roads, education, PDS, etc.)	133

**Table 2: Recurring issues of posts on Mobile Vaani with explanations and counts.**

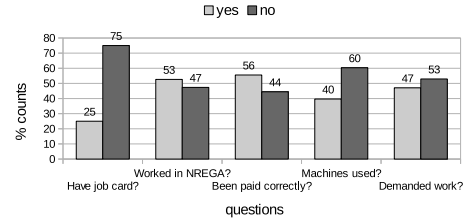
Table 2 lists the count of recurring issues that were brought up on Mobile Vaani. The statistics themselves are not important because of obvious sampling biases and low call volume which we discuss in more detail in the discussion section towards the end of the paper, but qualitatively the government officials agreed that many issues being articulated were new information that could be used in the planning and deployment of the scheme, or the comments pointed towards inadequate understanding of the scheme by the beneficiaries which needed to be addressed. Issues raised included blaming the sarpanch<sup>6</sup> for following corrupt practices, no allocation of NREGA work in the village, different ways in which corruption in NREGA was happening, and no job cards being issued despite requests.

A common feature in many of the posts was to blame the local sarpanch for the poor working of NREGA and other facilities in the village. Direct allegations of corruption and favouritism in the distribution of welfare benefits were in fact raised. When we talked to a few sarpanches during our field visits they highlighted a counter point. The sarpanches said that though the government makes laws that work has to be provided within 14 days of demand and payment must be made within 14 days of work, the officials at the district level do not review and approve the work plans and hence work allocation gets delayed, and they do not release the wages on time so the payment gets delayed. The beneficiaries do not understand this and think that the sarpanch has embezzled the money.

Such examples bring out the communication gap that exists between officials and the beneficiaries. The government can make use of media such as Community Radios to reach out and explain details to the beneficiaries to get them into confidence. The Alfaz-e-Mewat therefore conducted four live radio programmes on NREGA two of which featured a local government engineer and a local sarpanch. During the programmes the jockey played out audio clippings of grievances on NREGA posted on Mobile Vaani and the guests immediately directed the audience towards clarifications and how to resolve the grievances, live during the programme. During our field visits, listeners of the radio station even corroborated that such programmes where the authorities respond to issues raised by the people, serve a role to strengthen the trust that citizens place in the government.

This experiment of Mobile Vaani tied with a community radio thus demonstrates that bringing various stake holders on to the same platform for live discussions and resolution of problems helps them respond to local issues that might be specific to that region, and also strengthens the trust between citizens and the government.

<sup>6</sup>The village headman elected through local elections.



**Figure 3: Answers to DTMF questions on vSurvey. These questions were used to gauge the awareness, perception and problems faced by the beneficiaries on NREGA.**

## 5.2 Structured Survey

While Mobile Vaani presented an open-ended platform to collect user feedback on NREGA, the structured data collection through vSurvey can help get more detailed insights about the issues raised on Mobile Vaani. vSurvey allows questions to be answered verbally or by pressing buttons on the phone (DTMF).

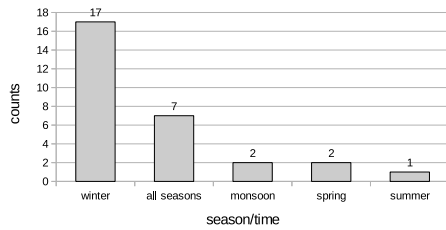
After three months of Mobile Vaani being active, vSurvey was integrated into the system and could be accessed by pressing a button. 180 Mobile Vaani callers opted into vSurvey, but 50 of them left before answering any question, and 50 answered all the questions. We saw that some Mobile Vaani users had reported that they do not have job cards for NREGA. Asking this question on vSurvey showed that many people indeed did not have job cards, which goes in line with the low NREGA adoption in Haryana. Similarly, we asked the question if machines were being used for NREGA as reported by some users on Mobile Vaani. Most people on vSurvey however responded that machines were not being used, indicating that it is probably not a widespread problem in the district. Using qualitative and quantitative data collection in tandem can thus help understand implementation realities of welfare schemes. The distribution of answers to the DTMF questions are shown in Figure 3.

Given the seasonality in NREGA utilisation, we also put up a question asking what times do people prefer to work under NREGA. The distribution of answers on preferred working season is shown in Figure 4. Most people responded that they prefer to work during the winter, which agrees with the lean agriculture season when daily wage landless labourers are unemployed.

Due to the small sample size, the survey statistics cannot be claimed to be conclusive. Our goal however was to test whether IVR systems can be used to quantitatively capture feedback from the community, and this seems to be valid. When used at scale, such surveys can help government officials gauge the awareness levels of people, ascertain the magnitude of existence of a particular problem, and plan the implementation times of the schemes better. We discuss concerns around wider adoption of the system in greater detail in the discussion section towards the end of the paper.

## 5.3 Work Verification

We tried 1682 different automated work verification calls to 1295 phone numbers over a period of one month. 1105 (66%) of these calls were answered, 567 (34%) of the users answered at least the first question, and 401 users answered all the DTMF questions. Unlike the previous Mobile Vaani and vSurvey tests where users gave a missed call to our system, the work verification calls were outbound and unsolicited. Probably because of this fact that the users had



**Figure 4: Preferred work season in NREGA as reported on a question in vSurvey. Most respondents preferred to work during the winter.**

Work Description	Work Description	Yes %	No %	Not Sure %	Follow-up Accuracy %*
Construction of drains		67	0	33	-
Construction of sheds for cattle		53	35	12	100
Construction of latrines in individual households		50	42	8	-
Dams in agricultural lands to check flow of water		34	53	13	-
Dumping soil on existing roads for repair	general	31	55	14	80
	detailed	29	47	24	100
Constructing new roads between villages	general	30	46	24	33
	detailed	25	50	25	100
Centre to provide online services to the villagers		30	53	17	100
Construction of toilets in the local school		28	48	24	-
Digging/desilting of ponds		27	62	11	100
Planting saplings in the village	general	23	41	36	75
	detailed	25	50	25	77
Constructing sheds for poultry		20	60	20	-
Dumping soil on the school ground for levelling		19	56	25	-
Total	general	30	50	20	81
	detailed	29	48	23	

\* A smaller sample was followed-up with than in the preceding 3 columns. Follow-up could not be carried out on all categories because many calls were not answered, and because of resource constraints

**Table 3: Work wise responses to if the work was implemented properly as reported in the Work Verification Survey. The first column explains the work. The second column shows the level of detail used when asking the question. The last column shows the accuracy of IVR data entry compared to manual follow-up calls.**

no prior information or training about the call and the IVR menu structure, the answer rates were low. We did try sending SMS alerts before making the calls, but it improved the rates only slightly to 70% from 65% without SMS alerts, probably because of the low literacy rate in the area. Had we enrolled users prior to the experiment, either offline through in-person interactions or via phone calls, the response rates may have been much better. We discuss this issue at length in the discussion section of the paper.

### Was the work properly implemented?

The verification calls themselves were straightforward, and simply asked the users to confirm whether they knew if the work had been completed satisfactorily, or not, or were unsure. A problem we however anticipated in designing this village level work verification tool was that people may not recognise the specific work about which we would be asking a question. For example, saying “A road has been built in your panchayat from point X to point Y” will elicit more accurate results than simply saying “A road has been built in your panchayat”. But, the latter format is reusable (only one piece of audio for all roads built) and therefore scales better. It is also possible that some works are indeed unique at the village level, such as building of a check dam in a village, and therefore may not require a detailed description. Table 3 shows the different work types for which we did

verification calls, and some work types for which we tried variations of giving general and detailed descriptions for the works. There are two observations we make from the table.

First, when the data is considered in aggregate across all the panchayats, we find that for all the work types, the majority of respondents were able to give a clear yes or no response. In most cases, less than 25% of the respondents chose the “unsure” option, and there were a significant number of dispute cases where people did not agree with the published data. Again, due to the small sample size, we do not intend to draw conclusions about the usefulness of the NREGA works that were done. Our intention is to see if such a work verification tool if used at scale can help spot corruption or malpractices. We indeed show later that some panchayats singularly have a higher dispute score, and the tool could be used to identify candidate panchayats that should be investigated more closely.

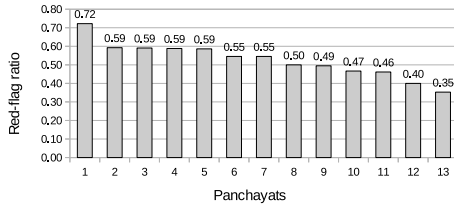
Second, for a few work types (new roads, road repairing, and plantation) which are likely to have multiple instances in the same village, we ran separate experiments giving a general and a detailed description respectively for these works. The yes and no answers seem to shift as expected. The encouraging result however was that when we manually followed-up with 10 of these respondents over a phone call to ascertain the correctness of their answers, we found the accuracy with giving a detailed description to be close to 100%.

While adding more details in the work description might ensure more accuracy, in the case of an IVR this translates to recording individual prompts for each work instead of the general and reusable template for work type. This compromises on scalability. A way forward may be the use of text to speech (TTS) modules that can generate audio on the fly from the textual description of the works available on the MIS. We discuss this in more detail in Section 6.

### Data entry accuracy

There are two types of errors that can happen in work verification. The first type as discussed above is if the caller misidentifies the work and gives a wrong answer, maybe because the work description is vague or incomplete. The manual follow-up calls revealed a high accuracy on this front, if the work could be described in sufficient detail. The second type of error that can occur is in data entry, if the user presses a wrong button or just gives a random answer thus corrupting the data. To evaluate this, we again manually made follow up calls to 31 people and compared their answers with the answers they had given on the IVR. 26 (81%) (95% C.I. 23 - 30) of these users confirmed their answers, while 5 (95% C.I. 2 - 9) disagreed. Of these 5 users, the reasons for disagreement were expressed as an incorrect interpretation of the question, or trying out the system for curiosity, or busy doing something else when the call arrived, or unable to answer the question in a simple yes or no format because the described work was partly done.

To evaluate the usability of the IVR, we also separately followed up with 10 people to understand if the flow and the language of the IVR was comprehensible. 6 participants responded that they could fully understand and follow what was being asked of them and could narrate the steps and questions and confirm the answers to us. 2 people said that someone else in the household must have answered the IVR call since they do not recall any such calls. 1 person said that



**Figure 5: Red flag ratio for different panchayats with at least 10 responses recorded (threshold).**

he was busy in his shop and therefore could not concentrate on the call. Only 1 person said that he could not follow what was being said, and added that he is illiterate and is not adept at handling a phone.

Overall therefore, we feel that village level work verification can be done with reasonable accuracy, as long as detailed work descriptions can be provided to avoid ambiguity.

### Red-flagging panchayats

While we may not get 100% accurate results for work verification through automated calls, this exercise can be used to *red-flag* panchayats from which considerable negative feedback is obtained. As a test, we define a ratio for each panchayat called the *red-flag ratio* which is the ratio of the number of ‘No’ responses from a panchayat for the work implementation question to the total number of responses for that question from that panchayat. The ratio for a panchayat is considered only if a minimum threshold number of responses have been received from the panchayat. The red-flag ratio with a threshold of 10 from our exercise is shown in Figure 5 for demonstration. We tallied this data with that from Mobile Vaani and found that the panchayat from which the second most proportion of negative posts were recorded on Mobile Vaani is indeed the panchayat with the highest red-flag ratio. This shows promise in using the work verification tool to identify panchayats that should be investigated in more detail.

### Verbal answers

We also gave an option to users to record a detailed feedback about the described work to qualify their DTMF yes/no answers for work verification. Among 221 users who opted for this, 139 valid recordings were obtained. Most recordings however were not related to the specific work in question, but were general feedback messages about the scheme, similar to those received on Mobile Vaani. Some valid qualifier recordings were clarifications such as roads which were built but got washed away in the rains, reports that the work was completed but contractors from outside the village were involved in the work, and also that a particular work on household latrines was a good example of convergence between NREGA and NBA (Nirmal Bharat Abhiyan). Allowing qualifier answers can therefore provide greater clarification and insights about problems in implementation.

## 6. DISCUSSION

We next discuss several perspectives related to using such tools at a larger scale.

### DTMF and verbal input

Mobile Vaani had an entirely verbal interface to provide feedback while vSurvey and the work verification tool al-

lowed a mix of DTMF and verbal inputs. Both the methods of input had mixed success. While many of the verbal recordings were blank, the DTMF input suffered from inaccuracies and being limited in capturing the entire spectrum of information. At the same time, DTMF inputs are easier to summarise and analyse while verbal input requires extensive hours of audio transcription, tagging and analysis. DTMF based input is also shorter in terms of call duration, and so is cheaper in airtime. Choosing one over the other, or a combination, should be based on the context and objectives for using such tools. Despite these overheads though, [7] indicates that IVR based verbal input can be lower costing than a call centre conversation, pointing towards a likely scaling route through IVR instead of a helpline operated by a human operator.

We also want to add that the IVR design and menu structures chosen by us may not be excellent designs, and there would be scope for improvement by framing the questions better to help users understand them clearly, or possibly even using speech recognition in some places. Experimenting with different IVR setups to find a good design is part of future work, and will depend on the context in which the system is to be implemented.

### Wider participation

The participation rates on our system were arguably low. We want to clarify that this was not due to the medium of IVR, but is more likely an artefact of externalities such as the level of publicity done by the CR, or the short term nature of the NREGA campaign at the CR, or the poor perception of people to respond to systems set up around government schemes. The Mobile Vaani system deployed for other use-cases with similar rural community radio stations has seen a sustained usage over several weeks of 2000+ calls per day. The main deployment of Mobile Vaani in the states of Jharkhand and Bihar, running independent of any community radio station in the region and is publicised through bottom-up offline mechanisms, now reaches out to 800,000 users and gets more than 10,000 calls per day [11]. Other similar IVR systems such as Awaaz De report 400,000 users as of December 2014 [5], and CGNet Swara which is used for grievance reporting around government schemes has close to 50,000 users and receives around 400 calls per day [22, 10].

We therefore believe that user participation for the IVR tools we developed and tested, can be much wider if appropriate publicity and branding is done, and evidence is presented to the users of the benefits they can gain from participation.

### Completeness of the MIS data

We have observed that the work description given on the MIS does not always have correct details. For example, there are several stages in building a road but these stages are often shown as separate works with the same description in the MIS. So an external observer might get the impression that the same work is being repeated over and over in certain villages, or, during the verification process a caller might wrongly answer that the described work has already been done. The work description is also often in unstructured format, in a mix of Hindi, English and other languages and with several variations in spelling. This will make standardisation harder, especially if TTS is used at scale, for example to read out detailed work description to the caller.



Alternately, work verification could be done at the wage-seeker level by obtaining a listing of recent works under the worker's job card, and contacting the worker to get feedback about these works. Although there is a chance of collusion and mis-reporting in this case, the greater challenge is that job card numbers are not always mapped to mobile numbers of the workers to be able to contact them. The Telangana government has only recently started maintaining phone numbers alongside the job cards, but so far to the best of our knowledge nobody has checked the validity of the data. It is well known that most people have pre-paid numbers which they change frequently to opt for the best deals offered by telecom companies, so many phone numbers could be out of date. It is also possible that multiple job cards could be mapped against the same phone number, in cases where a social worker or volunteer registers their phone number on behalf of several beneficiaries, and this could complicate the verification process. This is however worth deeper investigation, if despite these challenges even a few people can directly query their job cards, it will add strong checks and balances to the government scheme implementation.

The quality of the data on the MIS therefore will play a significant role in the effectiveness of verification systems and appropriate ways to deploy these systems.

It should also be noted that the MIS data cannot help catch all occurrences of corruption. During our field trips we came across a village where the MIS showed that plantation work had been undertaken. But when we interviewed the workers who were paid for this work, we learnt that these people did not know that they had job cards in their names. Clearly someone had drawn wages in their name with no work done on the ground. Such incidences of forged identity can be caught with the uptake of biometric systems and de-duplication against other identity systems such as the Aadhar system built under the UIDAI programme (<http://uidai.gov.in>).

### *Auditor's perspective*

The states of Telangana and Andhra Pradesh have a robust audit mechanism. We talked to an auditor from the state authorised audit society there, and he explained that their auditing activities were often triggered by requests and complaints from the beneficiaries themselves. He therefore agreed that the use of phone calls to verify work could be another viable way to trigger social audits since it leverages the knowledge already available with the people. He also suggested that verification at the wage-seeker level could be more accurate than at the village-level since the workers would have first-hand knowledge about the work quality. This feedback agrees with our conviction that despite the challenges described in previous sections, verification by the beneficiaries of data published on the MIS could be a reasonable way to detect corruption and malpractices.

### *Integration with the government MIS*

So far we have described how we deployed and evaluated various IVR tools in partnership with a community radio station to be able to reach out to their listener-base. Such a deployment via a media partner is hard to scale though, because for one not enough media partners exist that reach the target demography which is poorly literate and low income. India has just over a hundred functional community

radio stations which even cumulatively reach to just a few single digit percentage points of the overall Indian rural population. Second, procuring funds to run such IVR systems in the civil society space outside of the government, and to train and coordinate dozens of media partners, are also formidable challenges.

We feel that a formal integration of IVR systems to serve as a citizen portal for the MIS would be a more practical way forward. Personal communication between the lead author of this paper and the Ministry of Rural Development (Government of India) has created interest in the government department to make the MIS accessible to the target beneficiaries through IVR systems. Conceptually, beneficiaries could go through a one-time registration process via a call centre to link their job card number with a contact mobile number (their own number, or that of a friend), and then continue to use this to know when wages are disbursed to them, what works have they undertaken, number of wage days remaining, participate in surveys, register a grievance, track the grievance status, etc. Such a formal linkage will create sufficient incentive for the beneficiaries to stay updated on their NREGA status, and would also provide a nationwide scaling route to making the MIS accessible to the target beneficiaries. Once the MIS data begins to be put to such use, it could also force the government functionaries to ensure more quality data entry so that the data is well structured and machine readable. The IVR tools as developed and deployed in the writing of this paper may not be exactly replicated in such a setup, but they serve an important role to demonstrate how citizen engagement can be improved, and technical nuances that arise in such systems.

## **7. CONCLUSION**

We presented a proof-of-concept of using IVR based tools to build citizen engagement around welfare schemes. These tools can help authorities get insights about gaps in awareness of beneficiaries on details of the scheme, collect suggestions on modifications for the scheme, and understand implementation problems. The tools can also be used to verify the implementation and quality of the schemes by cross checking official data directly with the beneficiaries. While these concepts were developed and evaluated in the context of NREGA, they can be easily extended to collect feedback and verify details about other welfare schemes such as the national scheme on health insurance (RSBY) and the public distribution system (PDS) as well. We see a strong case to advocate the integration of such systems as part of the government schemes themselves, to enable the beneficiaries to directly access their own records and provide feedback.

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