

Mobile for Development Utilities

NextDrop
Water.Simplified

JANUARY 2016

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Mobile for Development Utilities

The Mobile for Development Utilities Programme promotes the use of mobile technology and infrastructure to improve or increase access to basic utility services for the underserved. Our programme focuses on any energy, water or sanitation services which include a mobile component such as mobile services (voice, data, SMS, USSD), mobile money, Machine to Machine (M2M) communication, or leverage a mobile operator's brand, marketing or infrastructure (distribution and agent networks, tower infrastructure). The Programme receives support from the UK Government.

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The Innovation Fund

The Mobile for Development Utilities Innovation Fund was launched in June 2013 to test and scale the use of mobile to improve or increase access to energy, water and sanitation services. In two phases of funding, grants were competitively awarded to 34 organisations across Asia and Africa. Seed grants were awarded for early stage trials, Market Validation grants for scaling or replication of business models, and Utility Partnership grants to foster partnerships between utility companies and innovators.

The specific objective of the Innovation Fund is to extract insights from the trial and scaling of these innovative models to inform three key questions for growing the sector:

- How can mobile support utility services?
- For a mobile-enabled solution to be adopted at scale, what building blocks are needed?
- What are the social and commercial impacts of delivering community services to underserved mobile subscribers?

These insights, as well as grant-specific learning objectives, are included in individual case studies such as this one, as well as thematic reports that will be published throughout 2015 and 2016.

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Executive Summary

In January 2014, the Mobile for Development Utilities Programme awarded NextDrop a Seed grant to deploy its innovative service to 40% of Bangalore, a city of 8 million residents, in association with the Bangalore Water Supply and Sewerage Board (BWSSB). Due to scarcity of water, BWSSB is forced to ration supply to the extent that some areas receive water only a few hours each week. Water distribution is controlled by 400 valvemen who manually turn on/off 8,000 valves around the city. Valvemen are assigned a schedule but are unable to always follow it for a variety of reasons making supply times unpredictable. So far, BWSSB and consumers have not had visibility into actual supply times because there has been no real-time feedback from the valvemen.[1] As a result, BWSSB engineers say they receive 100-150 calls every day for information on water supply.

The NextDrop solution bridges this gap by gathering information from valvemen and giving consumers 30-60 minutes advance notice of water supply thus helping consumers to better manage their daily routine. Most importantly, NextDrop provides near real-time visibility into ground-level information to BWSSB leading to data-driven decisions that should result in improved service levels.

The key objectives of the grant were to fund the development and deployment of an information system to provide BWSSB visibility into its own operations; to create a two-way communication channel between BWSSB and its customers to increase transparency and accountability; and to enable BWSSB to make data-driven decisions to ultimately improve service levels, reduce the proportion of non-revenue water[2] and make water distribution more equitable. Key findings include:

The NextDrop solution has demonstrated improvements in service delivery by stabilising supply time in 14% of valve areas: From May 2014 through December 2014, supply timing was stabilised across 326 of the 2320 deployed valve areas. In the case of one valve, variation in supply timing was reduced from over nine hours to a few minutes. Steady timings were maintained over two months.

NextDrop's service together with process improvements made by NextDrop led to 90% reduction in complaints at BWSSB's call centre: As per NextDrop analysis, the water-related complaint rate among BWSSB customers in the NextDrop service area was an order of magnitude lower than in the remaining 60% of the city. Simple process improvements such as providing customer call centre operatives with the scheduled supply times were a major reason for the reduction in complaints indicating the importance consumers attach to water-related information.

About 64%[3] of respondents are very or somewhat satisfied with NextDrop's service: However, their satisfaction does not strongly correlate with accuracy of information. This may indicate a honeymoon period where people are happy to have some information rather than none. If accuracy does not rapidly improve, consumers might become disillusioned.

Outdated map of piped network introduces inaccuracies in mapping of consumers to valve areas: BWSSB's piped network map is over 15 years old. In this time, Bangalore's population has exploded and the mapping of new homes to valve areas is unclear, especially in boundary regions. Nearly 18% of survey respondents said that their

1. NextDrop serves several entities: water boards like BWSSB, their staff like water engineers who use the water supply information and people subscribing to their service. Together, these entities are referred to as "customers". People subscribing to NextDrop's service are referred to as consumers.
2. Estimated by BWSSB at 45%
3. All statistics that refer to respondents are based on a survey of 400 NextDrop consumers. All percentages are based on the number of responses to a question, not on the entire survey sample.

water alerts were never accurate, indicating incorrect mapping. NextDrop has been refining its processes to proactively identify incorrectly mapped consumers and is working with them to correct it.

Literacy is not a prerequisite for adoption of simple mobile solutions: Most valvemen have a primary education at best. With a mix of training, incentive programmes and active follow up by supervisors, valveman participation increased throughout the programme with nearly 90% actively reporting in December 2014.

Valvemen submit information for batches of valves leading to delayed water alerts: While the rate of valveman participation was high, valvemen tended to provide notifications for batches of valves rather than for a valve at a time thus degrading the timeliness of water alerts. Nearly 64% of respondents said that their water alerts were only sometimes accurate. The primary reasons for this are that valvemen themselves sometimes do not have enough information about the water supply, some valvemen have too many valves to operate and valvemen sometimes forget to report water timings. This exemplifies the difficulty in obtaining consistent and accurate data from "human sensors".

Advanced technology can improve fidelity of data but trepidation can hinder adoption: NextDrop designed the ValveKey mobile app to overcome the problem of batch reporting by partially automating the process of data gathering. The app automatically senses or computes the required information and the valvemen upload[4] it with a simple key press. However, the app requires valvemen to use a smartphone (for the first time in their lives). The fear of damaging or losing the smartphone initially hindered adoption but NextDrop showed that it is possible to overcome this barrier with education and training. Moreover, the ability to consume media creates a strong incentive to adopt smartphones.

The project also highlights another key lesson that utilities cannot easily support pilots because their risk appetite is low and they have to follow certain procedural norms such as open tenders. On the other hand, evidence from the pipeline of grant applications to the Mobile for Development Utilities Innovation Fund suggests that innovation is being spurred in the water sector by solution providers and not by utilities. This puts solution providers, and especially startups who are even more cash-strapped than utilities, in a very difficult situation. Most utilities cannot support pilots and startups do not have the lifeline to self-fund pilots. Grants can help create proof points that can eventually mainstream applications of technology to improve services in the water sector.

The NextDrop project is a case in point. As a result of the proof of concept funded by the GBP 141,250 grant, NextDrop was able to validate its value proposition to BWSSB. In March 2015, BWSSB issued a public tender to extend valve monitoring to the remaining 60% of the city which NextDrop has won. Prior to that in January 2015, NextDrop began operations in Mysore with a major corporate funding the rollout just like the GSMA did in Bangalore. This market expansion demonstrates the need for a replicable solution that promotes transparency and accountability in essential service delivery.

4. Information upload is over the mobile data channel. The mobile data plan is currently paid for by NextDrop.

Introduction

NextDrop was born in 2010 as a graduate project by students of the University of California, Berkeley who created a system that provided water alerts by SMS to residents of the twin towns of Hubli-Dharwad in the state of Karnataka, India. Since then, NextDrop has expanded to Bangalore, the state capital, with the GSMA grant, and to Mysore in January 2015. Along the way, NextDrop's business model has changed from a subscription-based B2C[5] model to a hybrid B2G[6] and B2B[7] model. In line with this change, the system was extended from one that supplies information to consumers to one that aggregates, analyses and presents information to water boards to enable data-driven decisions to improve water services.

Background on Bangalore

Bangalore, home to India's Silicon Valley and capital of the state of Karnataka, is facing a severe water crisis. According to the Census of India, the city's population rose 47% from 5.7 million[8] in 2001 to over 8.4 million in 2011.[9] In contrast, supply from the Cauvery River, the main source of the city's water supply has risen only 12% from 810 million litres per day (MLD) in 2002 to 910 MLD in 2012.[10]

The Bangalore Water Supply and Sewerage Board (BWSSB), formed in 1964, is the premier governmental agency responsible for water supply and sewage disposal in the city. BWSSB provides water to Bangalore's three zones which are further divided into nine divisions and 30 subdivisions. BWSSB serves about 900,000 connections of which over 700,000 are residential connections. An apartment building or complex is considered as a single connection so the number of households served by BWSSB exceeds the number of residential connections. Most parts of the city receive water once every two days through the piped network. The water supply is controlled by about 400 valvemen who manually operate 8,000 valves. The valvemen are subcontracted to BWSSB through a contractor.

5. Business to Consumer
6. Business to Government
7. Business to Business
8. List of towns (Karnataka): Census of India 2001: http://censusindia.gov.in/towns/krn_towns.pdf
9. Cities having population 1 lakh and above, Census of India 2011: http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/India2/Table_2_PR_Cities_1Lakh_and_Above.pdf
10. BWSSB website: http://bwssb.org/content/about-bwssb

Key Facts about NextDrop

FIGURE 1

Company overview as of December 2014

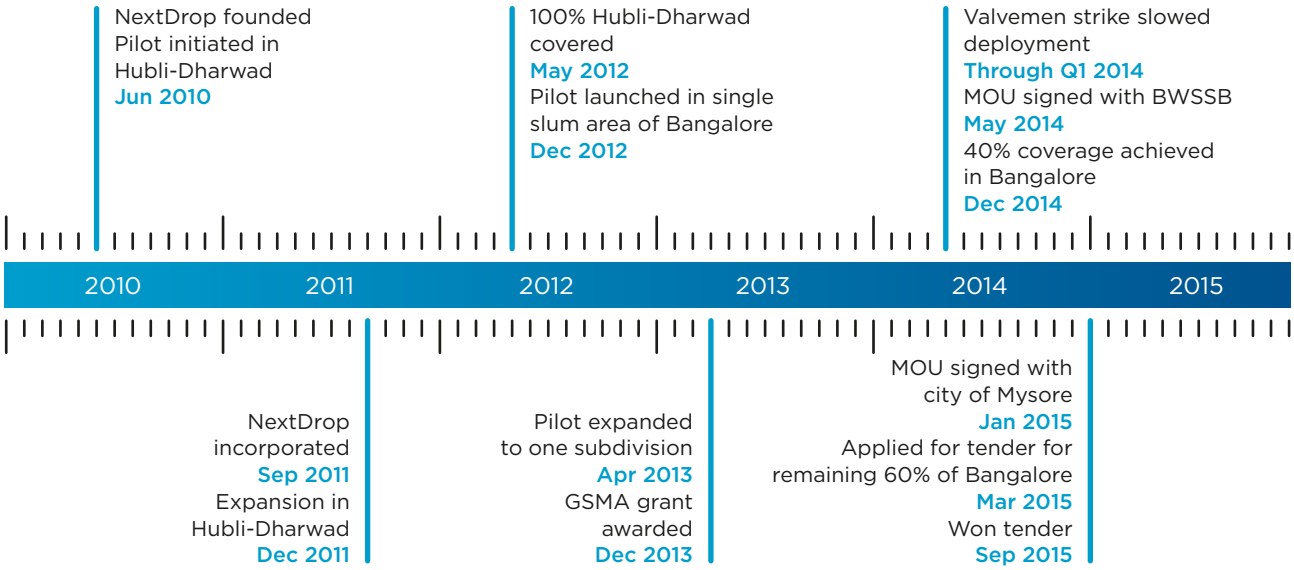
Name	NextDrop
Sector	Water
Year Established	2010
Country Footprint	India
Product/Service	A service to collect, analyse, present and share crowd-sourced information on actual water distribution timings, frequency or duration in real time
Market Segment	Utility: The Bangalore Water Supply and Sewerage Board (BWSSB) and other water boards in the future that supply water through manual valve operation Consumers: All those receiving water from water boards
Total systems/ Customers served	In Bangalore, 7,004 households had signed up for NextDrop's service. The service was deployed in an area with over 250,000 households.
Use of Mobile: Technology and Partnership	• SMS: Water supply alert to residents 30-60 minutes in advance • IVR:[11] Valvemen report water supply time and valve ID to NextDrop • Data (to replace IVR): Newly designed mobile app detects location and valve open/close information and uploads it with a single touch • Missed call: Consumers give NextDrop a missed call to separate phone numbers to inform that supply time was correct or incorrect

NextDrop's growth as an organisation is depicted in the timeline in Figure 2.

11. Interactive Voice Response; Valvemen do not incur charges for reporting over IVR.

FIGURE 2

NextDrop's growth



Grant Objectives

The objectives of NextDrop's Seed grant were as follows:

- To fund the development and deployment of an information system to provide BWSSB visibility into its own operations
- To create a two-way communication channel between BWSSB and its customers to increase transparency and accountability
- Ultimately, to enable BWSSB to make data-driven decisions to improve the levels of service and make water distribution more equitable across service areas

The expected learnings for the broader utilities sector, as defined by NextDrop at the outset of the project were:

1. Can crowdsourcing data increase accountability and operational efficiency for water service operators?
2. Can mobile phones increase access to water by reducing information asymmetries?
3. How can ICT initiatives in the water sector be scaled and sustained?

Market Opportunity

Market Potential

NextDrop's addressable market comprises the water boards and residents of all cities and towns across India and in other countries where similar systems of manual valve operation exist. As per the Census of India, the aggregate population of India's 46 "Million Plus"[12] cities was over 116 million in 2011. As 100% of India's urban population is covered by mobile networks,[13] virtually everyone in NextDrop's service areas who has a mobile phone can subscribe to and benefit from its service. India's market penetration of unique mobile subscribers is 35.4%[14] although the urban penetration is likely to be much higher.

Mobile Ecosystem

India has one of the most competitive mobile markets in the world. There are 12 active operators with up to eight operators serving some service areas or circles. Airtel leads with a market share of 23%.[15]

India does not yet have a vibrant mobile money market. Mobile money awareness and usage are low, in part due to regulatory restrictions that have prevented non-bank entities like MNOs from providing full-functionality mobile wallets that allow customers to cash-out. Other restrictions such as onerous Know Your Customer (KYC) requirements have also prevented the wide adoption of mobile money. However, mobile money uptake is expected to grow now that specialised Payments Bank licenses have been awarded to eleven new players, including five MNOs either individually or as part of a consortium.[16] Payments Banks will offer deposit accounts, remittances, and other payments products and may provide additional services on behalf of other financial institutions.

In the NextDrop ecosystem, all valvemen have phones, the overwhelming majority of which are feature phones. All consumers of NextDrop are required to have a mobile phone. However, for a sizeable minority of the consumers, the user of water alerts (generally the woman of the house) is not the recipient of the messages. This is generally for two reasons, either the head of household enrols in the service to ensure its authenticity and may relay water alerts by calling home, through a neighbour or not at all. Alternatively, the user of the alerts may not have a mobile phone and in a few cases, may not know how to open an SMS.

Market Assumptions

NextDrop launched their service in Bangalore, based on the following assumptions about their target customers, made as part of their grant proposal:

- BWSSB had low visibility into the performance of its network. BWSSB estimates that the proportion of non-revenue water is as high as 45%.
- The distribution of water was inequitable. Many consumers were paying for alternate sources which were much more expensive than the water supplied by BWSSB. By regularising the frequency and timing of water supply, consumers would save money, value the NextDrop service and have more trust in BWSSB.
- Most importantly, NextDrop assumed that once it ran a successful pilot project, BWSSB would be willing and able to pay for ongoing operations and expansion throughout the city.

12. https://en.wikipedia.org/wiki/List_of_most_populous_cities_in_India. Bangalore is ranked 3rd, Hubli-Dharwad is 50th and Mysore is 53rd.
13. GSMA estimate
14. GSMA Intelligence, Q4 2014
15. GSMA Intelligence, Q4 2014
16. Reserve Bank of India grants 11 "in-principle" approvals for Payment Banks: http://www.gsma.com/mobilefordevelopment/reserve-bank-of-india-grants-11-in-principle-approvals-for-payment-banks

NextDrop's Business Model

The Value Proposition

NextDrop's business model creates value for three stakeholders:

- Water Boards: Water boards get a clear view into their own operations, obtain actionable data and gain access to a convenient platform for consumer feedback. In the long run, it is expected that water boards will pay for the ability to track their operations and make decisions driven by on-ground data that is updated daily.
- Consumers: Consumers benefit from water alerts as they are better able to plan their day. Moreover, NextDrop provides a channel to consumers to voice their complaints to BWSSB. Not only is the NextDrop service free to consumers, but they also do not incur a cost to provide feedback.
- Corporates: Corporates can purchase rights to co-brand water supply SMSes. Like the grant, an upfront investment from a corporate can help NextDrop launch their service in a new area to prove its value proposition to the local water board. Once the value proposition is clear, the local water board can follow the Bangalore model and pay NextDrop an ongoing service fee. Thus, the B2B and B2G revenue streams complement each other. NextDrop followed this model to launch in Mysore in January 2015.

NextDrop's value proposition is delivered through the business model components discussed in detail in the following sections, including service and pricing, marketing, operations, and customer service.

Service and Pricing

NextDrop first experimented with monthly subscription fees to consumers of INR 10 (USD 0.16)[17] and INR 20 (USD 0.32) but moved away from the B2C model to a B2G model because the cost of collections was higher than the revenue. Further, NextDrop's service is predicated on crowdsourcing information. A free service increased subscription which led to more and better information.

NextDrop had expected to be paid by BWSSB during the pilot project. However, BWSSB first wanted to see the value of the service to its staff and customers before it signed a commercial contract. After BWSSB was convinced by the value proposition for the NextDrop service, it floated a public tender in March 2015 to extend valve monitoring to the remaining 60% of the city and for ongoing operation in the deployed 40%. NextDrop won the bid in September 2015. The estimated value of the tender is INR 9.6 million (USD 152,640) for seven months. After the seven month period, either NextDrop's contract will be extended for a period of 3-5 years or new bids will be invited.

17. Values in INR converted to USD using an exchange rate of INR 1 = USD 0.0159, the average exchange rate for December 2014 obtained from the OANDA Online Currency Converter.

Use of Mobile: Technology and Partnership

Technology: At the core of NextDrop's service is the use of mobile communication technology to gather and disseminate information. NextDrop's central server directs information to the appropriate set of consumers. The process is described below:

- Valvemen submit information to NextDrop servers through an IVR system or via a mobile app. Through the IVR, valvemen identify the valve and whether it is being opened or closed. The newly developed mobile app works by attaching a smartphone to the top of a valve key, where it computes the GPS location, detects whether the valve is being opened or closed, including the number of turns as well as the time at which the valve is being operated. As opposed to the IVR system which uses a voice call to upload information, the mobile app uses mobile data.

- Once the NextDrop central server receives water supply information from either the IVR or the mobile app, it creates an SMS alert for consumers. It uses a stored mapping of valve areas to consumers to direct these SMSes to only the appropriate set of consumers.

NextDrop also solicits and accepts feedback from household consumers using the mobile channel:

- After consumers first sign up, they are required to confirm that their location is correctly mapped to their valve area. NextDrop sends an SMS at the next supply time asking whether they are receiving timely supply information from NextDrop. The SMS instructs the consumer to place a missed call to one number to respond with a "Yes" and another number to respond with a "No". A "No" indicates the consumer is mapped to the wrong valve area.

- If the mapping is incorrect, the consumer receives a call from NextDrop to refine the mapping and the above process is repeated.

- Once the mapping is correct, consumers receive up to three SMS queries asking whether they received the correct supply time. Once they confirm with a missed call, future water alerts will be sent after information is submitted by valvemen.

- Consumers can provide unsolicited feedback proactively by giving a missed call to NextDrop's customer service line. A NextDrop customer service representative calls the consumer and enters the feedback into the Complaint Management System.

- When a consumer provides unsolicited feedback, for example, to complain about low water pressure or contamination, it may initiate a feedback request from NextDrop to all consumers in the related valve area.

All the information that NextDrop gathers from various channels and stakeholders is aggregated, analysed and available near real-time through interactive maps and dashboards to BWSSB officials. Moreover, NextDrop presents the most important findings to BWSSB officials at monthly meetings.

Examples of information available to BWSSB are shown in Figure 3 and Figure 4.

FIGURE 3

Screenshot of a live water supply map

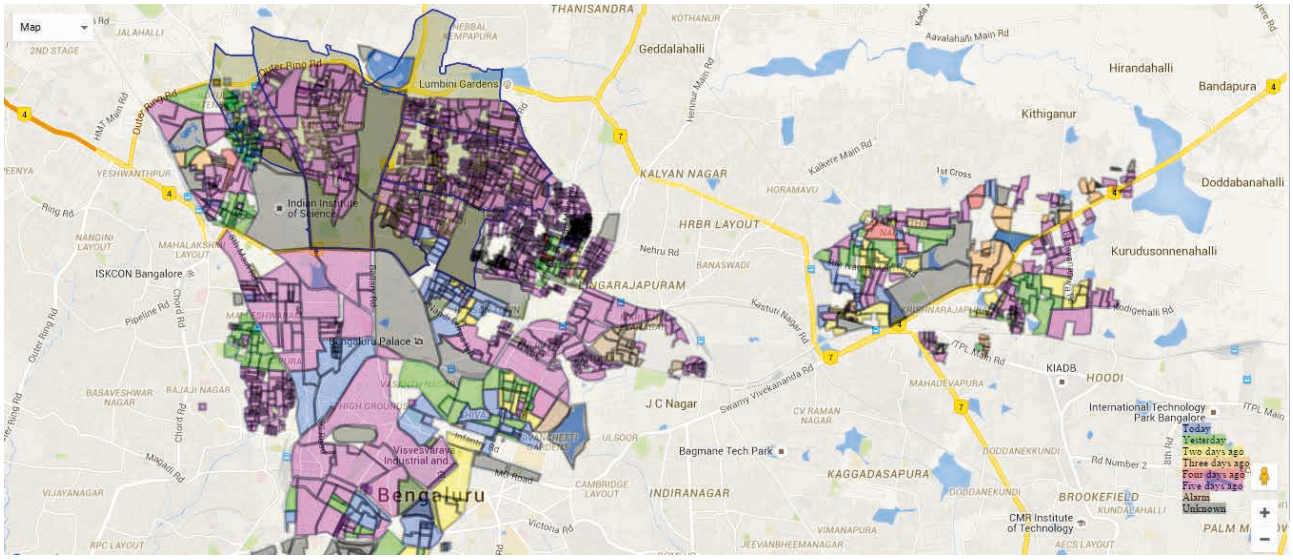
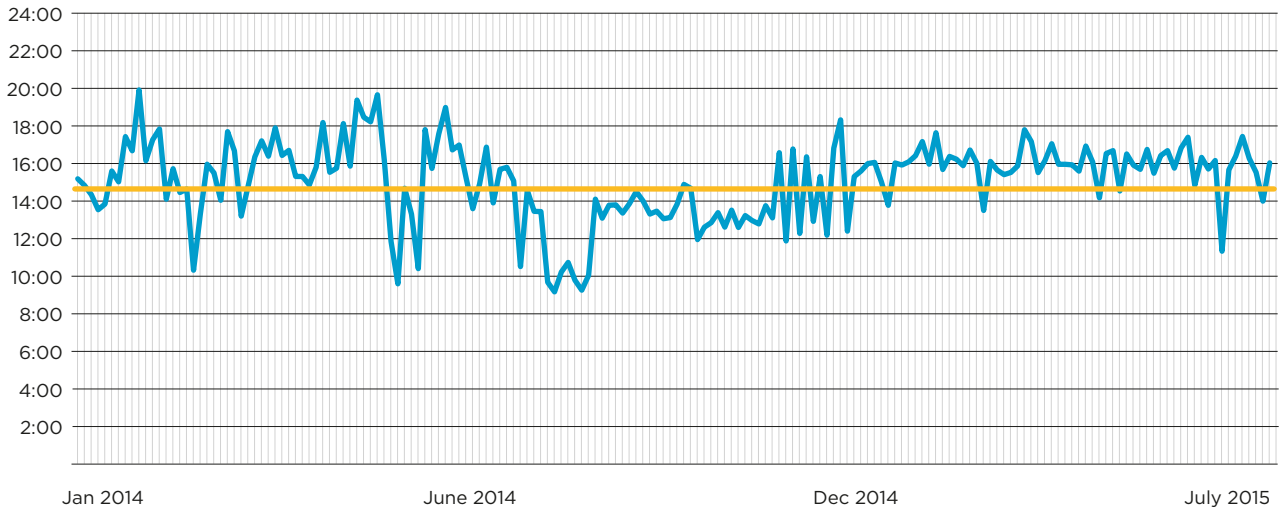


FIGURE 4

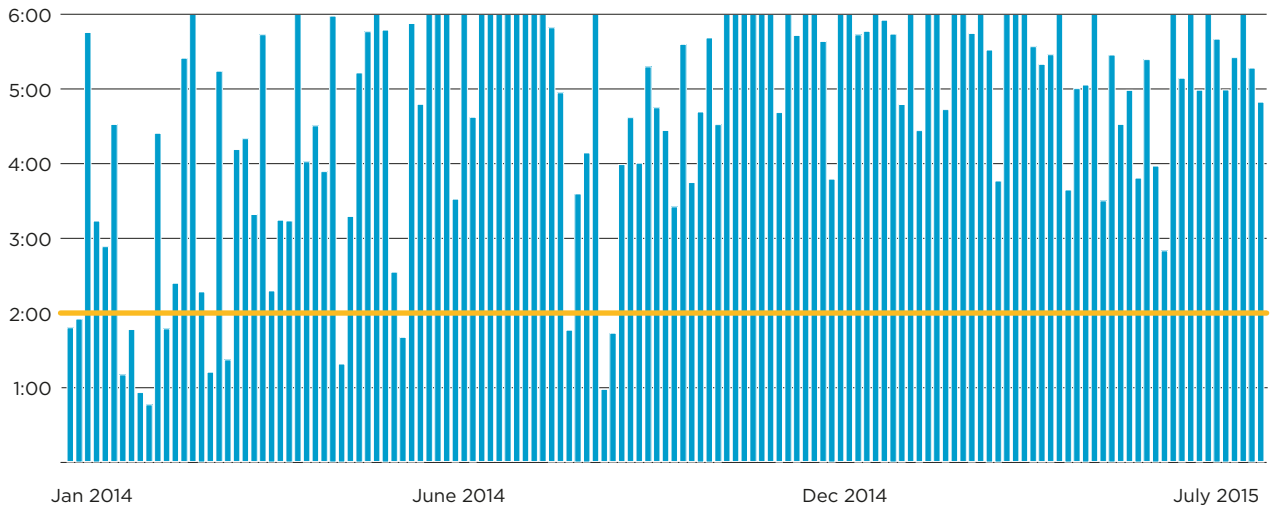
Live water monitoring dashboard for a single valve

SUPPLY TIME CHART



SUPPLY TIME 2:30 PM

SUPPLY DURATION CHART



SUPPLY DURATION 2:00

Partnership with a Mobile Operator:

NextDrop has not partnered with a mobile operator as restricting the service to customers of a single mobile operator would mean limiting access to critical information to only a subset of BWSSB's customers. This is not feasible or even desirable.

As of now, valvemen are also free to choose their operator and are responsible for their phone bills. In the future, a partnership with a mobile device vendor and a mobile network operator could enable NextDrop to offer a turnkey solution to water boards including devices and connectivity for valvemen.

Marketing, Operations and Customer Service

Beyond technology development, NextDrop's success depends on careful attention to the key business components of marketing, operations and customer service. Figure 5 below describes NextDrop's operations within these business components.

FIGURE 5

Description of NextDrop operations for core business components

Business Component	Structure & Strategies
Marketing	Above the Line: • TV news coverage • Newspaper articles and press releases by BWSSB Below the Line: • Pamphlets • BangaloreOne, a combination of physical offices and portal that offer citizen services. NextDrop placed posters in the offices and trained personnel at the utility bill pay counters to inform consumers of NextDrop's service • NextDrop employees accompany water meter readers to sign up consumers to NextDrop service • Train valvemen to explain service to consumers and sign them up

Operations	Supplying accurate, timely water alerts: • Refine consumer to valve mapping using landmarks when consumers complain about incorrect water alert timings • Improve reporting accuracy and decrease effort with ValveKey app to replace IVR • Trial various incentives to increase participation and timeliness of valvemen reporting • Solicit consumer feedback to continuously improve service delivery and data accuracy Training valvemen: • Trained 258 valvemen to report using IVR proving value proposition to BWSSB management • Deliver data-driven presentations at review meetings to increase confidence in NextDrop service
Customer Service	Registration: • Consumers give a missed call to a toll-free number to initiate a three-step registration process. By completing the first two steps, consumers can sign up to receive water alerts. The last step permits NextDrop to send unsolicited feedback messages to consumers. Consumer feedback: • After triaging consumer complaints, NextDrop forwards them to the appropriate valveman, water inspector and assistant engineer to ensure the loop is closed.

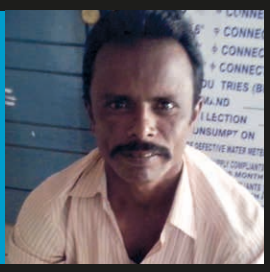
Source: NextDrop



Monthly review meeting conducted by Engineer-in-Chief and NextDrop

A day in the life of a valveman

Valvemen are expected to follow a strict routine. As a result, they are constantly chasing the clock to keep up. Below is a snapshot of a valveman's activities.



Name: Raju

Service station: RT Nagar

Subdivision: North East 3

Typical working hours: 7:00 AM - 7:30 PM

Supply schedule: Raju operates 40 valves on BWSSB's piped network on alternate days. To earn more money, Raju supplies borewell water to some areas or does maintenance work at a service station[18] on his non-supply days.

Typical work day: Raju is always racing to operate the valves. At the same time, he is constantly in touch with the water inspector, assistant engineer and assistant executive engineers about where water should be supplied (in case there are last-minute schedule changes) and problems he is encountering. On busy days, Raju may speak with them 20-30 times. Raju can get up to 200 calls from consumers in a day asking when water will be supplied. He does not answer most of them.

Monthly income: Raju's typical monthly income is about INR 6,500 (USD 103).

18. A service station is the smallest distribution unit in Bangalore's piped water network. It also serves as the office for the assistant engineer and water inspectors who supervise 5-10 valvemen. Finally, bill generation and collection, complaint filing and resolution, opening of new accounts, etc. are all handled at the service station. A subdivision comprises several service stations.

Early Results

Business Model Viability

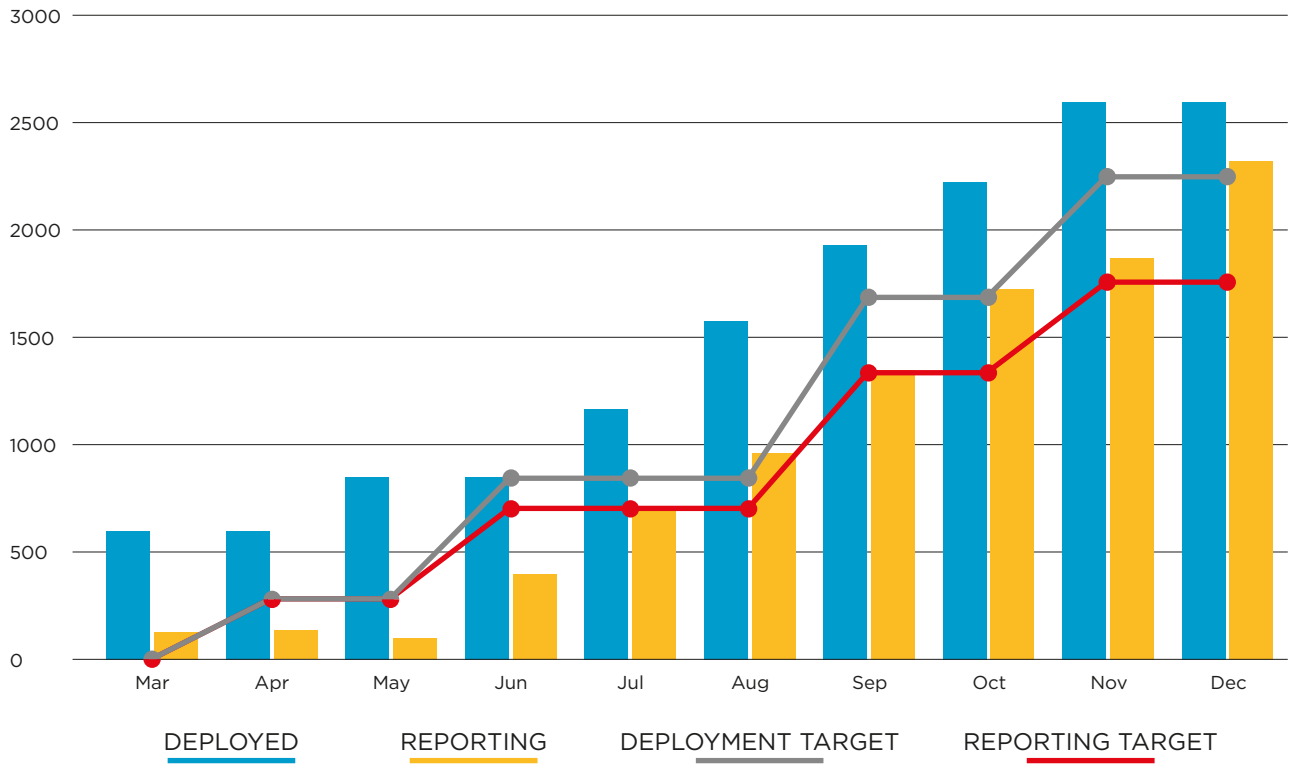
Deployment

In 2014, NextDrop deployed its service to 12 of Bangalore's 30 subdivisions. These 12 subdivisions comprised 2,365 service areas. Valvemen actively reported valve information for 2,320 of these service areas. Thus, NextDrop comfortably exceeded the project targets of 12 subdivisions and 2,240 deployed service areas of which 1,750 (78%) would be active.[19]

The monthly deployment progression is indicated in Figure 6 and the number of valvemen actively reporting is illustrated in Figure 7. Of the 258 valvemen trained in 2014, 228 actively reported in December. Increased visibility into valvemen performance and accountability of the engineering staff resulted in supply timings stabilising for 14% of valves. An example of the variation before and after is illustrated in Figure 8.

FIGURE 6

NextDrop deployment progression in 2014



19. Active service areas were defined as those where valvemen reported at least six times per month. This was based on the assumption that each service area would be supplied water 12 times per month. The definition and assumption were ratified by BWSSB.

FIGURE 7

Number of valvemen trained and reporting in 2014

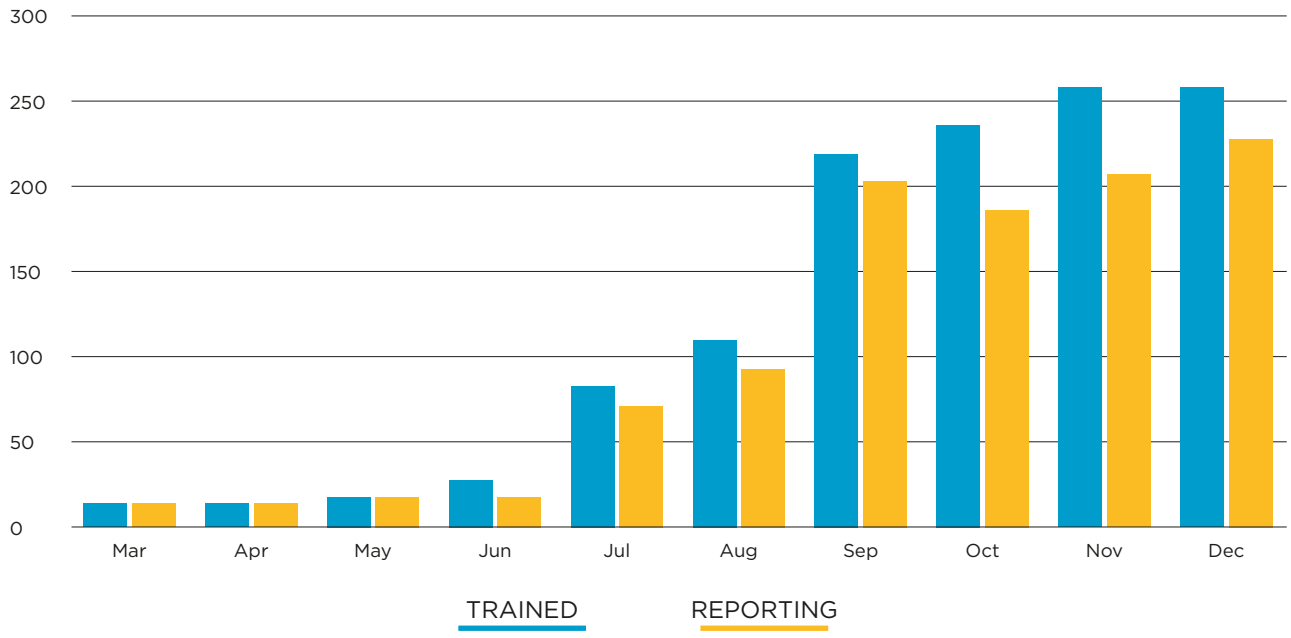
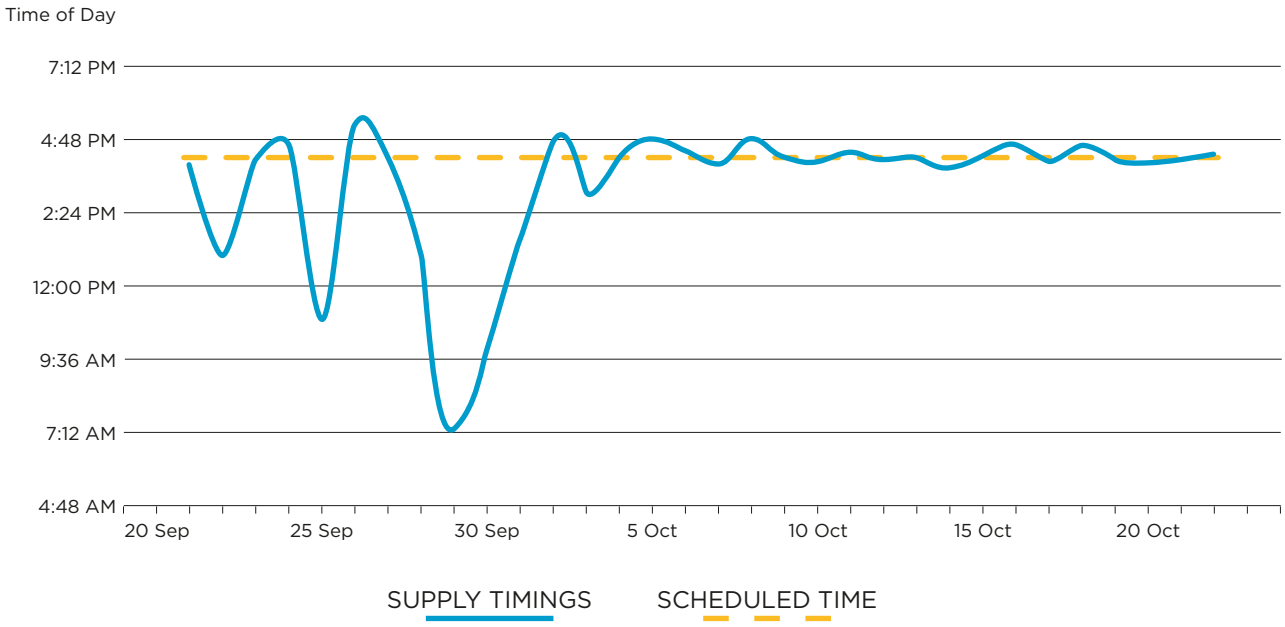


FIGURE 8

Variation in supply time for a single valve before and after monitoring in 2014



Voluntary stakeholder participation is sensitive to unpredictable events: Valvemen are not direct employees of BWSSB. BWSSB outsources valve operation to a contractor who in turn employs valvemen. Valvemen are offered incentives but are not paid by NextDrop or BWSSB to provide notification of valve operation. In this case, the contractor had collected payments from BWSSB for two months but had not paid the valvemen. Just as the project was gaining momentum in the first quarter, the valvemen went on strike because of the overdue payments. BWSSB resolved this situation promptly by finding a new contractor and deployment gathered pace in the middle of the year. By September 2014, NextDrop had exceeded the targets and remained comfortably ahead of its projections for the remainder of the year.

BWSSB required proof of NextDrop's value proposition before it issued a tender: Although BWSSB management accepted that NextDrop's service could help improve its operations, they required a proof of concept through a pilot deployment. Once BWSSB management was convinced of NextDrop's ability to deploy its service across 40% of Bangalore and of the value of the data to its customers and itself, it issued a tender for the remaining 60% of the city.

Working with the government is a path to scale but is especially challenging for startups: The reach of government organisations such as utilities makes them an attractive path to reach a large number of customers. However, it is very difficult for a startup to work with the government as a customer because:

- A startup generally cannot meet eligibility criteria to apply for government contracts such as revenue thresholds or number of years of audited accounts.
- Selling to the government requires patience which only organisations with a cash reserve can afford.
- Government entities are risk-averse and require evidence that innovative concepts will work before they can issue a tender. Thus, the start-up has to assume all the risk associated with the innovation.
- Even after the concept is proven and a tender is issued, there is no guarantee that the start-up will win the tender even if it meets the eligibility criteria.

Partnering with a large company to bid for government contracts can leave a startup in a weak bargaining position: As a startup, NextDrop did not qualify to bid for a BWSSB tender to revamp the BWSSB website, provide the IT backend and Complaint Management System (CMS) and man a call centre with 10 operators. So NextDrop bid jointly with a large IT services company and won the tender. While the implementation of the CMS was completed by NextDrop, the partner and NextDrop were not able to close terms despite several rounds of negotiation so NextDrop eventually walked away from the contract without compensation.

Lessons from NextDrop's experience in establishing a relationship with BWSSB and operationalising its idea:

You need a champion but top-level leadership is needed for change: NextDrop has gone so far only because they had strong encouragement and support of Dr. P.N. Ravindra, Executive Engineer, New Initiatives & Public Outreach, BWSSB. However, within a government organisation with well-defined jurisdictions, the champion's role may be limited to providing support until a concept is proven. For organisation-wide acceptance, buy-in at the highest level and willingness to push staff to adopt technology is required. The project would have languished without the buy-in and active support of the then Chairman of BWSSB, Mr. Anjum Parwez.

Develop operations to leverage buy-in and drive accountability: To review and act on data, BWSSB's Engineer-In-Chief set up monthly meetings that were attended by all senior engineering personnel and NextDrop. He would query the status of previous action items and assign new ones. This regular meeting with a strong focus on data and accountability resulted in improved service levels to consumers and increased reporting by valvemen.

Refinements to Operations

NextDrop made several refinements to its operations throughout the project. The most important changes were in dealing with valvemen who were their key source of on-ground information.

Valveman Incentives

NextDrop's service is fully dependent on valvemen providing notifications of valve opening and closing times accurately and in a timely fashion. To encourage valvemen to actively provide notifications, NextDrop experimented with several incentive plans in Bangalore as described below and summarised in Figure 9.

Point based incentive plan (January to June 2014)

The point based incentive system was devised for Hubli-Dharwad and is still active there. For each notification, valvemen accrue points which can be exchanged for mobile talktime recharges, fuel refills, groceries, electronic items, etc. Further, a valveman can reach higher levels and access more expensive goods by exhibiting good behaviour ranging from being consistent to proactively finding a backup if he is taking a day off. In Bangalore, valvemen largely lost interest in the point based incentive plan as they were required to perform consistently for at least six months before they qualified for higher levels that entitled them to the aspirational rewards. However, it is not clear what makes the same plan successful in Hubli-Dharwad but not in Bangalore.

Smartphone incentive plan (August to December 2014)

The next incentive plan awarded free smartphones to the 10 best performing valvemen. This plan led to a high level of engagement from valvemen and the 10 winners continue to be top performers. However, those who just fell short were disappointed and became temporarily disengaged.

Surprise mobile talktime recharge plan (October to December 2014)

The third incentive plan was trialled towards the end of 2014. Valvemen were given INR 60/30/10 (USD 0.95/0.48/0.16) worth of talktime recharges each week if they reached predefined thresholds. Thus, valvemen did not compete against each other to win a prize. While there was initial interest from valvemen, it dissipated in a few weeks and this plan was withdrawn.

FIGURE 9

Summary of valvemen incentive plans

Incentive plan	Nature of competition	Value of incentive	Performance period	Aspirational reward?	Comments	Relative cost to NextDrop	Outcome
Point based	Self-paced	Increasing with accumulation	Accumulative	Yes	Emphasis on consistency and leadership	Highest	Successful in Hubli-Dharwad, not in Bangalore
Smartphone	Head on competition	High	Few months	Yes	Emphasis on individual performance	Medium	Successful for winners, some blowback from those falling short
Talktime	Self-paced	Low	Week	No	Low reward, low commitment	Lowest	Interest dissipated in a few weeks

None of the valvemen incentive plans have been an unqualified success in Bangalore: At present, there is no active incentive plan. It is not clear why the point based incentive plan is successful in Hubli-Dharwad but not in Bangalore. This plan was run early in the pilot when there was already discontent among valvemen that led to their strike. Some of the valvemen would have lost their ratings on the consistency scale during the strike which may have led to their losing interest and preventing the build-up of critical mass.

Source: NextDrop



A valveman with his new feature phone exchanged for points

ValveKey: Replacing IVR with a Mobile App

Valvemen prefer to provide feedback on valve opening/closing in batches: Reporting through IVR is slow and repetitive. Therefore, many valvemen prefer to provide feedback in batches of valves causing delayed water alerts. Nearly 64% of consumers said that their water alerts were only sometimes accurate. The choice of IVR in 2010 was dictated by the fact that valvemen overwhelmingly carried feature phones. To overcome the limitations of IVR and leverage the declining prices of smartphones, NextDrop designed the ValveKey app.

More accurate and timely information can be uploaded with a simple key press: ValveKey is a simple Android app that utilises a smartphone's magnetic sensor, accelerometer, GPS and data connectivity to determine valve ID; detect whether the valve is being opened or closed; and sense whether a valve is being fully opened or closed. Information is uploaded with a simple key press.

Source: NextDrop



ValveKey app for a valve turned 1.2 rotations and being closed

New technology can lead to fear and overuse at the same time: Valvemen are afraid of damaging smartphones or having them stolen when using them in the field. At the same time, they are very keen to download and consume media. The aspirational nature of the smartphone can overcome the initial hesitation to adopt it but can also have unexpected consequences. Specifically, valvemen do not understand how quickly bandwidth or battery can be exhausted by media consumption. Therefore, reporting can suffer if they have exhausted their data allowance or have a dead battery. It will be a challenge for NextDrop and water boards to educate valvemen and devise appropriate controls to ensure the phones serve their primary function of reporting while allowing valvemen the advantages of digital inclusion.

ValveKey enables much faster rollout: The ValveKey app is much simpler to use than IVR. Consequently, valvemen can be trained much faster leading to rapid deployment. In Mysore, the service was rolled out exclusively with ValveKey to about 100 valvemen in a month. In contrast, training 258 valvemen in 40% of Bangalore took NextDrop more than six months.

Reaching consumers

NextDrop used several channels to spread awareness of its service including pamphlets, having an employee accompany water meter reader, valvemen telling consumers about NextDrop, listing on BangaloreOne (a citizen services portal), coverage on local TV channels and press releases in association

with BWSSB, such as the one published in the Deccan Chronicle,[20] a major local daily.

65% of NextDrop consumers surveyed said they had heard of NextDrop through pamphlets[21] and 21% cited BangaloreOne. Newspaper articles were cited by only 6% of respondents. Although having a NextDrop employee accompany a meter reader resulted in a high rate of registrations, NextDrop discontinued this channel due to its high effective cost of acquisition. In the future, it is expected that BWSSB will assume primary responsibility for marketing the service.

Excerpts from a Deccan Chronicle article published on July 27, 2014

Soon, you will not have to worry about dry taps in your area as consumers will be informed in advance about any disruption in water supply. Consumers registered for the SMS facility will get alerts on water supply schedules and delays and disruptions, if any...

The BWSSB is joining hands with NextDrop Smart Water System Pvt Ltd to alert consumers about its service... Following the success of the pilot project in Bhoopasandra (North East-3 division) and Bandappa Garden (North East-1 division), the Bangalore Water Supply and Sewerage Board is planning to expand the service to other divisions...

20. You may not get water, but you'll get an SMS to tell you so: http://www.deccanchronicle.com/140727/nation-current-affairs/article/you-may-not-get-water-you%E2%80%99ll-get-sms-tell-you-so
21. Respondents were allowed to specify multiple sources for this question

Customer Benefits

NextDrop serves B2G and B2C customers simultaneously in Bangalore. Although the underlying information is the same, the value proposition for each is different.

BWSSB

Supply timing stabilised in 14% of valve areas: As per NextDrop's analysis, monitoring of valvemen helped to increase their timeliness resulting in stabilisation of supply timings. From May 2014 through December 2014, supply timing was stabilised across 326 of the 2320 deployed valve areas. Valve supply times are considered stabilised if they are within two hours of the scheduled time.

Water-related complaints among BWSSB customers in the NextDrop service area is an order of magnitude lower than in the remaining 60% of the city: In November 2014, NextDrop temporarily ran the BWSSB call centre. As per NextDrop analysis, the water-related complaint rate among BWSSB customers in the NextDrop service area is an order of magnitude lower (2.8%) than in the remainder of the city (23%). Simple process improvements such as providing customer call centre operatives with the scheduled supply times were a major reason for the reduction in complaints which indicates the importance consumers attach to water-related information.

BWSSB has increased visibility into its own operations opening avenues to improve organisational efficiency: An example view into the operations of BWSSB is shown below in Figure 10. A valveman in the North East division operates nearly 17 valves while one in the South division operates nearly half as many. This represents an opportunity to balance the workload and improve operations.

FIGURE 10

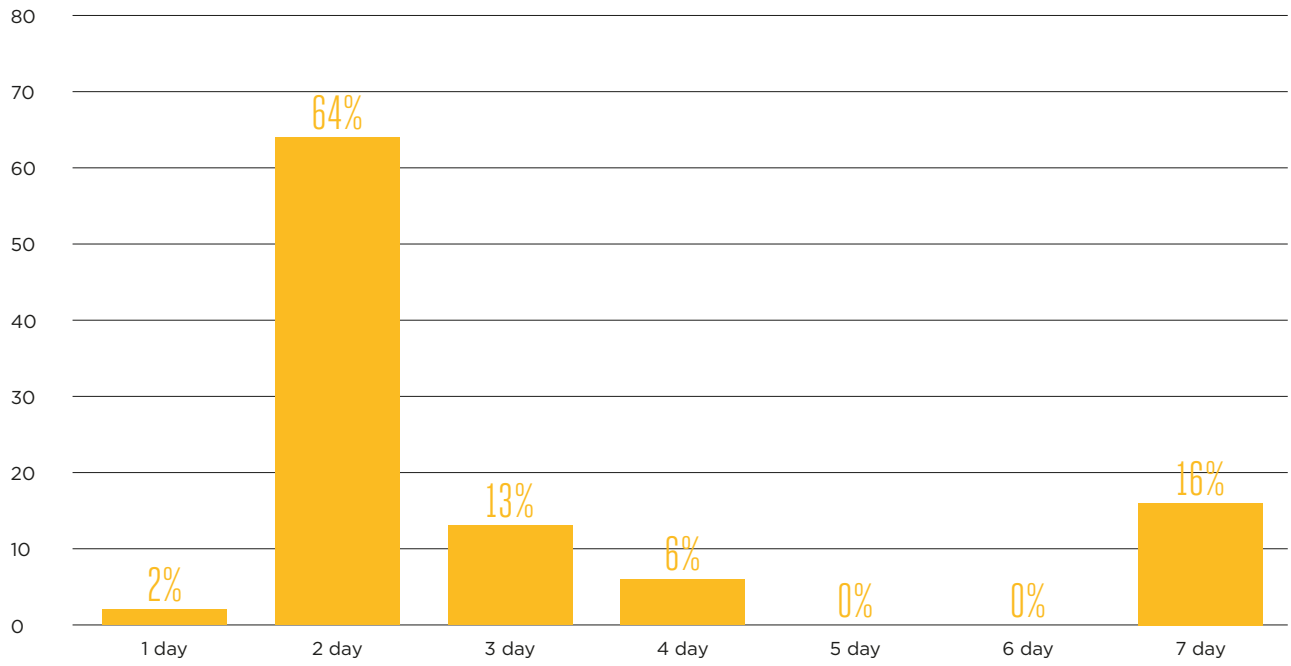
Number of valves per valveman across divisions



Another example is the frequency of supply to different areas in the city. While 65% of areas are supplied water at least twice a week, 16% of areas are supplied only once a week as shown in Figure 11. This points to the potential to make supply more equitable.

FIGURE 11

Supply frequency – days of supply per week across service areas



Consumers

To evaluate consumer perception of its service, NextDrop surveyed 400 of the 7,004 NextDrop consumers in February 2015.

76% of respondents receive the NextDrop SMS; 55% of them find it very useful: That over three-quarters of NextDrop consumers receive NextDrop SMSes shows that consumers feel engaged enough to open and possibly act on the information. Over half feel that the information is very useful.

High information accuracy leads to higher satisfaction but the corollary is not true: As expected, there was a high level of satisfaction (89%) among respondents who received accurate alerts all the time (18%). However, the corollary was not true. Of the 18% who never received accurate alerts, 51% were somewhat satisfied with the service. This indicates that consumers are happy with the expectation of improved service. However, if the service does not improve quickly, they may lose patience and become disenchanted. On the other hand, the high level of satisfaction among those who receive accurate information indicates that if NextDrop is able to improve information accuracy, satisfaction levels will rise significantly.

NextDrop can make a tangible difference where consumers do not have a voice: A valve in the Pillana Garden area was covered in filth that would be sucked into the water supply each time the valve was opened. Despite complaints by the valveman, the valve was not cleaned and covered. When this case was brought up by NextDrop during a Steering Committee meeting, BWSSB immediately acted on it. The result is shown in the photos below.

Source: NextDrop



Before and after – Pillana Garden valve

Consumer Experience

The following testimonial paints a picture of the impact NextDrop has on quality of life:

"Shantha and her husband Nabhirajaiah live in AECS Layout, Bangalore. They were registered with NextDrop in November 2014. Both of them find the water alert messages very useful. "Oh yes, NextDrop! Your messages inform us about when we next get water. It is very helpful – the messages allow me to plan my day well," says Shantha. "Whenever your messages come, I go and check our tap and am really happy that the messages are accurate. Keep up the good work!" said Nabhirajaiah."

Mobile Industry Benefits

One of the key objectives of the Innovation Fund is to identify the types of mobile technologies that can support mobile enabled services. In part, this depends on the benefits that accrue to mobile operators from partnering to provide these services. NextDrop did not require an operator partner for this project. However, there are potential benefits to operators from partnering with NextDrop as it expands its footprint.

Revenue

Today, valvemen almost exclusively use feature phones which are sufficient to report data over IVR. However, if the ValveKey app is adopted throughout Bangalore and in future deployments, valvemen will need smartphones as well as data plans. Further, in the near future, NextDrop will release other mobile apps such as one for the engineers to monitor network and valveman performance. Bangalore itself has about 400 valvemen and engineers all of whom will need data plans. Thus, there is an opportunity for the operator to provide data connectivity, closed user group calling plans, etc. to BWSSB and other water boards.

Additional MNO Benefits

A partnership to help deliver information about a critical resource on a daily basis is an excellent opportunity to make a difference and simultaneously raise the operator's brand value. Moreover, operators could gain insights into future business opportunities with water boards.

Conclusions

Despite several challenges, chiefly the valvemen's strike in the first quarter of 2014, NextDrop achieved its deployment targets on time. Even more importantly, NextDrop was able to validate its business model as BWSSB became convinced of the value of valve monitoring. Beyond the grant, NextDrop expanded to Mysore exclusively with the ValveKey app. The speed with which it was able to train approximately 100 valvemen in Mysore (in a matter of a month versus more than six months for 258 valvemen in Bangalore) shows how significant the mobile app is to NextDrop's ability to rapidly replicate its service in other cities. However, governing the use of the smartphone is required to ensure that it has sufficient data capacity and battery life to perform the primary function of reporting. If self-regulation by valvemen does not work, then other means such as whitelisting the ValveKey app will have to be employed.

As is to be expected from a successful Seed grant project, the next set of challenges ahead of NextDrop are primarily about scaling and improving operational efficiency.

Depth or breadth: NextDrop's success in Bangalore has created interest in the state government to deploy a similar system across 100 cities and towns. Should NextDrop pursue this opportunity, assuming it materialises, or should it focus on further fine tuning its model and operations before reaching for scale?

Streamline consumer registration process: Currently, NextDrop's registration process comprises three steps, partly due to legal requirements of the Do Not Disturb regulation in India. If NextDrop aspires to scale quickly, it will have to streamline this process and make it cost-effective.

Improve valvemen reporting frequency and timeliness: Valvemen ultimately control the flow of water in the city. They will share information willingly for the right incentives but providing incentives raises the cost of NextDrop's service. Alternatively, they will report more regularly when their supervisors follow up with them. To enable supervisors to follow up, NextDrop is creating the ValveBadge mobile app which will highlight problem valvemen. In the future, NextDrop could explore less intrusive forms of automation where information is uploaded without valveman intervention.

Increasing consumer engagement: Although the majority of consumers are satisfied with NextDrop's service, a Case Study by the GSMA's Mobile for Development Impact team showed that the majority are not actively engaged. For example, 69% of consumers who receive inaccurate water alerts do nothing about it. Thus, NextDrop has not been as successful as it would like in crowdsourcing information that could significantly improve the accuracy of water alerts. For the time being, consumers are forgiving but this may change if the accuracy does not improve soon. Further, NextDrop is only a channel to convey complaints to BWSSB; it cannot actually resolve complaints. If consumers do not understand this distinction, they may have more reason to become disillusioned. Therefore, it is imperative that NextDrop position itself correctly in the mind of the consumer.

Appendix: Case Study Methodology

Overview: This case study is based on learnings that emerged throughout NextDrop's Seed grant through the Mobile for Development Utilities programme. These were tracked through the following:

Grantee reporting: Monthly reports were completed on activities, project risks and mitigation, and key performance indicators. These were discussed during a one-hour call with the grant manager each month. Quarterly reports were completed to document progress on milestones, the grantee's learning objectives, barriers and other key project developments as well as financial compliance.

Customer Surveys: NextDrop carried out an endline survey as part of this project. The survey was carried out randomly across all of NextDrop's service areas by interviewing 400 of NextDrop's customers. The survey was conducted in person from February 17th through February 25th, 2015.

Limitations of this study: The study aims to provide only the key learnings from NextDrop's grant and cannot possibly cover all the day-to-day learnings from NextDrop. It also aims to share learnings with the broader sector without releasing commercially sensitive data from NextDrop.

The customer surveys are meant to be representative while not necessarily statistically significant to a specified degree of certainty. Customer surveys are known to have limitations in accuracy, particularly around expenditures, income and previously carried out activities, where people often fail to recall these correctly or are influenced by perverse incentives (e.g. stating a lower income than reality thinking it will reduce the future pricing).

For more information on the Mobile for Development Utilities programme visit:
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