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The ins and outs of participation in a weather information system

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Abstract. In this paper our aim is to show even though access to technology, information or data holds the potential for improved participation, participation is wired into a larger network of actors, artefacts and information practices. We draw on a case study of a weather information system developed and implemented by a non-profit organisation to both describe the configuration of participation, but also critically assess inclusion and exclusion. We present a set of four questions - a basic, practical toolkit - by which we together with the organisation made sense of and evaluated participation in the system.

Keywords: participation, participatory development, rural and agricultural development, open development.

1 Introduction

The question of participation has long been debated in the development discourse [6, 7, 9]. Participation in this context means exercise of agency of presumed beneficiaries in setting and implementing goals of development initiatives [16]. Although not a recent concept in the development vocabulary, emphasis on participatory approaches rose in prominence from the 1980s onward as a critique of top-down modernization approaches in defining development priorities, solutions, or metrics [5, 10, 11, 21]. Failure of earlier approaches brought two main points to focus; firstly that development initiatives need to place local realities at the centre, where local people are not mere recipients of but rather active participants in shaping development; secondly, moving from depoliticised, technocratic implementation of project goals to transforming power relations [5, 11]. However, participatory approaches in development faced backlash in early 2000 for reducing participation into another metric without much meaning for either empowerment or transformation of local communities [7, 18, 23, 28]. The main questions that drives these critiques are: Does more participation mean more development? How do we measure the quality of participation? How do we understand the contested spaces of participation in relation to the broader institutional and structural underpinning of popular agency? [8, 16]. Emerging from these critiques is the positioning of participation within the interface of structure and agency and the lived spaces within which participation takes place [9, 16]. This shifts the focus to practices of development instead of its outcome. In this paper we look at participation

in relation to Information and Communication Technologies (ICTs) in development initiatives.

ICTs have been a critical part of development initiatives under the rubric of ICTs for Development (ICT4D) since late 1980s [14]. The assumption that development in the information age will depend on access to ICTs and the education to use it (digital literacy) dominated until early 2000 [4, 20]. However, the focus on access and the associated agenda to mend the digital divide across geographies and communities received serious criticism for neglecting structural factors shaping access to and meaningful engagement with digital technologies post access [26, 27]. Gradually, the discussion within development theories around ICTs moved from digital divide to digital inclusion. Digital inclusion typically addresses issues of access, skills, resources, infrastructure and social positions [15, 27]. Overall, the discourses in ICTD moved from access to participation [26, 27]. However, failure to account for the notion of participation continues to concern both development researchers and practitioners. Two major concerns we identify as prominent in ICTD literature are: how to examine participation and how to evaluate its implications for development initiatives. A subset of ICT4D literature that have substantially engaged with the concept of participation is that of open development [1]. The term open started to be used as a prefix for a variety of terms such as knowledge, data, science, innovation and more importantly for development itself since early 2000 [25]. Open development can be defined as the free (both in access and cost terms), networked, non-discriminatory sharing of digital (information and communication) resources towards a process of positive social transformation [24]. Openness suggests potential for ICT-mediated social interactions to create more flexible social structures by creating more spaces of participation and collaboration [24]. But Singh and Gurumurthy [22] argue, “open ICT4D frameworks seems to overlook the ever-present dimension of power manifest in new forms of networked relationships. The outward appearance of access, participation, and collaboration can mask less desirable social and political outcomes undermining equity and social justice” (pp. 176). Smith and Seward [25] suggest a practice-based framework of openness as social praxis dividing it into processes of open production, distribution and consumption - they argue, “even the most well-intentioned participation process discriminates against some, and there are some costs associated with accessing and using content, even if it is just ones time”. Access, use and contribution all face social, economic, political or cultural barriers [25].

Beyond practices, we propose to critically analyse ICTs most constituent element, information itself. Many argue that ICTs are responsible for overload of information, information reductionism, and decontextualisation of information [2, 3, 12]. When we think about access to ICTs we often end up obscuring the politics embedded in the information itself. Participation gets intricately related to the politics of information as it again highlights the social and structural factors shaping individual action or agency. For example, Mulder et al. [19] in their analysis of

crowd-sourced Big Data for inclusive humanitarian response argues that "all data, including Big Data, are socially constructed artefacts that reflect the contexts and processes of their creation" (pp.1). Data (or information) are neither raw nor objective and are in fact, dependent on social and cultural impediments [13]. Therefore, who collects data, who participate in data (information) making, who mediates access to information are as ever more important questions to understand how people gets to excise their choices and voices in shaping development agenda with or without ICTs.

Based on the above discussion, we argue that there are two important dimensions of participation in and through ICTs. First, the practices that are built around ICTs and second, the content of information that drive ICTs. In this paper, we set out to address these complex questions about notion of participation in development by observing everyday practices around an information system as deployed under a development initiative in West Bengal, India. The information system we have studied is a system to generate weather forecasts and agricultural advisories for small-scale farmers. While there are existing weather forecast services for farmers in India provided by the Indian Meteorological Department (IMD) these faced two main problems. On the one hand they would provide forecasts for a much too large area, making them inaccurate for specific farmers, and on the other hand, the forecasts would not be easily accessible by small scale farmers in remote villages. In response, a system was designed to disseminate forecasts based on locally collected data that allowed preparation of accurate, meso-scale forecasts combined with relevant agricultural advice. The implementing agency for the project was a medium sized non-profit organisation which had for a long time been based in the region. The focus of the non-profit lay on the sustainability of farming livelihoods - both from an economic and ecological standpoint - focusing on organic farming and agroecology. Our aim is to show even though access to technology, information or data holds the potential for improved participation, participation is wired into a larger network of actors, artefacts and practices. To be able to do this, we have developed a simple toolkit intended to be a practical approach by which to analyse and deconstruct participation. We use this toolkit in our work with the organisation to support them in conceptualising participation within the project.

2 A practical toolkit for participation

As the above studies indicate, we see that participation is far from straight forward and truly unfolds only in everyday practices. In order to capture this complexity of participation we propose a framework based on four main and interrelated questions. In developing these questions, we draw on Smith's and Seward's open production, distribution and consumption as types of practices taking place around an information system.

What constitutes information or data in the system? This concerns two processes; firstly, what information is considered important enough to be part of information

platform/system (IS), secondly, what form does information take on a system/platform or in other words in what form the selected information is presented. We argue that information-making and its subsequent curation displays the socially constructed nature of information and denotes what sort of structural limits are imposed on its potential use.

Whose agency is realized in the becoming of information or data? This question addresses the issue of in- and exclusion in the production, distribution and consumption of information. We ask which actors play what role at each level of information processes and how each of these actors are positioned in the larger society beyond the IS.

How is this agency realized through everyday practices? Here the question is invoked to understand the context of participation in an IS. In a way we propose to look at participation, not as a matter of degree but of kind. We focus on the quality of participation in and around the IS, to what extent such participation is a function of participants own volition, and whether participation has implications for their existing social positions and social practices.

For whom and in what do we address participation or lack thereof? This question stems from the assumption that participation is always ensconced in the relations of power. Improved participation may not mean much unless we ask who is participating in what. For example, are women participating more in unpaid work? Does more participation of men in public spaces mean less participation by women in the same space? We need to ask how we address and challenge existing processes of participation in an iterative way that does not presume any direct, linear and non-differentiated development of participation.

3 Methodology

In order to study the way participation unfolded throughout the project we based our methodology on a multi-method case study approach [29]. We employed participant observation, semi-structured interviews, informal conversations, focused group discussions, photo documentation at various sites as well as collection of work materials and project documentation. We began the first phase of our research with discussions with organisations head office staff in Kolkata. After these interviews, we conducted preliminary visits to the two districts where the system was deployed - Purulia and Bankura. During these visits, which took place in June 2016, we engaged in two rich picture drawing workshops with field office staff [17]. Drawing rich pictures with staff was a useful approach for our mapping purposes, helping us to identify both the actors as well as locations, challenges and issues faced in the system. At the same time, it provided us with an overview of how the system operated in practice and the information flows that took place through it. It helped us select the villages to focus on as we gathered data about their involvement in the system. As the boundaries of the system in terms of geographical locations were ill-defined, and it was intentionally

broadly accessible, it was impossible to gauge the exact extent of the system in terms of the number of villages covered or number of users. The implementing organisation, however, specifically targeted 40 villages (18 in Purulia, 22 in Bankura). We decided to limit our case to Purulia. From the 18 villages in that district we selected five. To select the five villages included in our research, we assessed the level of engagement by all villages with the system. To define level of engagement we listed the different ways in which the village was engaged with the system. Firstly, through access to the various artefacts that made up the system - automated weather stations, manual data collection units and blackboards used for information dissemination. Secondly, we looked human-mediated participation with the system in village group meetings, interaction between field workers and villagers, and the presence of village volunteers. We chose three villages with a high degree of access to the artefacts of the system along with many forms of participation, one village with limited forms of participation as well as limited access to the artefacts and finally one village with many forms of participation but with limited access to artefacts. While the first three villages were intended to be our main focal points for understanding the system's impact, the second two villages were chosen to allow for comparing the role of participation and access to artefacts as well as to represent the diversity of roles the system might play in different villages.

We sought to observe changes in the way people learned and interacted with the system over time and therefore we conducted monthly, repeated visits to villages over 6 months. Visits to the project area involved interviews lasting up to an hour with field office staff, as well as both individual interviews and group discussions in the chosen villages. In each village, we initially spoke to the people formally tasked with managing the system and then adopted the "snowball" sampling method to target various actors using or operating the system. We held group interviews with women's and men's groups in the village as well as attended regular group meetings. Interviews with individual villagers included the *majhis* of each village, who are the traditional authorities. While we sought to conduct individual semi-structured interviews, we also found that informal conversations and impromptu group discussions were valuable sources of information. This work was documented through field journals as well as recordings and photography where possible. Interviews were repeated at least two times, in some cases up to four times, capturing how involvement with the system changed over six months. Starting from 2018 we participated in development of the project on the basis of the understandings that our toolkit provided. This sought to address some of the challenges to participation identified through the initial study a new geographical location.

4 Artefacts, actors and practices

Below we present the case study through its artefacts, actors and practices. Building our analysis around who is involved and what their practices around the IS are is the

foundation for being able to move on to apply our toolkit or framework in analysing the system.

4.1 Artefacts

The main artefact produced as part of the system's information flow is the weather forecast and the agricultural advisory. The weather forecasts contain a five day forecast - covering rainfall, temperature and wind. The associated agricultural advisory contains recommendations with regards to irrigation, harvesting, potential pest attacks and remedies and other cropping practices. The agricultural advisory is written on the basis of the forecast, combining both activities related to the season as well as the specific weather patterns for the next five days. For dissemination, the agricultural advisory and weather forecasts are printed on A3 sheets of paper as well as written by hand on blackboards installed throughout participating villages. They are also be sent out via SMS to selected farmers. As part of generating data for the forecasts, other artefacts are involved. At three locations in the area automated weather stations (AWSs) have been installed. These continuously log data on rainfall, temperature, humidity, wind speed and direction. There are also manual weather stations in several participating villages. These consist of a rain gauge as well as a device to measure humidity and temperature.

4.2 Actors

On the village level, there are the farmers who are the primary intended beneficiaries of the system. In each village there is also a volunteer who is responsible for collecting manual weather data as well as disseminating forecasts to the village. These volunteers were sometimes farmers themselves and in other cases they were young people who had enough schooling to know how to read and write. On the block level, are the field workers of the non-profit organisation. These field workers are involved in organising the collection of data from the automated weather stations as well as receiving the forecasts and advisories, printing them and disseminating them to the village volunteers. The field workers would communicate thus collected weather information to the meteorologist. Located at the head office of the organisation, in Kolkata, are the project staff. They communicated with the agricultural experts and the meteorologist to gather data and provide it to the field workers. The final actors - the agricultural expert and meteorologist - were both external to the organisation. The meteorologist was based in another non-profit organisation in another state in India and the agricultural expert in an agricultural university.

4.3 Practices

There were four main practices involved in the running of the system. Following Smith and Seward, we can think of these as part of production, dissemination and consumption practices. The first two practices relate to the production of information in the system. The first practice covered collecting observed weather data and involved the meteorologist, village level volunteers as well as field staff. Village volunteers would keep a daily notebook of temperature, humidity and rainfall using equipment provided by the organisation. On a weekly basis, this information would be photocopied by the field worker who would then enter it into an Excel sheet. The field worker would also travel to the automated weather stations to download data from them. These manual and automated observations would then be sent to the meteorologist. The second practice when it comes to production was generating the forecasts and agricultural advisory. The meteorologist would collect weather data and combine it with data sourced from the Indian Meteorological Department (IMD) to feed into a weather forecasting model. From the output of this model he would generate a 5 day forecast. This 5 day forecast would be framed in simplified terms as deemed relevant by the meteorologist. He would then forward it to the agricultural expert, who would write an advice based on the current cropping season and the specific weather forecast. The project staff in Kolkata would then receive both the forecast and advice. However, since the agricultural expert would mostly term his recommendations on basis of conventional agricultural practice, the project staff in Kolkata would then translate it into organic recommendations - for instance recommending application of organic pest repellents rather than synthetic pesticides. The third practice was the dissemination of forecasts and advice. Here the village volunteers played a key role. While initially the organisation intended to primarily rely on SMS for dissemination this turned out to be unworkable for multiple reasons, primarily because of difficulties encoding Bengali writing in ways which the - often low-cost - feature phones used by farmers in the area could display. Therefore, they relied on print outs of the forecasts and reports to be pasted in various locations in the villages. Furthermore, each village had a blackboard which the village volunteers regularly updated with forecasts and reports. The blackboards were located in village squares and other gathering points allowing farmers to access and view the reports. Finally, farmers would hold regular group meetings. At these, the volunteers would present and discuss the latest forecasts and how the farmers may respond to them. This last dissemination practice also relates to consumption of the data. Partly, farmers would participate actively in the consumption process by discussing the advice and forecasts given, and combine it with their own knowledge and experience. There was also a fourth practice that involved the feedback and evaluation of the generated forecast. The weather data collected manually by the volunteers, as well as that collected automatically by the automated weather station would be used to evaluate the accuracy of the forecasts at the village level. Additionally, field workers

were intended to regularly collect feedback from the farmers on their perception of the forecasts and advisories.

5 Understanding participation

As discussed above, there were several participatory elements of the project. Not only were villagers and farmers groups engaged in the production of data within the system - form of crowdsourcing - they were also actively involved in dissemination and consumption of the generated forecasts and advisory. However, simply providing opportunities or spaces for participation is insufficient without a further analysis of patterns of inclusion/exclusion. We therefore turn now to applying the four questions we presented as a practical toolkit in the beginning of this paper.

5.1 What constitutes information?

We note that what constitutes information within the system was largely framed through the non-profit's objectives of enabling their view of sustainable agricultural development. The choice of weather forecasts as important information was based on the organisation's focus and framing of the project as adaptation to climate change.

In observing the development of the programme, we noted that even within the organisation there were disagreements as to what was important information. While initially more senior training staff were involved in analysing and framing the agricultural advisory texts, they were later excluded. It turned out that the concept of specific and targeted - primarily reactive - agricultural advice was difficult to combine with the more holistic view of agroecology that emphasised proactive approaches and long-term farm development as the main approach to handling issues faced by farmers. Another issue related to the fact that the advice was generated by an agricultural expert far removed from the field site. This meant that he sometimes provided advice ill-suited to the specific crops and cropping practices of the farmers involved in the project. His idea of what crops to focus on was based on the major cash crops of the region - not necessarily the crops of greatest relevance to small and marginal farmers. Furthermore, he would often include advice based on mainstream, non-organic practices. Project team members would respond to these difficulties by editing the recommendations, sometimes making them very generic as they lacked access to specific, weather-linked, remedies based on organic practice. Many of the farmers found the edited advisory lacking, as they claimed they could not identify with it because "they were not organic farmers" or did not have access to the necessary inputs. Furthermore, even though project staff would alter the type of crops discussed in the advisory, the advisory would still primarily emphasise major crops such as rice or vegetables. The choice to focus on agricultural practices and on major crops, meant that other needs were not specifically addressed. We observed how field workers would adjust and invent new recommendations based on the weather forecasts when present-

ing them to different groups. For example, when discussing with the womens groups they would rather talk about the forecast in the context of livestock management or house construction – two areas that fell under the responsibility of women in the villages. Likewise, other livelihood activities undertaken by the villagers - such as daily labour in construction work in towns (for which the forecast was used by some villagers) - were comparatively neglected in the planning and development of the system.

When it came to the forecasts themselves, these were adapted by the meteorologist who designed them to provide less data so as not to be confusing. He also ensured that meteorological terms were matched with local terms. This, however, made the reports more generic and occasionally led to difficulties for the farmers in telling what specifically they referred to. Other important information in the system was the weather data collected by the villagers and field workers through manual and automated weather stations. In combination with this data, feedback on the weather forecasts was collected occasionally, though the organisation found it difficult to gather this in a systematic way. However, we observed that several villagers involved in this collection had both rich information about the weather as well as combined the data they collected, the provided forecasts and data, as well as their traditional knowledge of weather to create their own understanding and predictions. This kind of mash-up information was largely invisible to the implementing organisation in Kolkata or the experts located elsewhere.

5.2 Whose agency is realized in the becoming of information or data?

The participation of various actors in production, distribution and consumption of information throughout the system was varied. The organisation itself exercised strong agency, even in relation to the experts providing the majority of the technical knowledge, by editing and reframing the recommendations on the basis of their aims and goals. This ability may partially be understood from the long-term work of the organisation in their field, providing them with a sense of understanding and expertise about the farmers' situation and cropping practices - even though they admitted to lacking detailed knowledge of specific practices that could respond to specific weather conditions. However, the organisation was also affected by the priorities of the funder in framing climate change and weather as the most critical issues to address.

In the target region for implementation, the role intended for local actors involved was focused on dissemination and consumption of forecasts and agricultural advisory. However, as most of the field staff - as well as all village volunteers – were recruited from the local area and were provided with relative freedom by the organisation, allowed them to exercise considerable agency in the way that dissemination and consumption was practiced. This was especially important for actors who were not fully included in the planning for the system. The advice provided through the system

primarily benefited male farmers - who were responsible for the major crops (rice and limited vegetables) - and specifically those who had for a long time been involved with the organisation. Other farmers - who to a greater degree practiced conventional agriculture - and women in the villages - whose responsibilities centered on smaller crops, livestock and housing - were comparatively neglected. Equally, those who did not own land and managed their livelihoods as day labourers or in employment in smaller industries such as brick kilns were not able to equally participate in the system.

Village volunteers who participated in collecting local weather data and disseminating forecasts were in several cases young students or recent class 12 graduates. They were recruited as they could read and write, and were thus better educated than most others in their villages. However, that they were recruited from local villages and often related to or at least known to others in the village enabled their active participation in disseminating the data.

5.3 How is this agency realized through everyday practices?

We now return to the everyday practices of production, dissemination and consumption discussed above. Firstly, when it come to the production of the data, the main actors both in plan and in practice were the two experts as well as the staff from the head office of the organisation. Not only did they produce the data underpinning much of the system, they also served as the primary translators and gatekeepers deciding what data and in which format it would be provided to the farmers. However, the participation of village volunteers in the production process served important purposes. Not only did it allow the village volunteers to be recognised and act as experts in their villages, but it also provided them with greater understanding of the weather forecasts themselves. This allowed several volunteers and field workers to strengthen their own social position through their participation in the production process.

When it comes to dissemination and consumption, the fact that most of the dissemination activities were managed within the village with the active participation of volunteers was important for several reasons. It strengthened the social position of the volunteers, by making their role highly visible. It also created a sense of ownership among other villagers, as they knew that there was a village member who received this data and should disseminate it. Furthermore, villagers were able to reinterpret and reframe the data provided specifically towards their own needs. This was enabled by the organisation opting to provide weather data in addition to agricultural advice, thus allowing different groups of participants to use the information provided. For example, female farmers could use the temperature data as an indicator whether they should allow their livestock to graze or children to go to school. Likewise, day labourers could use the system to decide whether there would be work available on a given day or not.

5.4 For whom and in what do we address participation or lack thereof ?

We used the analytical approach drawn from this toolkit of questions to understand the second phase design of the project. During this phase we undertook the implementation of the same innovation in a new geographic area. Here we relate two of the changes to the programme we identified on the basis of our analysis of participation.

Seeing the impact of village volunteers participating in data production and dissemination, we began by recruiting and training a volunteer in each village. Rather than aligning ourselves with power structures already in place - which had been the approach in the previous district - we recruited students, as they had opportunity for meaningful participation and could draw direct benefit from participating. We ensured that funding was available to place a manual weather station in each village. If viewed from the information needs of the meteorologist, this was a lot more than what was required, however when drawing on our understanding of participation we saw this as a means by which to support participation. We specifically adopted a gender perspective in identifying locations where to place notice boards with weather information. The list of locations drawn up by field staff included places around the tea shop, on the main road, etc. and tended to ignore the sites where women congregated. While traveling through the villages a new set of public locations were therefore identified through discussions with village women - for example near the temple, where the water pump was, around the ration shop. The two examples given above are a few ways in which we have tried to use this toolkit, as part of the ongoing development of the information system. With the help of our framework we were able to reconfigure the relationships between artefacts, actors and practices while expanding the system in new contexts. This ultimately allowed us to approach participation neither as a property nor outcome of a development intervention, but rather as a dynamic process.

6 Conclusion

Through our case study, instead of looking at varied degrees of participation, we sought to highlight for whom and how it is participatory. As has now been well established patterns of inclusion and exclusion plays an important part in the development impact of interventions. We have employed a simple toolkit consisting of four questions in looking at our case and, together with the implementing organisation, used the insights thus generated to develop their programme further. We identified that the establishment of participatory practices related to production, dissemination and consumption of information within the system was of central importance. We conclude that the toolkit, consisting of four simple questions, drawing on an initial analysis of artefacts, actors and everyday practices, is a useful

tool by which practitioners and academics can develop shared understandings of the encumbrances of participatory initiatives.

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