Delivering Next-Generation Public Services through Mobile Technology

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Abstract

With the ongoing dramatic drop in prices for smartphones in India and the broader developing world, new frontiers are opening up for the incorporation of mobile technology into public service delivery. Mobile services in the fields of education and health have already been widely disseminated, with enormous potential for future growth. Such platforms both improve the quality of the user experience and provide data which can vastly improve the public decision-making process. The expansion of public services into the realm of mobile technology will only be accelerated if governments synchronize the deployment of capable mobile platforms with investments in the digital infrastructure needed to support them. However, while this path presents great promise, it also risks deepening the digital divide. Implementing mobile-based public service delivery presents a number of roadblocks such as India's relatively low rate of smartphone ownership, broadband infrastructure limitations, and overcoming the legacy of pre-digital institutions. These will need to be addressed in order to facilitate a smooth and inclusive transition towards applying these powerful technologies, but a successful outcome would mean a profound transformation of the Indian economy.

Introduction

With 97% of internet users in India accessing the web through mobile phones, mobile technology has already become the dominant means of online access within the country. India's rural internet user base has seen particularly rapid growth in recent years, growing at over three times the rate of the urban user base and on pace to surpass the total number of urban users. Namely, smartphone ownership in rural households has increased from 36.5% in 2018 to 61.8% in 2020, constituting 40% of total users in the country and rising. Using the internet through a smartphone has also become vastly more affordable in recent years, with data prices falling from 152 INR/GB to 10 INR/GB between 2016 and 2019 alone. With this fall in price, data consumption per user rose over the same period from 2.7 GB/month to 10.4 GB/month. As more and more users experience the internet for the first time through mobile tools, society as a whole has improved its level of digital literacy which can increasingly be leveraged to improve the delivery of public services.

Smartphones feature a number of native advantages that make them better vehicles for service delivery than other digital tools, particularly in environments which would otherwise be challenging to reach. First, smartphones benefit from relatively light infrastructure needs, requiring only a relatively stable wireless internet signal and occasional access to a power source. These can both be delivered through the centralized hubs which have become the main pattern of digital and electrical infrastructure delivery in the villages at the frontier of India's efforts to provide power and internet access to all citizens. Second, smartphones are mobile in ways that other digital tools are not. Tying digital services to mobile platforms allows users to access these services on the go, without taking time to go to a desktop terminal, or making an even more time-consuming visit to a local government office. Finally, smartphones offer unique technological capabilities which can improve users' ability to interface with these services. Built-in services such as voice recognition across languages and translation can enable users to interact even with applications that were not originally developed in their native languages. Meanwhile, built-in biometric identification can simplify the process of beneficiary identification where it is necessary, as in Jharkhand, where fuel subsidies can be accessed by inputting Aadhaar details into a mobile app.[1] Finally, with judicious use of data tracking accompanied by proper respect for user privacy, service delivery can be improved by identifying synergies between user activities on different applications: for instance, offering location-specific agricultural services, or sharing participation status in a school nutrition program during a health consultation.

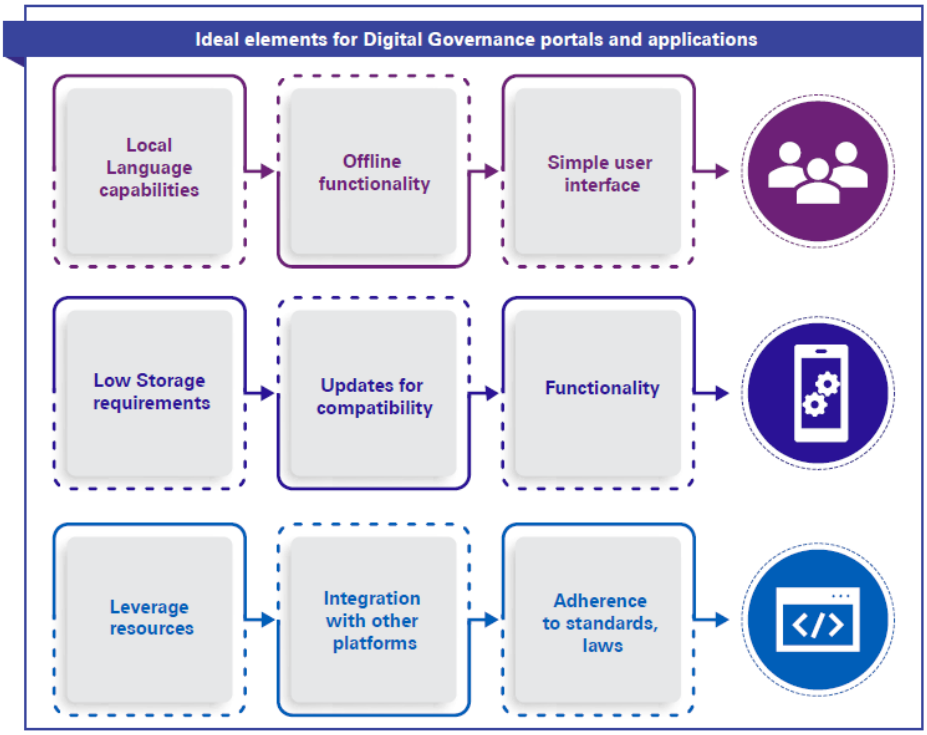
The most potent potential contribution of smartphones to public service delivery, however, is the data produced by users which can be shared with public agencies at the block, district, state, and federal level. By making a stream of real-time information available for analysis, smartphones create a feedback pipeline which can greatly improve the quality of local, regional, and national decision-making. This is particularly the case in the primary health sector, where data can be collected and forwarded by community health workers such as Accredited Social Health Activists (ASHAs) workers and Auxiliary Nurse Midwives (ANMs), and in primary education,

[1] https://www.livemint.com/news/india/jharkhand-aadhaar-card-required-to-avail-rs-25-per-litre-concession-on-fuel-says-min-11642606984470.html

where a similar role can be played by public school teachers and officials. Smartphones can provide visibility into the impact of policy decisions in ways that no prior public services had ever been able to achieve.

India is already the second highest producer of smartphones in the world, and in recent years various companies have been exploring ways to get smartphones into the hands of ordinary people. The potential market is vast, with a pool of 550 million feature phone users in India who could make the switch to a smartphone. The most significant development to prompt this transition will likely be a substantial reduction in the price of smartphones to make them accessible and affordable for new segments of the population. The Reliance JioPhone Next, at a retail price of just 6500 INR (86 USD), appears set to open up this market for the millions of predominantly rural users who have, until now, formed the main user base for feature phones. The JioPhone Next manages to achieve a low price without compromising its specifications to such a degree that users would struggle to complete basic tasks – with a 1.3 GHz processor and 2GB of RAM, its performance is roughly on par with the iPhone 6. Other domestically produced smartphones, as well as foreign brands already in widespread use in India such as Xiaomi, Samsung, vivo, realme, and OPPO, are likely to cross similar thresholds in the near future.

Smartphones, therefore, are likely to become an increasingly powerful and ubiquitous tool for delivering public services, and a tool which the Indian Government should affirmatively plan to integrate in its development policy. However, smartphones present a number of hurdles which must be overcome for them to reach their full potential in helping to flexibly deliver inclusive and sustainable development. These challenges include, but are not limited to, data privacy and security, opaque application design, the digital literacy divide, language challenges, and the technological trust gap, and will be elaborated upon in a companion piece to this paper.



Smartphones present a great deal of potential for improving the quality and accessibility of digital governance, but public platforms developed for them must meet certain standards in order to be truly accessibly for all. Source: India Cellular and Electronics Association

Target ICT Interventions

Agriculture

The following agriculture related information/services could be made available to a farmer over a basic smartphone in some or all of the following ways (not an exhaustive list, there may be many other interventions possible).

- Information about government schemes, services and benefits, including eligibility criteria, can be disseminated through digital channels. Applications for these schemes can also be sourced via SMS and smartphone applications. Land record and the processes involved with crop survey carried out by the respective state governments can also be digitized for faster and error-free completion and updating, thus benefitting farmers.
- Access to detailed and verified information about the agro-climatic zone of farm and crops supported in that geography can be provided on the basis of GPS location. Commonly found soils in that agro-climatic zone can be covered with their specific properties with visuals as well. An advanced option can be provided to input soil test results of a particular farm to the farmer user so that the farmer can receive detailed crop choice options available for his field based on the inputted soil test parameters, agro climatic zone and weather forecast. This can help the farmer take an informed decision on planning his crops.

- Based on sowing date and variety, a customized crop calendar and advisory of key farm operations such as intercultivation, irrigation, and nutrient management can also be generated and shared with farmers to enhance crop production efficiency and yields.
- Salient aspects of weather-related information concerning the farmer's location could be made available along with recent specific weather events, which may have triggered specific crop-related incidents impacting yields. This, along with location-specific forecasts, can help the production planning and irrigation management of the farmer. All the above farm and crop advisory related interventions are part of precision agriculture, which enhances crop production efficiency.
- Nearby agricultural advisory centers such as Krishi Vigyan Kendras, extension centers of agricultural universities/institutes, agricultural research institutes, and other such centers which farmers can approach for crop advisory can also be mapped and made available to the farmer users.
- Land profiles can be prepared and yields can both be forecasted and estimated using remote sensing, providing information for insurance and financial operations which can lead to faster disbursements of loans and claims to farmers.
- Remote sensing advancements have also made it possible to identify biotic and abiotic stresses on crops, meaning pest and disease forecasts can be generated and shared with farmers to take preventive action.
- Prevailing and past prices in the nearby markets, with a customizable distance parameter, can be made available and options can also be given for some triggers on specific price events. An advanced option may also provide price forecasts for crops.
- Along with prices, all nearby markets and avenues for crop sale and agricultural inputs can be shown to farmers, including eNAM availability and various online channels servicing the area.
- Logistical information concerning storage, transportation, and other post-harvest handling can also be made available.
- Smartphones also support digital Negotiable Warehouse Receipts (eNWRs), which can help farmers collateralize their stored harvests.
- Agriculture-based financial technology entities (Agri Fintechs) offer their services based on eKYC (know your customer), eNWRs and other digital channels as far as possible. This reduces both transaction costs and time.
- Finally, numerous agriculture related channels and farmer groups allow users to share their experiences, providing the dissemination of relevant, locally contextualized information.

Over the course of the agricultural calendar, implementation of the use cases above will generate data whose trends can be analyzed over time. Using artificial intelligence, data modeling, and machine learning techniques, these data can be used to fine-tune these offerings. As time advances and more and more data is generated, this customization can even reach the level of individual farmers and their fields. Once these are tested and the efficacy of the interventions is established, business models can also be set up for the financial sustainability of these initiatives. Thus, phased rollout of use cases is also possible. Since digital interventions can apply a modular, tailored approach to the diverse needs of a region, the development of these tools will allow farmers to take advantage of bespoke, procedurally-generated solutions to their precise local challenges.

Education

The introduction of the smartphone has led to nothing short of a paradigm shift in the Indian education sector – putting the "revolution" in "digital revolution." Smartphones don't require the same levels of infrastructure investment as other types of technology, most notably operating in environments without wired broadband connections or consistent sources of electricity. As long as they have access to no more than a stable internet network, they can reshape how educational materials are accessed and delivered in the classroom, and even how the classroom itself is defined. Interestingly, the rural increase in smartphone ownership has been evident for the families of children enrolled in government and private schools alike, suggesting that a shift to mobile-based public services delivery in the education sector would create benefits across society.

However, challenges still remain before education can be delivered with the aid of mobile services in a truly equitable manner. The majority of platforms so far are available only in English and Hindi, limiting their reach to users with other language preferences. This particularly limits their use in primary and early secondary contexts where languages other than English and Hindi are used as the medium of instruction. As recommended in the new National Education Policy, young children learn faster and retain more in their mother tongue. Therefore, audio applications on smartphones should be fully capable of native language input and output. Regional content, voice, and rural advertising, automatic read aloud off-screen text, language translation, augmented reality filters, and much more will expand the plethora of possibilities in the education sector, if implemented correctly. Additionally, increasing the saturation of mobile technology in rural areas will itself be an important factor in increasing the quality of digital service delivery by increasing levels of digital literacy. This can be accelerated in part by distributing smartphones which already have essential applications preinstalled.

Due to the rapid transition from in-person to online learning schools have had to implement during the pandemic, on top of unresolved issues relating to the digital divide, the first priority of any mobile-driven intervention in the education sector is simply to phase smartphone usage into the classroom and school environment, in the prioritized order of the needs faced by the sector. Pursuing this approach from the primary level, including in rural areas, will pave a path for the education sector to embrace digital innovations from an early stage. Below, we list a series of potential interventions, tentatively arranged by order of priority.

- Training for Anganwadi workers – Anganwadi Workers are the most important functionaries of the Integrated Child Development Services (ICDS). They impart early childhood care, pre-school education, and nutritional support to the children. They also collect health and nutritional data on mothers and their children. Equipping them with smartphones will support them in the process of collecting and documenting the data. Pre-installed training modules in their native languages will strengthen their knowledge and skills about health and nutrition. The phones can also have a repository of resources on videos, such as recipes for hot meals for pregnant women, lactating mothers, and children below six years, which can be shared with beneficiaries. Anganwadi workers

empowered with the smartphones will take the country forward in the journey of quality health and nutrition for young children.

- Improving school nutrition – Education and Adequate Nutrition are very critical for the development of children and their future livelihoods. Smartphones can be used to support School Nutrition Gardens, in which fruits and vegetables are grown around the school premises for use in the preparation of Mid-Day Meals. Beyond helping children reconnect with the natural world and making them aware of the true source of their food, these gardens also offer value opportunities to integrate hands-on learning with subjects like math, science, health, and physical education. Smartphones can help make this program more easily accessible for all schools by breaking it down into smaller modules and components.

- Effective training modules for teachers – The majority of the teachers have been experimenting with utilizing technology in their classrooms. This has carved a path for promoting teacher training programs through various digital platforms. National Digital initiatives like Nishtha are providing the training modules to teachers located remotely. Such online modes of training have proven to be a time and resource-saving means of training teachers. Affordable smartphones can bring these training modules to teachers in the most remote areas, as long as training modules are designed to be compatible with a mobile interface. Ways to optimize this include providing more audio/video prompts compared to the text, increasing the size of the print, and offering offline downloading of resources to allow teachers to access resources based on their needs. This will require smartphones to have sufficient storage space to save these resources. In this manner, the smartphone will bring the educational community closer and can optimize the channels of learning and sharing.

- Promoting Holistic Education – Life skills like self-awareness, mindfulness, critical thinking, and inquiry equip individuals to deal with stressful and conflicting situations around them. Realizing the importance of this, the Indian education community has been implementing various initiatives to cultivate these skills for rural and urban children alike. Applications featuring guided meditation and self-reflection exercises for adults as well as children, for instance, can provide them with tools to navigate their feelings and thoughts. Smartphones can play a big role in bringing this kind of awareness and learning to every household.

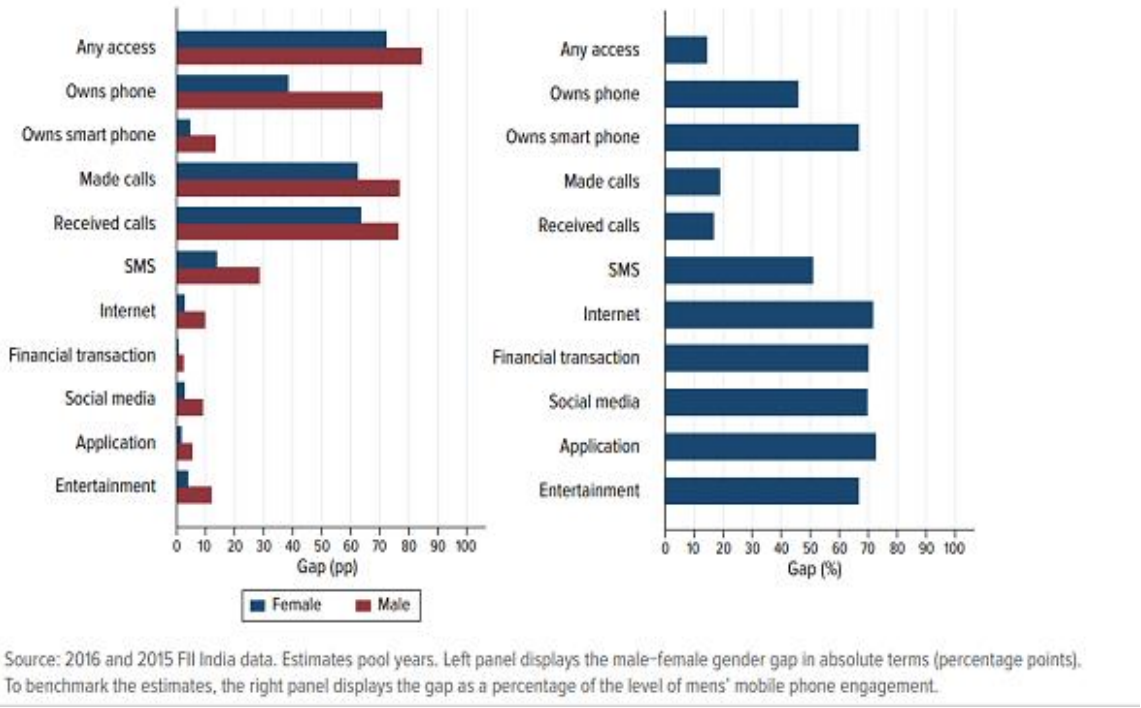
- Improving parental engagement – Parental involvement in early childhood education can enrich a child's educational experience in all aspects – social, emotional, and mental. Mutually supportive partnerships between parents, schools, and the broader community can deepen the impact of education, far beyond graduation. Low-cost smartphones can be a bridge between schools and parents, strengthening this engagement. If parental illiteracy hinders this process, especially in rural areas where many parents have not received education themselves, features like voice assistance, translator, or audio messages could be used well to overcome these challenges.

Health

The launch of low-cost smartphones will provide a great boon for the healthcare sector by enabling the scaling up of e-health services for the public in remote and rural areas of the country. In addition to being low-cost, these phones support various features which will facilitate both delivery and uptake of healthcare services in far-flung rural areas. These features include support for voice interaction in regional languages, on-screen translation and text-to-speech in local languages, voice-enabled search that help users find content, tools to aid information sharing such as AI-enabled low-light mode cameras, and image-based text translation.

ASHA workers are the linchpin of healthcare delivery in India's rural areas. Selected from within the community to work at the interface of community and healthcare systems, over 900,000 qualified ASHAs are serving at a minimum rate of one for every village with a population of 1000, typically between the ages of 25 and 45 and educated to at least 10th standard. ASHAs operate in groups of 10-25 under the mentorship of an ASHA facilitator (Sangini), while ASHAs themselves receive payment on the basis of the number of patients they serve and the meeting of specific incentive targets.

Because ASHA workers typically belong to poor family backgrounds and work with no fixed salary, many are forced either to buy or borrow expensive smartphones out of their own pocket to perform routine community activities. The challenges ASHAs face in accessing smartphones, in fact, is reflective of a broader gender gap in mobile phone access within India, for basic and smartphones alike. Therefore, low-cost smartphones will reduce this financial burden and make mobile health services more available to more community health workers, and by extension, more rural villages. This applies not only to ASHAs, but also to other ground-level healthcare workers such as ANMs. With smartphones, ASHAs can identify, report, and track disease in communities more easily, communicate with facilitators more quickly, and complete paperwork more efficiently. Additionally, smartphones can facilitate timely reporting of sensitive data to support more punctual health policy decision-making. Finally, increasing the smartphone ownership rate for ASHAs will increase their levels of digital literacy, allowing them to make greater usage of these tools. If smartphones become affordable enough for ASHA patients to purchase them as well, then they will be able to make direct use of e-health services such as teleconsultation, e-pharmacy, and e-diagnostics.



Source: Sanghera, Tish. 2018. "Wide Gender Gap In Mobile Phone Access Is Hurting India's Women." 2018. https://www.indiaspend.com/wide-gender-gap-in-mobile-phone-access-is-hurting-indias-women/

Beyond just making smartphones more available within rural communities, ASHA training modules should be optimized for use with smartphone features, with guidance for ASHAs to get the most out of smartphones. Training should be imparted to ASHA workers to use various smartphone features including apps. The revised training modules should incorporate standard operating procedures (SOPs) for these smartphones in the local language. Apart from the initial training, refresher trainings should also be provided at regular intervals. Once trained, these ASHA workers can then act as "Digital Health Agents". These agents can act as a digital link between the community and primary care, and also between primary care and tertiary care. These agents can also empower the rural community on the use of smartphone and related apps. Further, these agents can aid the government in large scale implementation of various community level digital healthcare interventions. To hasten the process, ASHA workers can also be incentivized to become a part of the growing digital ecosystem as envisaged by the National Digital Health Mission (NDHM).

Sector	Intervention	Target Audience
Agriculture	Mobile delivery of agricultural extension information	Farmers
	Mobile publishing of prevailing market information	Farmers, Merchants
Education	Mobile trainings for Anganwadi Workers	Anganwadi Workers

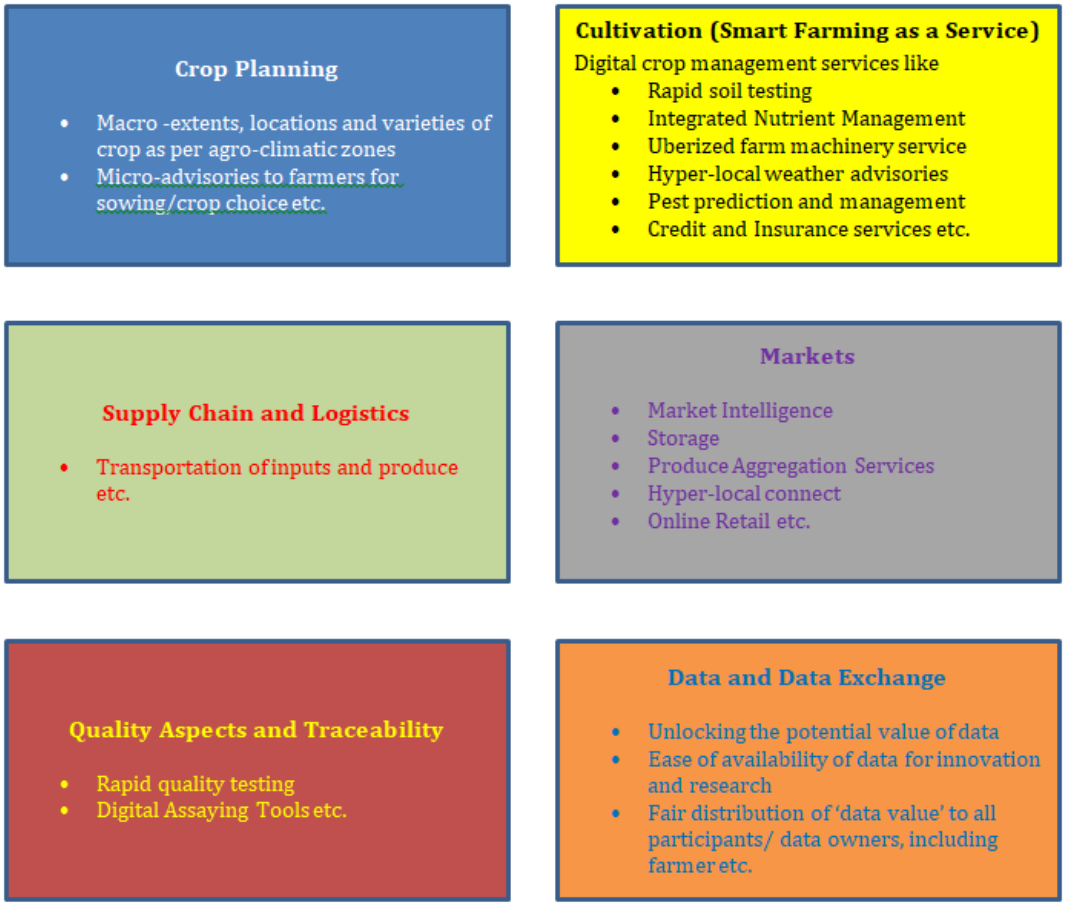
	School Nutrition Garden education modules	Students, Teachers
	Teacher Training Modules	Teachers, Education Departments
	Platforms for improving parental engagement	Parents, Teachers, Students
Health	Providing low-cost smartphones to ASHA workers	ASHAs, State Health Departments
	Developing mobile training modules for ASHAs	ASHAs, State Health Departments

Existing Mobile Public Services

Agriculture

The GOI has already begun the process of building a policy framework for a digital ecosystem in the agriculture sector. The India Digital Ecosystem of Agriculture (IDEA) initiative, undertaken by the Ministry of Agriculture, promotes a long-term view of aspects like interoperability, data governance, data quality, data standards, security and privacy, while promoting open innovation as prerequisites for building a digital ecosystem in the context of Indian Agriculture. The IDEA initiative aspires to place the farmer at the center of the agriculture ecosystem by leveraging open digital technologies.

Among its objectives, the system articulated in the IDEA framework aims to operate through a mobile-first approach which designs the delivery of all digital services through mobile platforms by default. The IDEA framework would provide location-specific and personalized extension services across the agricultural lifecycle, with concurrent protection of private personal data. It also aims to build capacity for digital and precision agriculture and to promote the adoption of interoperability standards for seamless information exchange across the ecosystem, including proper management of digital rights. This improved availability of high-quality data, accelerated through a cloud-based approach to data and technology management, would boost R&D in agriculture at the same time. A lab-to-field modular pipeline would reduce the lag time between the development of new, cutting-edge agricultural knowledge and its implementation and widespread use by farmers. Finally, the broader agricultural market would become more streamlined through the dissemination of real-time data on domestic and foreign prices for key commodities, and additional private-public partnerships would be formed to realize the “power of the digital.”



Value-added and Innovative Services within the GOI IDEA approach. Source: Authors.

In fact, a look at the MoUs that the Indian Agriculture Ministry has signed with leading private sector entities to pilot different solutions under the IDEA initiative suggests that a smartphone would be the prime medium through which substantive elements of the solutions being designed would be taken to the farmer as the end user. For instance, in the MoU with ITC, in the delivery mechanism, it is mentioned that 'smartphone-enabled agri-extension team can be deployed for continuously advising the farmers as per the customized calendar of the farm and the advice from call centre' (MoU between Ministry of Agriculture, India and ITC). Similarly, the MoU with Jio talks about a common integrated platform to drive efficiencies in agricultural activities through 2 categories of features, basic and advanced. The 'basic features use stand-alone data on apps to provide advisory, the advanced features use data from different sources, powers AI/ML algorithms, and gives accurate personalized advisory.' One of the modules which will be deployed through the platform is 'Precision farm advisory module: Weather, Irrigation. Nutrition, Pest & Disease forewarning alerts & advisory'. (MoU between Ministry of Agriculture, India and Jio). It is thus clear from both the above examples that a lost cost smartphone in the hands of the end-user farmer can be empowering to benefit from initiatives under IDEA.

Indian agriculture is clearly trending towards greater levels of digital integration, and under the IDEA approach, mobile services are already set to be prioritized in a way which makes

smartphone ownership a prerequisite for their digital rollout. The arrival of powerful, low-cost smartphones on the Indian market makes this vision a distinct possibility at the mass level for the first time. Already, states are making efforts to provide smartphones directly to farmers, such as Jharkhand, which plans to distribute smartphones to 28 lakh farmers in the coming years with the aid of the eNAM national agricultural market program. This vision will only become clearer with rising levels of digital literacy. Active initiatives for promoting digital literacy within India, not just confined to the agricultural space, include PMGDISHA under the GOI; Internet Saathi, managed under Google and Tata Trust; Code Unnati, administered by SAP and NITI Aayog; and Digital Udaan, launched by Reliance and Facebook.

A more governance-oriented example of mobile-oriented delivery of public services has been Mission Basundhara, an initiative of the state of Assam. Mission Basundhara aims to digitize all maps, land records and registrations within the state under the Digital India Land Records Modernization Program (DILRMP), with the aim of providing citizens with access to real-time land records. The portal will provide additional services for management of land ownership, such as reregistration, partition, conversion of land record documents, reclassification of former agricultural land, and data correction. Access to a smartphone simplifies the application process for all these public services by eliminating the need for physical visits to the land revenue office, and mobile access to proof of land ownership can be useful for anything ranging from providing collateral for business loans to demonstrating proof of citizenship. Studying the efficiency benefits of digitizing land records not just in Assam, but in other states with high-quality land record digitization such as Madhya Pradesh, could provide an important proof of concept to encourage other states to pursue similar strategies.

Education

With increases in the availability of low-cost smartphones and affordable internet in recent years, digital education platforms have spread rapidly into rural parts of the country. Reaching a huge number of teachers and students through smartphones, digital platforms such as DIKSHA, e-Pathshala, and Nishtha are creating unprecedented opportunities in classrooms that until recently lacked substantial access to supplementary resources and curricular support. Meanwhile, distance learning platforms have enabled many learners to partake in continuing education, especially during the transition to online learning during the pandemic. Platforms like WhatsApp, Youtube, Zoom, and Google Classroom were widely used by teachers, students, and parents alike to continue the learning process despite great disruption and upheaval, and in the face of these challenges, smartphones became the ideal tool for delivering necessary educational content and services to the population.

An overview of the online education platforms currently in use in India, many of which enable mobile usage, can be found in *Working Paper 3 – Information and Communications Technology in the Education Sector in India*[2]. The most prominent of these platforms are summarized below:

DIKSHA

DIKSHA is one of the most established ICT platforms for education in India. It was launched in September 2015 as a collaboration between the Ministry of Human Resource Development (MHRD), the National Council for Teacher Education (NCTE), and the EkStep Foundation as a state-level open and customizable digital education platform intended to host a comprehensive set of educational resources. Through consultations with state governments, NGOs, and more than 30 public and private organizations, DIKSHA has compiled a set of features intended to help teachers develop into more interactive and engaging educators. These are offered on a flexible platform currently supporting ten Indian languages that can cater to the varied educational needs of India's diverse population.

DIKSHA's core objective is to host Open Educational Resources (OERs) for schoolteachers, teacher educators and student teachers. Resources such as lesson plans, concept videos, and worksheets mapped to local curricula are offered in conjunction with personalized professional development training and assessments to aid teachers in identifying their strengths and areas of improvement. It also gives teachers the opportunity to contribute their own training content, classroom resources, and advice to a community that aims to reach five million teachers in India.

In order to reach such a large community, DIKSHA is designed to accommodate existing constraints to ICT platform integration in education and highlight the advantages of bringing ICT into the classroom. Platform materials are made available both online and offline for smartphones, tablets and other devices, and are mapped both to local languages and local curricula. Teachers can conduct digital assessments of students on the platform, and are likewise encouraged to share best practices for explaining difficult concepts, enhance their professional development through a gamification approach, and compare their past and present teaching performance. DIKSHA's reach additionally makes it an excellent means of communication between teachers and institutions.

E-Pathshala

Introduced by the MHRD in November 2015, E-Pathshala offers free and easy access to digital textbooks and learning resources in Hindi, English and Urdu. Teachers have access to instructional and curricular resources through the platform, including resources for teaching diverse groups of students. Parents can also access curricular documents and student resources to support learning outcomes and participate in their children's education.

[2] Accessible at https://sustainable-development.site.drupaldisttest.cc.columbia.edu/sites/default/files/content/docs/ICT%20India/Papers/ICT_India_Working_Paper_3.pdf

Resources are available both through a platform website and a mobile app. Eventually, MHRD plans to offer the platform in 22 Indian languages, involving 31 states and Union Territories in textbook and resources digitization.

Health

Smartphone features such as regional language voice interaction are already helping build the capacity of ASHA workers. By delivering native-language training through a variety of media, these tools improve the quality and transparency of ASHA training, especially when integrating audio and visual content. Mobile apps such as mSakhi, for instance, are currently being used to provide the most up-to-date training to healthcare workers in remote areas of the country, with highly beneficial effects. Additional training content in local languages can also be distributed for access via smartphone on more public channels such as Youtube, and mentoring and communication to ASHA workers can be coordinated through WhatsApp groups – all tools which would be inaccessible without access to smartphones.

Various state governments, such as Himachal Pradesh, are already providing smartphones to ASHA workers, with states like Tripura planning to procure them in the near future. Low-cost smartphones will make direct provision of smartphones to ASHA workers accessible for more state health departments. This will improve the work not only of ASHA workers themselves, but also of the health departments, which will be able to track and analyze their work more efficiently using various smartphone apps. This, in turn, will improve transparency and accountability.

Towards Universal Mobile Public Service Delivery

Leveraging smartphones as a delivery vehicle for mobile public services has the capacity to change hundreds of millions of lives in India. By bringing access to government services to their users' pockets, these platforms can instantly make public institutions more responsive, inclusive, and versatile. Furthermore, data compiled by mobile service users can be aggregated and analyzed in order to further improve both the efficacy of these services and the reach of government initiatives. In the best-case scenario, this can create a virtuous circle in which constant, live feedback from mobile public service users contributes to ongoing, incremental adjustments and improvements to these services to better meet the shifting needs of the population. With over half a billion prospective new smartphone users in India, the sum potential of these services to elevate quality of life and development outcomes is nearly limitless.

Nor is the possible impact limited to the direct contribution of these platforms alone. Every feature phone user who is prompted by the availability of mobile public services to adopt a smartphone brings India one step closer to its goal of universal broadband connectivity. Internet access brings a world of external social and personal services which are instrumental to participation in India's emergent digital society and knowledge economy, meaning that any initiative which can familiarize new groups with the information sphere is instrumental to achieving the goals of the GOI's flagship Digital India initiative. The first step to transforming

India into a digital knowledge economy is simply to get people online, and mobile public service platforms will act as important entry points to achieving this goal and closing the digital divide.

However, introducing these platforms to the general public is not a sufficient step on its own. Mobile public service platforms must be designed in a way which makes them truly accessible to those which have to this point been excluded from India's digital revolution. This means making accommodations for local languages, accessibility options such as text-to-speech, and implementing simplified, straightforward design in line with the most fundamental needs of end users. Steps must also be taken to publicize the efficiency and convenience of these platforms, and to improve the functionality of those that do exist so they indeed are more convenient than other available options. Finally, efforts must be made to fill the familiarity and trust gap inherent in new digital tools, as well as to upgrade the country's electrical and broadband infrastructure to reliably support even the most rural users. Through the National Broadband Mission, launched in 2019, investments are currently being made to provide broadband access to all of India's villages – an effort expected to be completed this year. Universal broadband accessibility in rural areas will create the basis for a crucial proof of concept regarding how digital connectivity can be bundled with more advanced public services in the most remote areas, and could allow India to serve as a role model for digital public service delivery throughout the Global South. The progress in this initiative, along with the other hurdles discussed above, will be examined in further depth in a companion piece, to be published soon.

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