Building ICT-based Information Flows to Improve Citizen-Government Engagement

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Abstract

Many public funded social welfare schemes in India suffer from implementation problems. Most of these problems can be traced to missing or broken information flows and accountability loops. First, beneficiaries are often not aware about the schemes and the rules and regulations governing the schemes and the policy-makers does not have any direct medium to obtain feedback on the schemes from the beneficiaries. Second, they are not able to access scheme-related data owing to Internet access and literacy challenges because the data is often posted on web-based MIS systems. Third, when the entitlements are denied there is no effective avenue to redress their grievances as most grievances filed on the government-run helplines go unresolved or the resolutions are ineffective.

In this thesis we address the questions of how to augment the grievance redressal systems to improve their uptake and effectiveness; how can low-literacy users access information on web-MIS platforms and report discrepancy in the data; and, how can policy-makers directly obtain feedback on the implementation of the schemes from the beneficiaries.

We approach these questions by charting out the different stakeholders in public welfare schemes and public services, like the citizens, implementing officials, policy making officials and auditors. Information flows between these actors are either missing or broken. Flow of information from the government to the beneficiaries and from the beneficiaries to the government can establish feedback loops that make the system more accessible, transparent and accountable over time. Towards this end, we introduce new information flows into the system by designing, building and deploying several Information and Communication (ICT) tools. We designed a model of grievance redressal which connects citizens with volunteers from the civil society through an IVR (Interactive Voice Response) and Android based system. The civil society volunteers leverage their personal networks and influence to build pressure and push grievances for resolution. We built and deployed a system which crawls web-MIS platforms and through IVR calls communicates scheme-related data to the beneficiaries and enables them to flag anomalous data. We designed deployed IVR tools to collect unstructured and structured feedback from the users about the implementation of public schemes and systems.

Through the deployment of the tools in the real world, we were able to establish new information loops among the stakeholders. With the help of a pool of civil society volunteers, who resolved several difficult grievances, we were able to establish a case for integrating the civil society into grievance redressal systems. When provided access to the information on web-MIS platforms, the beneficiaries were able to identify the information being shared, flag anomalous data published by the government and help identify places where the scheme was particularly performing poorly. We were also able to collect unstructured and structured feedback from the users about the implementation of the schemes which the policy makers acknowledged was new information for them and will help in improving the implementation of the schemes. The models and processes documented in this thesis are being used by the government and other agencies to improve access to services for citizens.

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1 Introduction

The central and state governments in India (and similarly in other countries) design public funded social welfare schemes to cater to the needs of the marginalised communities in the country. Such schemes include employment guarantee schemes (NREGA), food security schemes (PDS, FSA), housing schemes (IAY, PMAY), financial inclusion schemes (Jan Dhan Yojna) and health insurance schemes (RSBY) among others. However, when it comes to the implementation of these schemes, several serious gaps come to be noticed [1, 2, 3, 4, 5, 6, 7, 8]. Reasons for the gaps can be attributed to missing or broken information flows and accountability loops in the system. There is an awareness gap around many of the schemes. The beneficiaries often do not know about their entitlements, and if they do know about the entitlements they do not know whom to approach in order to access the entitlements. When their benefits are denied to them by the local officials, because of corruption or other reasons, they do not know where to go and complain so that an effective resolution can be obtained.

The governments, on their part, want to increase transparency and accountability in operations and have incorporated ways like publishing data on websites, social audits and grievance redressal helplines. However the websites (MIS) have turned out to be more administration-facing than citizen-facing. The beneficiaries of these schemes have almost no access to the Internet, and the websites often tend to be in English, thus cutting off a substantial portion of the beneficiaries many of whom are poorly educated. Social audits are very difficult to scale because they require extensive manual scrutiny by experts by visiting the sites of the programmes. Moreover, many states in India have no mechanism to conduct independent social audits, and depend on the implementing agencies to also do the audit, which is counter-productive. In addition, the policy makers do not have any direct means to collect feedback on the implementation of the schemes and services from the beneficiaries. The grievance redressal systems set up in many states also suffer from inadequate awareness and uptake, and lack of effective and timely resolutions. This is also corroborated through surveys that we conducted as part of this thesis (See Section 5).

In this context, this thesis addresses the following *research questions*:

1. How can the grievance redressal systems be augmented to improve their uptake among the citizens and improve the effectiveness of the resolutions provided?

2. How can low-literacy and low-income users access information on web-based MIS systems and report any discrepancy to social audit agencies?

3. How can the policy makers in the government collect feedback from the citizens on the implementation of government schemes and services?

To answer these questions, in this thesis, we charted out the various stake-holders, like the beneficiaries, the policy makers, the implementing officials and the social audit organisations, in the ecosystem of public services and welfares schemes and studied the missing and broken

information flows between them. We designed and deployed appropriate technology tools which are able to introduce new information flows in the ecosystem and are able to improve the engagement between the citizens and the governments and strengthen the implementation of the schemes and services.

1. When grievances are filed on the grievance redressal systems set up by the government, we discovered through surveys that there is no guarantee of effective or timely resolutions. When people approached the civil society, however, the civil society volunteers were able to obtain resolutions for many of the grievances. We built an IVR (Interactive Voice Response) platform to involve the civil society in a formal way in grievance redressal. The civil society volunteers who participated in our pilot were able to resolve some very difficult grievances, which are usually ignored by the government-run grievance redressal systems [9].

2. We found that given specific inputs, the beneficiaries are willing to file grievances when they identify disputes in data published by the government. We designed a system which crawls wage-payment data from the NREGA website and, over phone calls, asks the specific beneficiaries who were paid the wages to verify the payment and the amount. Most of the beneficiaries who disputed the data in our pilot agreed to file a grievance [10].

3. We developed an IVR tool to conduct data verification exercises at scale. We crawled the NREGA website for details of work implemented under the scheme and automatically called local people to verify the data published by the government. Most people were able to identify the work that was being described and clearly indicate yes or no for if the work was implemented properly. We were able to identify places where the scheme was under-performing and thus narrow down the places that needed extensive social audit [11].

4. We deployed voice platforms to collect unstructured and structured feedback on the implementation of NREGA and uptake and effectiveness of the grievance redressal systems. This feedback is a source for the policy makers to directly engage with the citizens that would ultimately serve as a rich source of information to improve the implementation of the schemes and services. We used the feedback on the grievance redressal systems to design a civil society mediated grievance redressal system [11, 9].

5. We extensively use IVR calls for our pilots for three reasons. One, voice calls break the literacy barrier which encumbers other digital technologies as basic phone usage is common in the target population. Two, call networks in India have a substantial higher availability and reach when compared to data networks, which other digital technologies depend on. Three, voice calls allow users to work with the same device and call-plan they already have on their current phones. In a different context, we conducted an

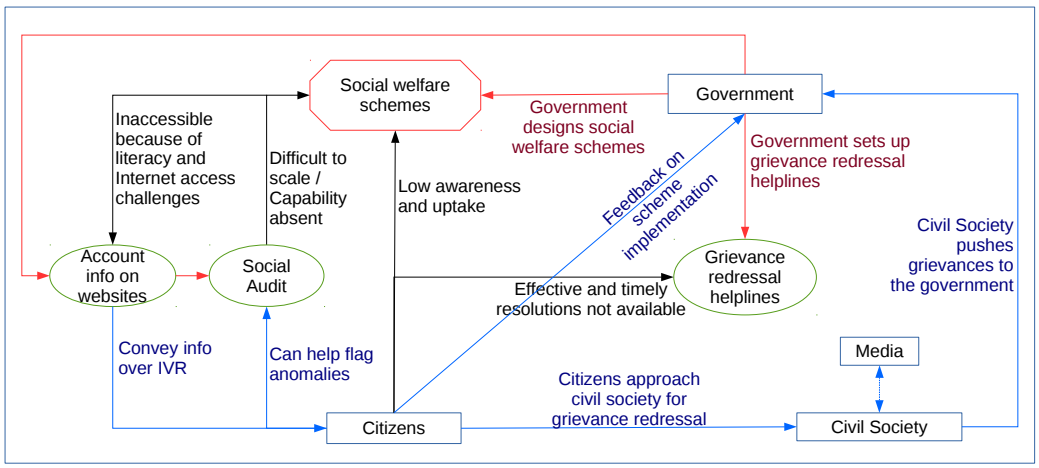

Figure 1: High level view of the processes in this thesis. The actors are in blue rectangles. The government runs social welfare schemes (red octagon). To improve transparency and accountability it publishes data on the website, provisions for social audits and has set up grivance redressal helplines (green ovals). However, the websites are out of access for beneficiaries, social audits are difficult to scale and the capacity to conduct social audits is missing in most states in India, and the helplines are not able to provide effective and timely resolutions (black arrows). Citizens approach the civil society to get help in accessing benefits. We deployed IVR tools which introduced information flows (blue arrows) to make the system more accessible and accountable.

experiment, to validate IVR as an appropriate medium to collect data in a low-resource and low-education context. Comparing the accuracy of data collected through IVR to data collected through a manual operator, we found that the accuracy of the data collected through the IVR is very close to that collected by the manual operator and IVR usage results in cost savings compared to a manual operator[12].

The primary contributions of this thesis are:

1. Underscoring the importance of the civil society in the process of access to services. Current technology based solutions deployed by the government cut off the decentralised and effective methods that the civil society use to facilitate marginalised citizens to access public services and programmes.

2. Demonstrating how by using technology we are able to connect citizens to volunteers from the civil society at scale. While previously citizens might have been able to approach volunteers personally known to them, this system enabled previously unknown citizens and volunteers to connect to each other.

3. Establishing the feasibility of using voice technology to communicate personalised scheme related information to beneficiaries, and enabling the beneficiaries to verify the data being published by the government.

4. Establishing the feasibility of using voice technology to collect unstructured and structured community feedback on implementation of public programmes.

Figure 1 depicts the gaps in the implementation of welfare schemes and grievance redressal systems and what information flows have been introduced by our pilots. We have conducted successful real world pilots on the systems that we have designed. We designed and deployed a civil-society mediated grievance redressal platform in Jharkhand, Bihar and Madhya Pradesh. We conducted a NREGA wage verification exercise in Telangana and NREGA work verification exercise in Haryana. In Haryana, Jharkhand, Bihar and Madhya Pradesh we also hosted voice platforms which helps policy makers to capture unstructured and structured feedback from the users around various government schemes and services. A discussion on the research methods used in this thesis is in Section 2. In the Sections 3, 4 and 5 I discuss in some details each of these interventions and the outcomes. I discuss some of the impact of our pilots in Section 6. Directions to scale the pilots is discussed in Section 7. A brief description of related work in this space is in Section 8.

2 Research Methods

In this section I discuss some of the research methods that have been used in our projects.

2.1 Identifying missing or broken information flows

Meadows in [13] provides a hierarchy of leverage points in any system. Leverage points are points in a system which when tweaked slightly, bring about big changes. One of the leverage points is information flows in a system. One example cited in [13] is the introduction of a new rule in the US in 1986 requiring factories releasing hazardous air pollutants to report those emissions publicly. Thus, a new information flow was created where none existed and everyone could find out what comprised the exhaust of the factories. This, without the need for any new law, led to self correction in the factories, which began cutting down their emissions.

Many problems in the *development space* are because of missing information flows. Our approach to solving a problem has been to identify the different stakeholders in an ecosystem and identify what technology to design that will establish new and essential information flows which do not exist currently. For our research, extensive studying of a context and field interviews helped us map out the different stakeholders. For example, in the context of NREGA, the primary stakeholders are the beneficiaries, the local government officials, the higher government officials and the auditors. We were able to identify that information flows between the beneficiaries and the government and the beneficiaries and the auditors are missing, or are unusable like the web-based MIS which is inaccessible to the beneficiaries. The next step then was to design technologies which establishes this information flow. Taking advantage of the penetration of basic mobile phones, we designed platforms which enables beneficiaries to communicated scheme-related implementation problems to the government, to access MIS data over phone calls, and to flag anomalous data for auditors to look into. This new information flow creates pressure on the local government officials to fix the gaps in the implementation of the scheme. Similarly, in the context of grievance redressal, the information flow between the citizens and the government is broken because of inefficient grievance redressal helplines mediating between the two. However, there appears to be strong flows between the citizens and the civil society, and the civil society and the government. Our intervention was to connect the two flows and formalise it, again through an appropriate and accessible technology.

2.2 Importance of field partners

Most of the work in this thesis is extensively based in rural parts of India. We needed a foot in the door in order to deploy our pilots in the field. Our approach to doing this was through field partners who are already well-established in these places. We piggy-backed on the credibility of the staff and volunteers of the partners to pilot our tools. We did this

with Alfaz-e-Mewat, a community radio station in Mewat, and with Mobile Vaani in Bokaro, Jamui, Madhubani and Chhindwara and with the field-staff of the Liberation Technology group at Stanford. This approach helps to jump-start the pilots, which otherwise would have taken longer to deploy. Using a local contact also helps in avoiding confirmation biases arising because of an external and more educated person (the researcher) being present in the midst and conducting interviews. Going through a field partner also helps in accessing beneficiaries who are often not open to talking to an outsider, like beneficiaries from the opposite gender.

2.3 User-centric design

To design the user interfaces in our systems we used participatory design, rapid prototyping and Wizard-of-Oz testing. Participatory design involves repeatedly running the design through experts and users in the field who will be able to immediately identify usability issues with the interface. Rapid prototyping involves ability to quickly make changes to the system to reflect feedback from the field, and running the tests again with the new design. We often used Wizard-of-Oz testing, which involves not building the system end-to-end but providing the user with an interface closely resembling the final interface for testing. The users do not know that the system behind the interface is not complete. For example, in one instance, when we wanted to test the usability of an IVR interface, we told users that they are interacting with an IVR, when in reality a manual operator was speaking to them, reading out from a fixed script, imitating an IVR. This lets us test the interface before building it. We also use A/B testing in which two interfaces (A and B) are presented to a participant and she/he is asked to choose which one she/he prefers.

2.4 Recruiting participants

There are several methods to recruit participants for a pilot. In an experiment to test the usability of an IVR, we used snow-ball sampling to recruit participants into our experiment. We awarded a ₹50 phone recharge to everyone who completed the experiment, and additional ₹50 recharges for each person they referred to us who completed the experiment. While this leads to rapid growth in the number of participants, care must be taken to ensure that the assumptions in the experiment (in our case the assumption was that all participants are drivers who do not know the questions to be asked on the IVR) are not violated.

In the other pilots, we had to take care that we did not interfere in the dynamics that our partners have with the community. So we could not incentivise participation as that might have led to changing how the partner engages with the community. Keeping this in mind, to recruit participants for the other pilots, we advertised the pilots through our field partners on local community media channels like Mobile Vaani and community media radio stations like Alfaz-e-Mewat. The staff of the field partners also conducted village-level meetings where they publicised the pilot and guided users on how to participate. The focus of the publicising

campaigns was how participation in the pilot will ultimately help in improving the delivery of services.

3 Augmenting the grievance redressal systems through the civil society

Several state governments in India have set up grievance redressal systems, some of which are phone based and some in-person. Over these systems, citizens can register grievances regarding public services and welfare schemes. To understand the utility and uptake of the systems we deployed structured and unstructured feedback collection tools in four districts across three states: Jharkhand, Bihar and Madhya Pradesh. Through the feedback collection exercise (described in details in Section 5), we learnt that the awareness about the grievance redressal systems set up by the government is very low (37%). In addition utilisation (51%) of the systems and resolution (48%) of the grievances is also low. Respondents cited reasons like non-resolution of grievances, resolutions being untimely, or the resolutions provided being ineffective, for the low utilisation. The experts associated with the grievance redressal system and from the civil society who we talked to pointed to several problems in the design of the systems. The systems are over-centralised, it is not possible to manage grievances diverse in terms of issues and geography from a centralised place using the same methods. Beneficiaries are not able to trust that a phone call can solve their problems, and there is significant negative publicity by beneficiaries whose grievances are pending, thus impacting further enrolment on to the platforms. People tend to place more trust on people they can see and speak to directly. The helplines are under-staffed and the operators are under-trained, so people speaking regional dialects and languages can not communicate their grievances properly. Also, the answerability of the officers is questionable. Experts reported that sometimes the only reason they resolve a grievance is because there is pressure from above. The survey and feedback from the experts elucidate that the information flow from the citizens to the government through the grievance redressal systems is broken.

Existing offline civil society organisations, for example the NREGA Sahayata Kendra (NREGA Help Centre)[14] have been more successful at grievance resolution than the government system. These organisations have built a lot of trust within the community over the years because of their on-ground presence and availability. Experts from these organisations told us it was the human element of being able to talk face to face which built the trust and goodwill. Besides grievance resolution, these centres help people enrol into welfare schemes. They also train the beneficiaries to go and help others in the community. The people running the centres at different places operate according to their own methods depending on the attitude of the officials that they are dealing with. The role of the civil society is to catalyse the resolution as the resolution must come from the government. They use their influence and build pressure on the government officials, including holding public hearings where they demand answers from the officials on why a particular grievance has not yet been resolved.

The networks between the beneficiary, the civil society volunteers and the government officials are depicted in Figure 2.

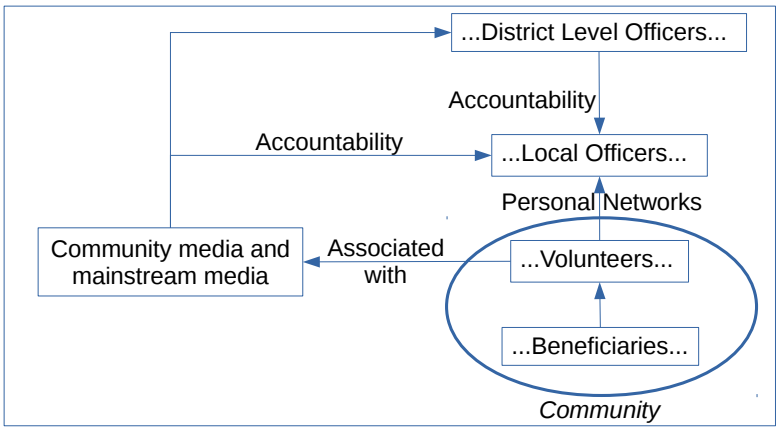

Figure 2: The beneficiary – civil society, and civil – society government networks that we leverage to build the grivance redressal model.

Given the challenges of the centralised helplines like low awareness, lack of resolutions and lack of answerability and noticing how decentralised civil society groups improve accessibility and accountability of the officials, our model is to integrate civil society into the design of helplines, assisted through appropriate technology. The volunteers can also tap into local media platforms to publicise the grievances and build pressure on the government. Our model builds new information flows and aims to formalise the role of civil society volunteers in the grievance redressal process while preserving the scale of the helplines. We documented our observations on how volunteer networks operate, what kind of grievances are suited for centralised Vs decentralised processes, and how the model can be scaled [9].

For our pilot, we built an IVR system on which beneficiaries could record their grievances. Civil society volunteers can call the same IVR and listen to the grievances recorded by the beneficiaries. The volunteers could assign to themselves any grievance that they want to work on. The assignment also provides the beneficiary and the volunteer each other's contact information. The volunteer works on the resolution of the grievance and keeps the beneficiary posted on the progress through the IVR. The volunteers could also use an Android App to perform these tasks.

We piloted this in the four districts from where we collected feedback on the government-run grievance redressal systems. For our pilot we enrolled community journalists from the local Mobile Vaani channels to act as civil society volunteers. The community journalists have, with the help of Gram Vaani, and on their own, built their own network in the community and in the government offices. They have also worked on the social campaigns run from time to time on Mobile Vaani. They therefore have a good social standing and understanding of social issues and government schemes.

Over six months, we received over 450 valid grievances. Our volunteers were not able to take up all of them because they did not have a lot of free time from their occupation and there was additional costs involved like travelling to the government offices multiple times to

resolve a grievance, but they were able to resolve around 70% of the grievances that they had taken up. In addition there is a corpus of around 180 impact stories from the Mobile Vaani channels that the volunteers have resolved over time [15]. We analysed this volume of around 200 cases to understand how the volunteers use their networks to build pressure through the media or use their influence to get grievances resolved, and the suitability of grievances to be resolved by centralised helplines or through civil society mediation.

We bucketed the grievances that were resolved through our pilot or through the Mobile Vaani network into six categories:

The largest group of grievances were a result of *administrative inaction*. These grievances were reported on the government systems too but because there is not enough accountability in the system they remained unresolved. The volunteers were able to use their personal networks to resolve several of these grievances and highlight them on community media channels. Such grievances included broken power transformers, non-functional handpumps and non-payment of NREGA wages among others.

Other grievances were related to the *lack of public infrastructure* like passenger shelters or anganwadi centres. These grievances are more difficult to resolve than those owing to administrative inaction because these needed allocation of funds and work orders. Yet, the volunteers were able to highlight several of these grievances and also resolve some of them.

Many of the grievances are owing to *local corruption*. These do not point to involvement of an organised corruption network but personal corruption by some officials, for example the headmaster of a school demanding bribes to issue exam admit cards. These grievances need regular inspections by the higher authorities and imposition of penalty to root out.

Some posts were not grievances per se but *demands from the community*, for example distribution of textbooks in private schools or sanitary napkins to girls. There might not be any policy for these, but the authorities took a one-time decision to act on these cases because there was a demand from the masses.

Some grievance pointed to *systemic corruption*, like illegal sand mining from the river beds. These grievances require sustained campaigning by the volunteers to mobilise public opinion for some action to be taken.

Other grievances are of a *personal nature* and do not affect the community as a whole, like a beneficiary not being able to access poverty benefits. These are resolved by the volunteers through personal follow-ups with the officials.

Grievances of a simpler nature, like clerical errors in data entry or those of a personal nature can also be addressed by the government grievance redressal systems, but those with more complex natures require volunteers to use their influence and build pressure through the media to resolve.

Some of the grievances were resolved through personal contacts and influence of the volunteers, some through pressure building through the media. There were some cases, like demands for new roads or bridges, which were highlighted by the volunteers and acknowledged

by the government officials but required additional funds to be resolved. In one particular case the beneficiary who had filed a complaint against a PDS dealer refused to bring more witnesses because he feared backlash from the community of the PDS dealer. We do not know if the volunteer asked the beneficiary to perform a very difficult task or if the grievance was not a genuine grievance. Such instances point to the complexity of variables involved in grievance redressal which centralised systems tend to overlook [9].

Civil society groups have much to add over centralised grievance redressal systems. In our model, there was no monetary incentive for the volunteers. Most of the active volunteers had other jobs to sustain themselves. The low uptake of grievances was because of the availability of the volunteers. The volunteers who were active were motivated by factors like helping people from the community in their mind. Other studies [16, 15] have also found that the most motivated participants are motivated by social outcomes and not monetary gains.

When our model is institutionalised, volunteers will likely participate for social credibility and the sense of service. But keeping the feedback of the volunteers in mind, there should be a mechanism to compensate the volunteers for the costs they incur. The government is already building corps of volunteers, like the Bharat Nirman Volunteers, the RSBY Mitras , the para-legal volunteers, who can be trained and enrolled for the grievance redressal processes. At the same time, checks should be in place so that the volunteer model does not get hijacked by vested interests, like in many of the trade unions. Compulsory rotation of leaders and transparent elections are ways to ensure that these groups stay on course. This model also helps us establish that it is important to couple good technology with the right mix of enablers to create new information flows which effective outcomes, which in turn leads to increased adoption of the technology.

4 Access and verification of scheme-related information

While the government spends a substantial amount of the annual budget on social welfare schemes, there are allegations of the benefits not reaching the intended beneficiaries but being siphoned off by middle-men. For example, in the Public Distribution System (PDS), a very common complaint is that the dealer is not distributing the full quota of articles (food grains, fuel, sugar, etc.) [4, 5].

One of the approaches the government has taken to mitigate this is to introduce transparency in spendings by publishing scheme related information on websites. The employment guarantee act, NREGA, has a very extensive web based MIS where work openings, work progress, job allocation and payment of wages can be tracked. However, questions have been raised on the accuracy of the data reported on the MIS. There are reports of beneficiaries not being paid wages on time, and of ghost work or work of poor quality [17, 3]. Besides, this information flow is broken: the MIS is largely inaccessible by the beneficiaries because the beneficiaries are mostly poorly literate and have very little access to the Internet. So the beneficiaries have little means to cross-check if they are being paid the correct wages, or if the jobs sanctioned in their villages are being implemented properly. To bridge the access and literacy gap we introduced an alternate information flow into the system. We built a tool which crawls the data on the website and makes automatic IVR calls to the beneficiaries to communicate the information published on the MIS. In addition, the system allows the beneficiary to vet the information being conveyed to them. This system led to the creation of new information flows through which beneficiaries were able to identify disputes in wages data and on the data on completed jobs in various villages.

To start with, we conducted a small pilot in the Ghattu mandal in Telangana (then Andhra Pradesh) [10]. We made phone calls to NREGA-workers to verify if the wages payments that have been reported by the government have actually been received by them. We also asked them if they want us to file a grievance with the government if there was any discrepancy with the data. 23% of the respondents reported that they had not received the wages, 75% of them agreed to let us file a grievance on their behalf. 16% of a different set of people told us that some amount was paid but the amount reported was incorrect, 75% of them agreed to let us file a grievance on their behalf. This indicates, that given appropriate inputs, the beneficiaries are willing to file a grievance when the data is disputed.

In a longer pilot in the Mewat District in Haryana, we obtained a phone database tagged by the village from our community radio partner, Alfaz-e-Mewat. We then crawled the NREGA MIS to obtain information about the NREGA jobs completed in those villages. We made automatic outbound phone calls and described the job done in the village as published on the web-MIS and asked them to confirm if the job was actually implemented by pressing buttons on the phone. In addition the users could also qualify their answers with verbal information. For example, we asked the users, "*Government records say a road has been built from point A to point B in your village. Press 1 to confirm, press 2 to deny, press 3 if you are not*

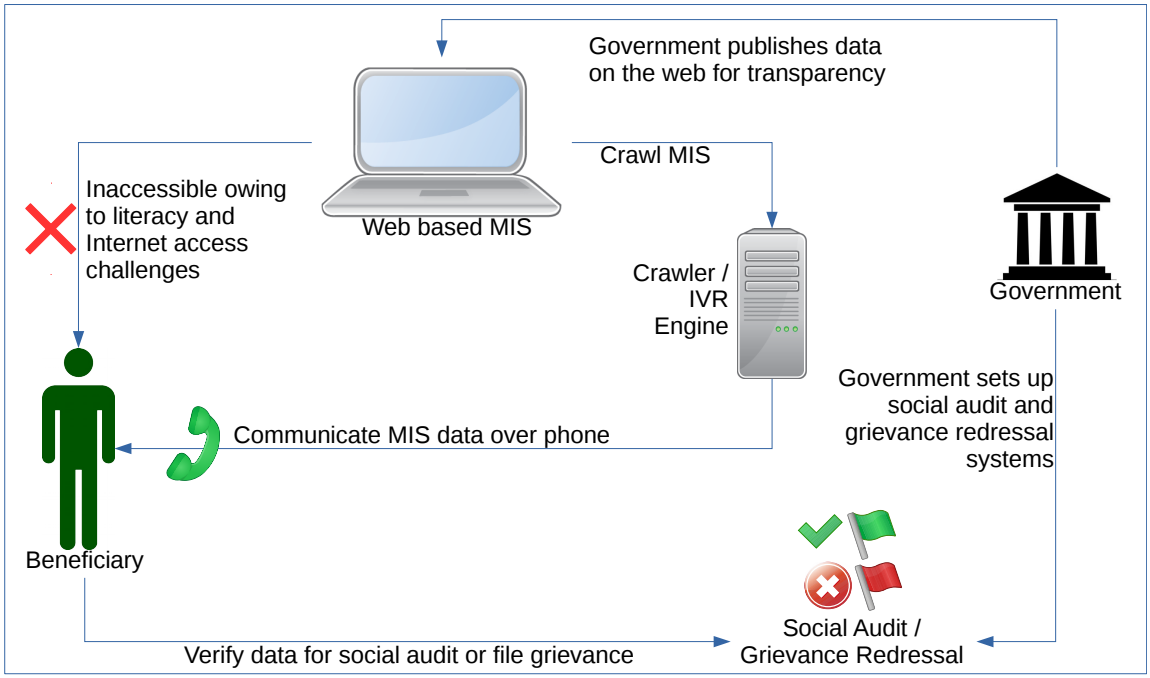

Figure 3: Overview of the MIS data verification system. MIS data is inaccessible to the beneficiaries. The system crawls the data and communicates it to the beneficiaries over IVR calls. Beneficiaries can mark disputed data which can be inspected in details by auditors or a grievance can be filed on the grievance redressal platforms.

sure."[11].

We experimented with varying levels of details in the questions. For example, do we mention landmarks in the village in the question? The more details one adds to the audio, it means the audio can not be reused for calls in other places, hence it affects the scalability. We followed up over manual calls with some of the respondents to measure the accuracy of our exercise. We were able to obtain 100% follow-up accuracy for several questions which had very detailed descriptions, and lower accuracies for questions with less specific details. Therefore, there appears to be a trade-off between accuracy and scalability in this context. Importantly, most respondents were able to identify the work being described and were able to give a clear *yes* or *no* answer to the questions. Less than 25% respondents chose the *unsure* option. This points to the effectiveness of IVR as a platform to get users to verify data when correct inputs are provided to them.

To evaluate the usability of our IVR we followed up with 10 people to understand how comfortable they were while using it. Of them, 6 replied that they could completely understand the call flow and could repeat the call flow to us. Only 1 person said he was not very literate and could not understand the call. We could not talk to 2 of the participants and the last person was busy when the IVR called him and so could not concentrate well on the call, this is not necessary a shortcoming of the IVR, but strategies can be designed so that the system is able to schedule calls at a time when a person is able to devote her or his attention

to it.

We also wanted to identify areas where the scheme is particularly performing very poorly. So we aggregated responses from each panchayat and calculated the proportion of *no* responses from each of them. We call this the *red-flag ratio*. We discovered that the panchayat with the highest red-flag ratio is the same panchayat from which the second most negative posts were posted on voice forum in the exercise described in Section 5.

When we presented our method and results to an auditor from Telangana he agreed that this was a good way to trigger audits. He also suggested that if we could get the verification done by people who have actually worked on the job we might get better results. This would require mapping of job-card numbers with phone numbers, which we did not have in Mewat.

The design of the system is summarised in Figure 3.

In the pilot in Mewat, 401 respondents of the 1682 calls that we tried responded to all the DTMF (answerable through button presses) question. Participation in the experiments depends on several factors, including how well the CR partner advertised and campaigned for our programme. On days that the CR partner conducted in-field campaigns the number of calls from the place where the campaign was conducted went up, but went down on subsequent days.

Our sample sizes are small, so we do not claim to accurately reflect the ground reality on the payment of wages or completion of work through these exercises. What is noteworthy that when the information is communicated to the beneficiaries they are able to identify the information and verify it. We present proof that through introduction of new information flows it is possible to cross-check facts published by the government in a crowd-sourced manner. We conducted this pilot in the context of NREGA, but the tools and concepts presented are very general and can easily be applied to any other context.

5 Collecting user feedback on government programmes and systems

Currently the design and implementation of government programmes, like social welfare schemes, and government systems (like grievance redressal helplines) is decided by policy-makers in a centralised manner. Information flow through participatory design of these schemes can improve their utility and uptake but the governments do not have any formal mechanism to collect feedback from the users on these schemes. As a part of the various pilots that we conducted, we deployed voice-based unstructured and structured feedback collection tools through which the users of these services were able to express their feedback on the implementation of the welfare schemes and public systems. Unstructured feedback collection helps us accumulate a mass of issues on the implementation which then leads to the formation of structured questions to quantify the frequency of these issues. In this section we describe the outcomes of such a deployment on the implementation of NREGA in the Mewat district in Haryana, and another deployment in Jharkhand, Bihar and Madhya Pradesh to collect feedback on the government-run grievance redressal systems in these states.

Both structured and unstructured feedback collection is important to understand the range of issues that the communities face and to understand the depth of each issue. When designing unstructured feedback collection systems, we observe that prompting the users with very general cues does not elicit actionable feedback. For example, asking people to speak on the performance of the employment guarantee scheme in their village leads to people saying that the programme is not working in their village, which is not a very useful feedback. Ideally the government would want more actionable feedback like job cards are not being issued or work is not being allotted. To facilitate this we provided call to actions to the users where we provided specific examples on how to record their feedback. What this leads to is that many users limiting themselves to the examples provided and not adding any new feedback from their experience. This can be mitigated by regularly changing the examples provided in the cues. In addition many of the posts we received was blank or out of context. Unstructured feedback is also more expensive to transcribe and summarise.

Structured feedback collection involves asking a set of questions to the users which the users can answer through button presses on the phone or by recording a verbal answer. IVR being a linear medium, too many questions on the same call or too many options to choose from in multiple choice questions is frustrating for users. In addition, mixing the answering mode of questions between verbal and button presses also confuses people and people tend to drop off in these cases. We observed that people usually drop off right at the beginning or at the end of the survey. We put all the verbal questions at the end so that even if people drop off at that point we still have the answers to the other questions. We used iterative prototyping with the users to finalise the design of our surveys. We next describe our experience with collecting feedback from users using these tools in two contexts: the grievance redressal systems running

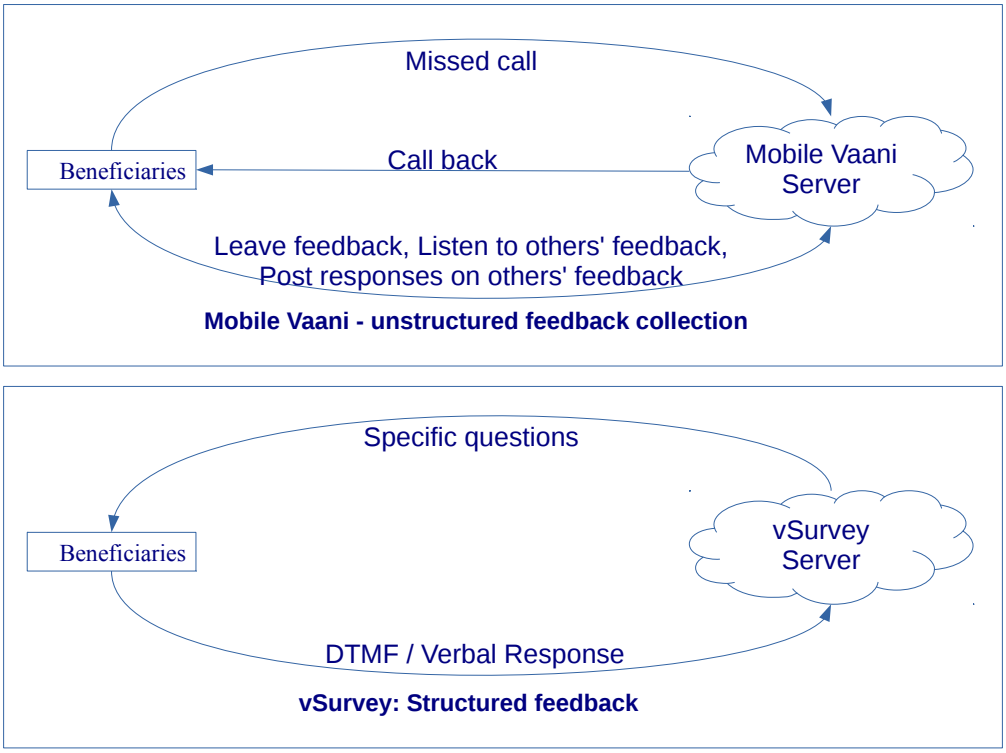

Figure 4: Overview of unstructured and structured feedback collection systems.

in three states, and the rural employment guarantee programme in one district in Haryana. An overview of the feedback collection systems we used is described in Figure 4.

The governments in many states have set up different grievance redressal systems. Jharkhand and Madhya Pradesh have a phone based helpline operated by manual operators. Bihar has a quasi-judicial model where a magistrate adjudicates over the grievances.

We obtained unstructured qualitative feedback on the grievance redressal systems over a citizen journalism programme on the local Mobile Vaani (a community media platform over voice) [15] channels running in these districts [18, 19, 20, 21] and also over manual phone interviews. Mobile Vaani is an IVR-based community media platform, which allows users to record audio two minutes in length. Other callers can listen to these posts and comment on them. People reported several problems that they encounter with these systems on Mobile Vaani, like inability to connect to the helpline numbers. One of the common complaints highlighted was that resolutions are not provided in a timely manner. Often the resolutions are also meaningless – some people reported that the officers against whom grievances are filed submit false claims countering the grievances, and the complaints are subsequently closed taking the officers' words at face value. One person added that "...officers try to resolve grievances from their offices and hardly visit the ground," pointing to the observation that while certain grievances like clerical errors in data entry (such as the number of work days in the employment scheme) are solvable from an office, grievances which are on entrenched

#	Condition		Options	Bihar	Jharkhand	Madhya Pradesh	Total
1		*No. of respondents*		707	383	517	1607
2		*Completed all questions (%)*		75.25	69.71	77.37	74.61
3		Gender (%)	Male	73.58	80.70	88.60	81.23
			Female	26.42	19.30	11.40	18.77
4		Age (%)	<18	37.91	30.95	24.95	32.13
			18 - 30	44.62	53.27	59.87	51.53
			30 - 50	14.20	13.69	11.28	13.14
			>50	3.28	2.08	3.90	3.20
5	#4 > 18	know about government grievance redressal system (%)	Yes	21.64	29.61	56.87	36.35
			No	78.36	70.39	43.13	63.65
6	#5 = Yes	used government grievance redressal system (%)	Yes	36.49	48.33	57.23	50.49
			No	63.51	51.67	42.77	49.51
7	#6 = Yes	how many grievances filed by you were resolved by the government system? (%)	None	ISD	50.00	53.57	52.94
			At least half	ISD	33.33	25.00	26.47
			All	ISD	16.67	21.43	20.59
8	#4 > 18	what grievance redressal avenues do you use currently? (%)	Public meeting at Block or District office	24.77	28.40	4.65	-
			Public meeting at village	35.32	28.40	35.35	-
			District grievance redressal cell	10.27	-	-	-
			Public meeting at the Chief Minister's office	-	-	29.30	-
			None of these	33.03	43.21	30.70	-

ISD = Insufficient Data; '-' = not present in this state

Table 1: Summary of survey on the existing grievance redressal systems in the states of Jharkhand, Bihar and Madhya Pradesh. The survey was conducted across four districts in the three states.

corruption with local contractors or discrimination with certain groups, need a more layered and decentralised approach [9]. Based on the outcome of the surveys and discussions with civil society experts we designed a model of grievance redressal which formally connects the beneficiaries with volunteers from the civil society over an IVR platform. We describe the model and the results from our pilot in Section 3.

We conducted structured surveys over vSurvey [22] which is an IVR based survey tool to quantify the issues reported on the unstructured feedback collection tool. Questions on vSurvey can be designed to be answered by button presses on the phone or by recording a verbal answer. The survey aimed to understand the awareness, utility and uptake of these systems in four districts: Bokaro (Jharkhand), Madhubani, Jamui (both in Bihar) and Chhindwara (Madhya Pradesh). Among over 1000 respondents, a vast majority of respondents from Jharkhand and Bihar, and a little under half from Madhya Pradesh, responded that they were not aware of the grievance redressal systems set up by the state governments. Among those who knew about the systems, usage was very low and even among those who had filed a grievance on these systems, very few people reported that the grievance was resolved. Beneficiaries said they used in-person interactions with officers and public representatives for redress their grievances. A summary of this exercise is presented in Table 1.

In another instance, we re-purposed a Mobile Vaani instance to collect feedback on the performance of NREGA in the callers' villages. In partnership with Alfaz-e-Mewat, a community radio station, we asked callers in the district of Mewat in Haryana to record their names, village names, and about the performance of NREGA in their village. With over 130

valid posts, the beneficiaries articulated the various problems related to the implementation of NREGA. Beneficiaries reported job cards not being issued in their village, no NREGA work happening in their village, machines being used to complete NREGA jobs (heavy machinery is not allowed in NREGA), general corruption like bribery, and irregularities in wages payment in NREGA. This exercise enabled us to build a corpus of issues in the implementation of NREGA. Government authorities agreed that much of the captured information is new to them that will be helpful in improving the scheme. The next step was to understand the depth of the problems reported. We designed a survey to gauge the extent of the problems. We ran the survey over vSurvey The responses on vSurvey indicated that indeed not having a NREGA job card was a dominant issue, but the usage of machines was perhaps not very widespread. In addition people indicated that they would want to get employment in NREGA in the winter season, which tallied with the fact that many agricultural labourers are unemployed in the winter season and hence they would want to gain employment through NREGA during this season [11].

The government officials that we shared this data with agreed that the information was new and they did not have any means to capture them at scale. Using these platforms can establish new information flows which serve three purposes for an implementing agency: one, since the platforms are over voice calls, the agency will be able to reach a significant portion of the population which is not captured by other digital surveying tools like surveys on social media; two, these platforms are able to rapidly capture the information at a scale which would take significantly higher resources for a manual survey to reach; three, the inputs are vital information for participatory design of any programme and incorporating the inputs gathered can be put to use to make the programmes more robust.

As a validation of using IVR for collecting data from low-income and low-literacy users in a different context we conducted an exercise to build job-profiles for urban drivers through automated IVR interviews. We compared the data entry accuracy, speed and cost of conducting such an interview through a live operator and over an IVR call. Our results showed that with a little loss in accuracy (4%) and speed (2.5x) data could be collected from the users at a lower cost (1.5x in 2012 costs) [12].

6 Impact of the pilots

The pilots in this thesis have been deployed on the ground, in real world scenarios and have been able to gain significant traction within the government and the community. In this section we present some of the impact that our pilots have had.

We presented the findings from the pilots on NREGA to the officials of the Ministry of Rural Development, Government of India. The officials of the ministry acknowledged that the web-based MIS was unusable by the beneficiaries and appreciated our method of conveying the information over IVR calls (Section 4). The NREGA MIS contains vital information that could be used by the beneficiaries to demand work, plan common infrastructure in the village, track the progress and quality of the work, and track payment of wages to the workers. In addition, the users can also be the eyes and ears of the government on the ground to verify the correctness of the data reported by the local officials. The ministry formed a committee involving us to formulate a plan on designing an IVR to complement the NREGA MIS. The final IVR design proposed by the committee incorporated features to enrol beneficiaries and map their NREGA job card numbers, phone number and Aadhar (Unique Identification) numbers, and would enable them to access personal information and village level information related to the scheme. The beneficiaries would be able to register for work demand, check for open work in the village, check wages paid to the beneficiary, and register grievances through the IVR. It was a big success for our pilot that we were able to influence the government into thinking along the same lines and the committee adopted several features and design principles from the IVRs that we piloted.

In our pilot on grievance redressal, we were able to highlight several issues that the communities face (some of them have been discussed in Section 3) like very unreliable power supply, bad roads, irregularities in the public distribution system, problems in the schools and irregularities in the housing scheme. There were several cases where the volunteers participating in the pilot were able to expedite the replacement of power transformers and get broken handpumps replaced. In addition, the volunteers were able to solve some very difficult grievances which tend to be ignored by the government-run helpline systems. One volunteer was able to get in touch with the local MLA (Member of Legislative Assembly) to get a passenger shed built at a bus stop. The politician had promised the bus stop before the elections but when nothing moved after he won, one beneficiary filed a grievance. The volunteer immediately got in touch with the MLA and got the passenger shed built. In another instance, an insurance company sent a cheque to the wrong person, who then went on to encash it. The concerned volunteer was able to use his influence to make the person return the amount. In another case, a grievance was lodged about irregular staff attendance at a health centre. The sub-divisional officer took cognizance of the news when it was broadcast on the Mobile Vaani channel, conducted an inspection of the health centre and recommended suspension of a compounder who was habitually absent. In yet another case, a local official refused to pay NREGA workers after completion of a work. A volunteer brought it to the notice of the

higher officials. Coming under pressure from the higher officials, the local official immediately paid half the amount and promised to pay the remaining amount soon. These are some cases where the volunteers were able to use their influence, contacts, and the media to highlight cases which would otherwise have been ignored by the government machinery.

UNDP is also interested in our grievance redressal model involving the civil society and are pitching the model to various departments in the Government of India to design a single-window grievance redressal app.

7 Scaling and Sustainability

Figure 5 depicts the information systems that we built as part of this thesis. The system brings into the loop the civil society volunteers and the media in the grievance redressal process. It also gives people access to information on websites over voice calls and enables them to verify the information published by the government. In addition, we also built a channel for users to provide unstructured and structured feedback directly to the policy makers on the implementation of the government programmes and schemes. In this section I will discuss some ways to scale the systems, challenges which affect the scalability of such systems and our methods to mitigate them.

Recurring data points.

In the civil society mediated grievance redressal pilot, we noticed several of the grievances were recurring in different places and being reported by different beneficiaries. Similarly, when citizens flagged information published by the government on MIS websites, several of the flagged information were similar. Data mining techniques applied on the information crawled from the government websites will be able to identify these patterns and recurring data points. Proactive identification of data points will help scale the number of cases being handled by the system, and also bring out cases which were otherwise not reported by the beneficiaries.

Civil Society Assisted Audit.

When information published by the government is disputed by a number of users, ideally social audit processes set up by the government should begin. However, capacities and infrastructure to conduct social audits is not present in most states in India. In light of this, we can use the civil society volunteers to conduct audits and report it to the government for action.

Challenges.

Challenges in a volunteer assisted model include enrolling a critical number of volunteers, sustaining participation, and ensuring monetary sustainability.

In the pilot introducing a civil society mediated grievance redressal we trained forty community reporters on the system but only around ten actively participated. Also, only around 10% of the total grievances were taken up by the volunteers for redressal. There needs to be mechanisms to enrol more volunteers, sustain their participation and improve participation.

We did not provide any monetary incentive to the volunteers to participate in the pilot. Monetary incentives are difficult to sustain and can lead to unwanted problems as I discuss later. So, why did 10 volunteers actively participate in the absence of obvious incentives? When we interviewed the active participants, they told us that they participated in order to channelise their passion for social work and helping people and because it enhanced the image of the community media channel that they were running. They also pointed out that the main reason for the low redressal rate was their time availability and the additional expenses incurred by them in order to resolve the grievances, which required travel to the beneficiary's

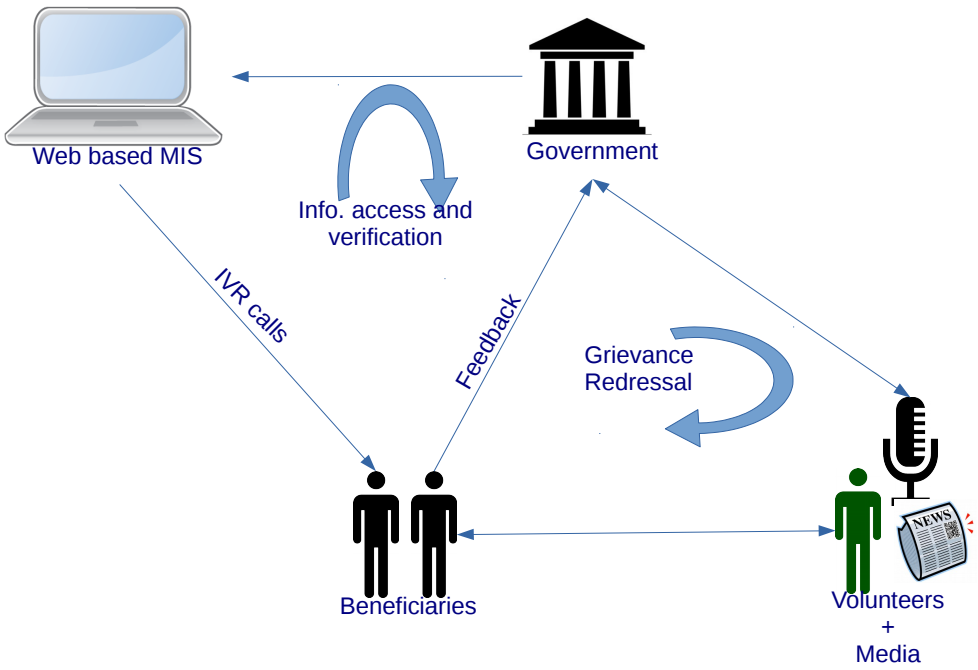

Figure 5: Overview of information systems described in this thesis. With similar systems it is possible to augment any public programme.

house or to government offices.

Studies [16, 15] have found that monetary incentives to individual participants do not really increase participation and scale of an intervention. Besides, monetary incentives also tend to attract individuals who are not primarily motivated by the cause of the intervention and are not able to match the performance of participants who are not participating for monetary incentives. Social incentives like skills-upgrade and improvement in standing in the society work as better incentives for civil society workers than monetary incentives. It was also found in [15] that incentivising groups of participants instead of individual participants helps in removing disputes arising because of the variability of effort that goes into pursuing different cases. Forming groups of volunteers raises the question of groups of empowered volunteers getting hijacked by vested interests or becoming exploitative [23]. Transparency in leader election and compulsory rotation of leaders can help mitigate this.

So, when recruiting volunteers for scaling, it is important to select people with the right motivation so that the intervention is sustained. Technology can help in identifying patterns across different instances of similar disputes and also to distribute and optimise the workload among the volunteers. At the same time, there should be provision to cover the daily cost that the volunteers incur in the process of resolution of the grievance. Mechanisms like a micro crowd-funding model can be used to cover the costs of the volunteers. This can take two forms: rich to poor and poor to poor. In the rich to poor model, interested donors can fund

issues that they care for and are kept updated about the progress made by the volunteers. For example donors might be interested to fund drinking water issues or education related issues. The amount collected can be used to cover the costs that the volunteers incur to work on the issue. The poor to poor model works like a subscription model where people pay periodic subscriptions and then the fund is used to fund volunteers who take up resolution of grievances on behalf of the community.

In terms of institutional support, the government is supportive of civil society organisations like the NREGA Sahayata Kendra and has pools of volunteers like the Bharat Nirman Volunteers, the RSBY Mitras and the Para-legal Volunteers which can be leveraged to provide assistance in grievance redressal and other service delivery.

8 Related Work

This thesis encompasses a range of diverse topics: digital tools for resource-poor regions, e-governance, transparency and accountability in governance, grievance redressal and the role of the civil society and media in ensuring better public services. In this section I briefly place our work in the context of existing work in these areas.

CGNet Swara [24, 25] and Avaaj Otalo [26] are IVR based voice fora enabling basic phone users to interact with each other over voice posts. CGNet is a citizen journalism platform and a lot of content on the platform are grievances. Avaaj Otalo is a voice forum for farmers to discuss problems and solve them in a peer-to-peer fashion. We extensively use the Mobile Vaani platform from Gram Vaani for our work. Mobile Vaani is a generic community media platform, not limited to any one type of discussion, unlike CGNet. Other works like GRINS [27] Phone Peti [28] and Gurgaon Idol [29] couple IVR based platforms with a community radio station similar to our work with Alfaz-e-Mewat.

Several works on IVR usability testing also exist. Avaaj Otalo [26] reported that users prefer to provide DTMF inputs over speech based input. Similar results were also reported in [30]. However, Lerer et al. [31] 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. Similarly, Sherwani et al. [32] in their work with low literate health workers in Pakistan reported that well-designed speech interfaces performed better than DTMF interfaces. Different IVR based voting methods were tested in [29] and it concludes that cultural factors could play an important role in influencing the adoption of different kinds of voting methods. In one of our experiments we work on the usability of IVR to collect user data versus collecting the data through manual phone calls.

E-governance has been long touted as a means of ensuring transparency and accountability. Bertot et. al. in [33], Anderson [34] and Kim et. al. [35] report on reduction of corruption because of e-governance systems and usage of social media tools. In India, delivery of services through Common Service Centres (CSCs), which are Internet kiosks, failed because of poor return on investment, long turn-around time for services, and lack of commitment at the local offices [36, 37]. Veeraraghavan [38] found that MIS systems built to introduce e-governance are subverted by the officials and them ending up being more of an accounting tool rather than being a tool for accountability and transparency. This is borne out by our argument that MIS systems are administration-facing and not citizen-facing.

A comparision of grievance redressal methods on CGNet and a government-run helpline is available in [39]. CGNet is able to resolve more complex problems which tend to get neglected by the government helplines. Narayanan [40] recommends greater horizontal accountability within government departments to be able to deliver better services to citizens. Mohan, et. al. [41] find centralised complaint tracking systems to be ineffective. Van Teeffelen and Baud [42] observe that beneficiaries dwelling in extra-legal settlements have to depend on local politicians to access amenities because the municipality does not recognise their settlement.

Our arguments are very similar and we formalised the role played by the civil society and the media in grievance redressal. The role of mass media and social media in fixing accountability has also been studied in [43, 39, 15, 44].

In [45] Srinivasan explains how decentralised demands by the common people has led to excellent public services like roads, schools and hospitals in Tamil Nadu. Carothers and Barndt [46], and Weiner [47] highlight that governments should provide space for civil society groups to bargain legitimately for their rights. Brenton in an Australian Parliament research paper [48] argues for a reform in public administration towards 'co- creation' and 'co-production' wherein government agencies, non-government organisations, communities and individual citizens collaborate to design policy. Narayan [49] lists some primary successes of pressure groups in India in bringing legislative reforms, like the Right to Information Act, the Lokpal Act, and mandatory disclosures by election candidates. In this thesis we argue for and demonstrate through grievance redressal the effectiveness of civil society collectives in pressure building and gaining access to amenities.

9 Conclusion

In this thesis we studied systems to identify missing information flows which when put in place would be able to form direct communication channels between the stakeholders, in turn making the implementation of the systems better.

We discovered through unstructured and unstructured feedback from the users that when grievances are reported on grievance redressal systems set up by the government there is almost no effective resolution of the grievances. These systems are over-centralised and miss local perspective and wisdom on the grievances and hence fail to provide effective resolution for the grievances. At the same time, many civil society organisations have been working as a bridge between marginalised beneficiaries and the government to ensure that the marginalised beneficiaries get their dues. These organisations have often been more successful in helping people with their grievances than the government systems. We analysed in details why this is the case. We designed a system to bring the best of civil society and the reach of telephonic systems together. With a case study of over 200 cases of grievance redressal we analysed what kind of grievances are suitable to be solved by the civil society, and what kind can be solved by the government systems if more accountability is built into them.

We designed an IVR system that crawls information from government websites and communicates the information to relevant beneficiaries over automated voice calls. The users can also flag the information that is being communicated to them if there is any discrepancy between the published data and the ground reality. Working on the employment guarantee scheme (NREGA) in the Mewat district in Haryana we found that people are able to identify the information that is being communicated to them and flag discrepancies in the data. The social audit organisations and grievance redressal systems can use this as input to undertake detailed investigations.

We deployed unstructured and structured feedback collection systems that enables beneficiaries of government schemes to provide feedback on the implementation of the schemes. Unstructured feedback collection is useful to accumulate the issues that the community is facing and then structured feedback can be used to determine the frequency of occurrence of these issues. In the context of NREGA, officials agreed that the information being collected is new and will help them in improving the implementation of the scheme. A similar exercise in four districts in the context of grievance redressal systems running in three states was able to bring out the shortcomings in these systems and we used the feedback to design a civil society mediated grievance redressal system.

This work has already been able to make impact by identifying implementation problems in government schemes and solving some really hard grievances through a technology assisted volunteer network. The models are also being considered for scaling by the government and the UNDP. This thesis can also be used by other computer engineers who wish to work on challenging problems of using technology to catalyse societal change.

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