ICT Intervention Challenges in Education in Rural India

Gopal Naik, K. N. Narasinga Rao and Ashwini Baje

Abstract People in rural India encounter greater paucity of facilities and services compared to their urban counterparts in scaling the opportunities created by technological advancement. Information and Communication Technologies (ICT) have the potential to provide much-needed succor by bridging the challenges of remoteness with satellite, web and mobile based applications. Education, being a critical requirement for social and economic well-being, and primarily a media-based service, lends itself well for technological interventions which aid in addressing the urban-rural divide. The case study that we have done shows that there are challenges in the eco-system that impact the smooth implementation of digital technologies in rural areas. Inadequacy in infrastructure both in terms of quality and quantity, inefficiencies and other systemic issues impact the ICT solution roll-outs causing delays and unmanageable cost escalations, thereby making solutions infeasible. The way forward is urgent, serious and needs concurrent efforts on many dimensions, which require strong collaboration of public as well as private partners.

Keywords ICT · Tele-education · Broadband · Interaction · Content · Education · Infrastructure · Power · Rural

1 Introduction

Education helps unleash the true potential of the human mind. It increases individuals' chances in the job market and helps them earn their living. Gary Becker has shown this empirically using the Human Capital Theory, which posits that education is an investment and provides a better payoff in terms of higher wages [1]. A study has also shown how GDP per capita is linked to learning levels [2, p. 2]. In addition to improving income distribution, education also brings in other benefits. It promotes innovation and entrepreneurship and raises people's productivity and quality of life. The educated population, generally tends to be well-informed about government

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policies, lead a civic life and take decisions that benefit them individually and the society at large.

Despite considerable efforts by successive governments in India, the progress made has been inadequate compared to other countries. A comparison of how much prominent governments across the globe spent on education, during 2009–13, shows (Fig. 1) that the India's expenditure on education remained less than that of South Africa, Brazil, the European Union, the United States of America and even the World Average. In 2013, the Government of India spent less than 4% of its GDP, whereas, the other comparable developing countries, Brazil and South Africa spent about 6% of GDP on education.

According to a National Sample Survey Office (NSSO) study in 2014, rural India in comparison with urban India, performed poorly with respect to various indicators (Table 1) [3]. For instance, a huge gap of 20% in the Adult Literacy Rate was recorded in rural and urban India. Large disparities (of around 10–12%) also existed in the percentage of male and female population that completed graduation and above. The percentage of population (belonging to the age group of 5–29 years), who never enrolled in any educational institution, too was seen to be higher in rural India.

Poor learning outcomes among rural students could be attributed to a host of issues—not considering ground realities when framing education policy, limited

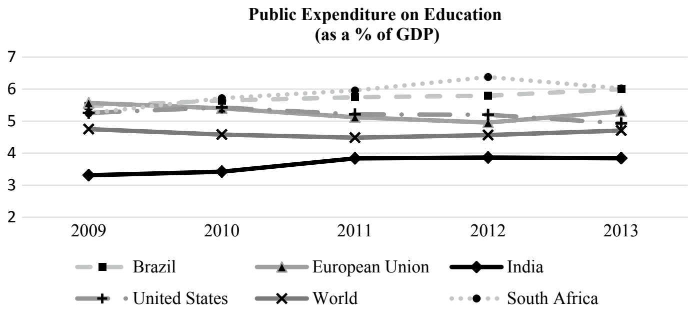

Fig. 1 Public expenditure on education. *Source* Created by authors based on World Bank Data (retrieved in March 2018)

Table 1 Educational disparities between Rural and Urban Populations in India (as of 2014)

Indicator	Rural (%)	Urban (%)
Adult literacy rate	64	84
Attained education level of 'graduation and above' (male)	4.5	17
Attained education level of 'graduation and above' (female)	2.2	13
Persons who never enrolled in any educational institution (age group 5–29)	11	6

Source Social Consumption: Education, conducted by the National Sample Survey Office (NSSO), 2014 administrative power for school headmasters (in terms of taking disciplinary actions, hiring or firing of teachers), overambitious curricula that must be completed in a given time, poor state of school infrastructure, lack of teachers and their training etc. [4]. Also, many rural students cannot afford private tuitions and have limited or no access to other knowledge sources. Their parents may not be educated enough to clarify doubts about various concepts taught in the school. Added to this is the poor state of educational infrastructure and manpower in schools. Another factor that impacts the rural students is the distance they have to travel to school. Only about 60% of rural students have a secondary school within a distance of 2 km, whereas about 91% of urban students can avail a secondary school within the same distance [3].

According to UNESCO report, primary schools in India require at least 3.7 lakh new teachers. This acute shortage of teachers has placed India second among world nations, next to only Nigeria in terms of teacher recruitment required to meet the existing education demand. It is projected that this number would snowball to 30 lakh requirement by the year 2030 [5].

Shortage of teachers implies higher Pupil-Teacher Ratio and overcrowded classrooms. World Bank Statistics indicate that despite a receding Pupil-Teacher Ratio in Primary Education in India, it is still higher than the world average and that of most other nations (Fig. 2).

The reasons for this shortage are many. In many schools, teachers and students are registered under pseudo-names. Fearing increase in expenditures upon hiring permanent staff, the government-run schools temporarily appoint teachers on an adhoc-basis. This leaves a lasting effect on the quality of education [5]. Another issue is difficulty in attracting qualified staff owing to factors like remoteness of village and low salaries.

This is a vicious circle, schools in rural India fail to attract talented staff because of their poor state of affairs, and this deteriorates the quality of teaching imparted. As a result, there are children who in spite of completing schooling, struggle to read basic text and perform simple arithmetic.

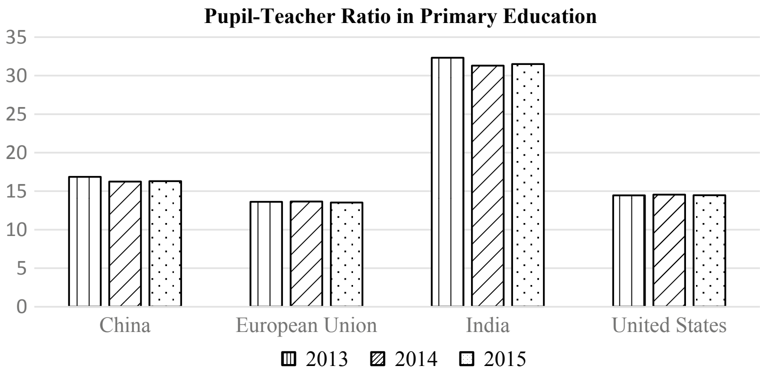

Fig. 2 Pupil teacher ratio in primary education. *Source* Created by authors based on World Bank Data (retrieved in May 2019)

2 ICT in Education

Information Communication Technology, which is often touted as the means for enabling knowledge transfer is today well-integrated with the educational system. ICT integration helps enhance the learning process of students [6, 7]. ICT fosters students' learning capabilities and retention power by making lessons more engaging and interesting. It also encourages students to undertake further reading that can help them enhance their knowledge.

With the goal of improving the quality, reach and cost-effectiveness of delivering instruction to students, integration of ICT is also being carried out in rural schools. In most rural schools, education through ICT is considered not as a replacement of teachers, but as a complementary teaching resource. It is mostly adopted as a distance education mode [8]. Use of ICT is particularly beneficial to students in rural and remote areas, who otherwise find it difficult to access courses or subjects of their interest due to geographical barriers. It can also help rural students become technologically better skilled and thus be confident and prepared for the new-age jobs.

To reap the full-benefits of ICT, it is critical that ICT is well-integrated into the rural education system. The process of integration of ICT is a continuous process [9] that needs constant support from the management, proper planning and appropriate policy making. Researchers contend that the development and success of ICT programs in the field of education in developing countries, depends on how well it is adapted to local social and economic factors [10]. It is critical to evaluate different aspects of ICT-based learning like "*usefulness, self-efficacy, willingness and challenges and readiness*" before adopting it [11, p. 154]. For any ICT project to be successful in rural areas, it would need to undergo a "trial-and-error" phase before the teachers and students are comfortable with its usage and are able to benefit from it [8]. The key is to find the right subject area that needs intervention (which involves complex concepts or skills), review of its curriculum and finding the right match of technology and pedagogy for these subjects and curriculum [8].

Studies have shown that teachers who have undergone ICT training are more effective and confident in using them when teaching than teachers who have not undergone any such training [12, 13]. Studies have found that students find it easier to grasp the subjects taught through the ICT projects, when done through local language [14] and used in conjunction with active pedagogical techniques. The quality of the content should be evaluated [15] for its distinctiveness, variety, volume [16], use of multimedia and ease of understanding. A study has shown that users' satisfaction and interest in a technology increases significantly, if it presents information in a vivid and interactive manner [17].

3 Approach of the Study

In this study, we use a case study to identify key challenges in reaching digital education in rural areas. The case study examines a project that provides tele-education in 1000 rural schools in Karnataka, India. This section covers the details of the case study.

Tele-education in 1000 Rural Schools in Karnataka

Owing to difficulties in achieving last mile connectivity in rural areas of India, innovators and policy makers have tried and experimented with various ICT models. One such model that has met considerable success is the SAMIE (Satellite & Advanced Multimedia Interactive Education) tele-education implemented in over 1000 schools of rural Karnataka. It was implemented in PPP model by an IIMB-led consortium.

The project made use of satellite communications for downstream communication and broadband internet for upstream communication to conduct live, multi-way interactive learning sessions for rural students. The classes were taught in Kannada by well-experienced subject matter experts, from a central studio. The teachers additionally made use of multimedia animation content to deliver the lessons.

First Phase—Pilot Project (2011–2012)

The pilot project (tele-education) was conceived by the Centre for Public Policy, Indian Institute of Management, Bangalore, led consortium. It was a satellite-based interactive educational program communicated live via the satellite EDUSAT. Phase 1 was completed by the consortium, with the tele-education technology led by Gumbi Software Pvt. Ltd. and multimedia animation content provided by Edutel Technologies Pvt. Ltd. The project involved roll-out in 14 government high schools located in the GP (Gram Panchayat) locations of Gubbi Taluk, Tumkur District, Karnataka State. The studio in the Government Department of State Education Research and Training (DSERT) was used for delivery of the classes. Quality training was provided to as many as 3112 students belonging to classes 8–10 in the subjects of Maths, English (Grammar) and Science. Significant improvement in passouts was observed as a result of the training. This hybrid technology was unique and involved the features provided by VSAT and terrestrial broadband connectivity. The technology enabled two-way voice and video. DSL broadband was used for reverse communication (student interaction). The hybrid model enabled 2-way communication with satellite channel for forward and broadband for reverse channel communication, as shown in Fig. 3.

Second Phase: SAMIE for a Thousand Schools

The Karnataka Department of Primary and Secondary Education approved a proposal to increase the number of schools from 14 to 1000, with a focus on backward areas. 18 such districts were identified; 2 talukas were randomly selected from each of those districts.

Department of State Education Research and Training (DSERT's) studio was used to conduct live classes which were beamed to schools through satellite for 30–35 minutes. The schools were provided with equipment for receiving the live stream

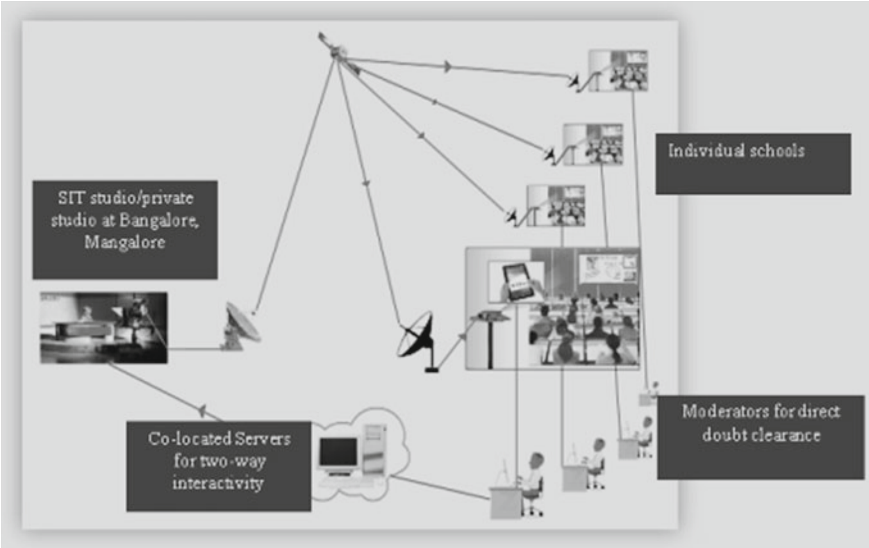

Fig. 3 Components of the SAMIE solution

sent. These were at managed Gram Panchayat levels. The course was designed to be run for classes 5–10th, for subjects English, Maths and Science. The duration was for 200 days and comprised a total of 1000 hours of classes in an academic year. The content created adhered to the state syllabus and provided methodical description for conveying the concepts, with animations where necessary. During the last 5 minutes of the class, interactions took place through broadband or cellular channels. Moderators were stationed to answer the question directly after the live classes. The tele-education classes were managed at the school level by one teacher in the projection room of the school. The content and process were arrived at by collaborating with the government department.

The consortium installed the technology components across 700 higher secondary schools and 300 upper primary schools. These schools were located across 36 taluks (18 districts). The training commenced with trial classes in October 2014, while the actual sessions commenced in November 2014. A total of about 2 lakh students belonging to classes from 5 to 10 participated in the project. The lower income group constituted in excess of 95% of the students. Nearly 95% of the Headmasters of the schools rated the program as excellent, as per a survey conducted.

Satellite and Multimedia Interactive Education (SAMIE) can be used to overcome the current deficiencies in the schools such as shortage of trained teachers and teacher absenteeism and provide educational content of high quality. The tests conducted showed that the project had a significant positive influence on the performance of students measured through a standardized evaluation for the three subjects.

The progress of the tele-education program was monitored through automatic updates from the remote end. Also, by building intelligence into the computing elements and mobile applications, the server got to know that a particular class was functioning. Progress of the project thus was collected, and consolidated on a dashboard so that it could be easily viewed by the key stakeholders. However, broadband availability was poor and therefore the interaction sessions had to be conducted through the cellular mobile alternative. The State Government, though responsible for providing broadband, could not organize it and instead decided to curtail the program as interaction could not be conducted via broadband in all the schools.

Key Factors Influencing the Outcome

The project was rolled out in November 2014 in 1000 schools. The lessons relayed through satellite for about 85% of the duration of the class, worked very well. However, the last 10 minutes of the scheduled interaction in each session faced constraints. The success of the project was impacted by various factors. An account of those factors is given below.

Technology Issues

Provision of reliable technology is a critical aspect of any ICT project. In several institutions, even though necessary infrastructure was present, internet connectivity required for interaction was not available. The challenges in technology can be best viewed against the aspects of connectivity and power supply availability with the required quality.

Data Connectivity

The choice of appropriate technology was a complex exercise. From an internet connectivity perspective, the service providers did not guarantee availability of connectivity in all the required schools. Despite inspection for feasibility before committing to the provision of connectivity, the actual rollout fell short significantly. Many locations, hence, had to face the possibility of being declared not feasible. Choosing alternative connectivity technologies, was complex and changed over time. The following three connectivity options were available.

1. Digital Subscriber Line (DSL) broadband connectivity
2. Cellular Mobile Data Connectivity
3. National Optical Fiber Network (NOFEN)

A depiction of data corresponding to DSL coverage in schools is given in Fig. 4.

When we looked at the reasons as to why the connectivity failed to function, the data collected reveals the following (given in Fig. 5). To start with, 1000 schools were selected based on the feasibility declared by the telecom service provider. However, when it came to provision of the connection, the feasibility got reduced to 900 schools, indicating a fall of 10%. Only 62% of the school locations declared feasible were enabled with broadband modems and connectivity. Out of this, only 34% were functioning satisfactorily. These inconsistencies ended up frustrating the user and posed difficulties in realizing the purpose and potential of the project. Also, this required continuous follow-ups and discussions that added up to the efforts and

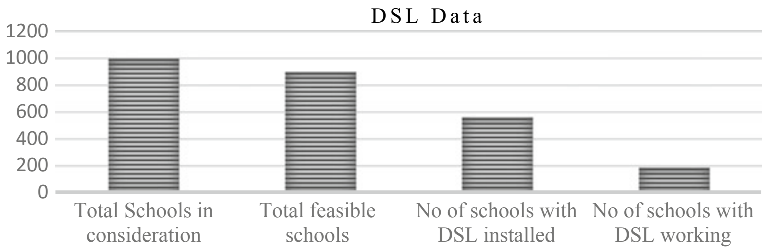

Fig. 4 DSL coverage data

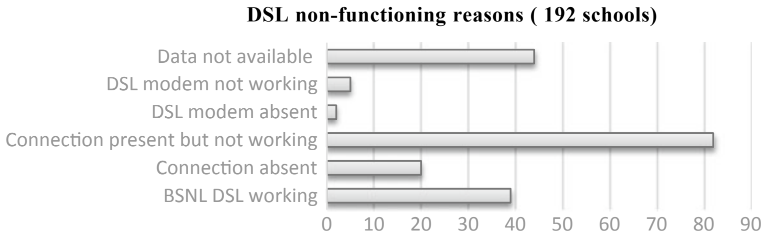

Fig. 5 Reasons for DSL not functioning

costs. Billing issues also cropped up where data mismatch was observed between those of the telecom service provider and that of the consortium partners.

From an analysis of 192 schools, valid data was available for 148 schools and only 39 of these schools had the DSL functioning to satisfaction (only 26%). About 82 schools had connections in place but internet was not working. In 20 schools, the wired connectivity from the exchange itself was missing. Five schools had modem malfunctioning, and in two schools, the modem itself was missing. Where the user expected 100% functioning of service, in reality only 26% of the 148 connections was working. This sort of issues impacts the confidence of user in offering any quality service in rural areas and also discourages the user from entering into any Service Level Agreement (SLA) based commitments that depend on this type of connectivity arrangement. Absence of competing telecom service providers in the rural areas, created further constraints to the user.

The consortium had to come up with a cellular alternative, which was not there in the original proposal of the project and differed from the Memorandum of Understanding with the Department. The Department itself was responsible for the broadband connectivity but could not do much with the chosen service provider. With respect to the data connectivity, the DSL broadband connectivity was not consistent in supporting real time interactive sessions. This made it difficult to commit to any SLA based on this connectivity. Even if data connectivity was present, the speeds were inadequate (<300 kbps) for real time video. This adversely impacted the 2-way real time moderator interactive sessions. Large scale deployment of broadband had challenges of operations and tracking. This resulted in increased manpower and escalated costs. Apart from data, even voice and SMS were not consistently available given the last mile reach challenges. The inconsistencies in SMS delivery, caused confusion as the automation of project tracking relied heavily on reliable SMS delivery. Telecom operators were not sufficiently equipped to attend to issues in the field leading to inconsistencies. The modem was not adequately provisioned by the service provider, this resulted in alternate purchase of modems and installations leading to cost and operational implications. Billing and tracking of problems were a significant issue given the scale and spread of locations. Inconsistencies in billing were observed which took a long time to verify and rectify. Lack of clarification in the bill-related queries on part of the telecom service provider, created confusion and unnecessary expenditure. Lack of consistency in data between different entities resulted in stalemate in decision making. Agencies came up with different sets of data (especially related to the number of DSL connections actually working) which gave rise to confusion and conflicts. Private telecom service provider's commitment to programs was also an issue and top leadership commitment for such critical responsibilities is absolutely necessary from the concerned organizations. In experiments such as in this project, there was a need to accommodate fine tuning of equipment parameters (like mobile antenna direction) so that the quality and quantity of data coverage could be improved. However, procedural delays at the operator's end resulted in the attempt becoming aborted. State-of-the-art technologies like NOFN also faced technological challenges and issues with co-ordination amongst stakeholders leading to inconsistent and unreliable service.

These observations indicate that there are serious issues with the internet service provider (ISP) in rural areas, emanating from a position of monopoly. We find that while the state-level officials of the ISP showed interest in the project, that interest did not translate into field-level action, requiring continuous and repetitive follow-up by the consortium on every small matter. This forced the consortium to look for alternative technology and service providers. While the alternative cellular technology was deployed smoothly, the Education Department initially agreed and later went back to say that DSL broadband was necessary, even though it was their own responsibility to provide broadband in schools. The Government ISP being the only service provider offering DSL, alternative DSL broadband ISPs were not available. Alternatively, cellular service providers were explored but the Education Department did not want to take private sector service provider's help even though it could provide better service at a lower cost. There was no enthusiasm on the part of the public service provider to address technology issues. Sending bills was the only prompt activity the public service provider did. Meetings and escalations to Divisional Heads of the public sector provider, did not help. It was an opportunity for the ISP to proactively participate in the consortium project and experiment on different solutions so as to encourage other users to follow. It called for proactive involvement of telecom engineers to be out in the field and study the problems, arrive at solutions given their end-to-end knowledge of last mile connectivity, network equipment configurations and their limitations, transport network configuration tweaking. But that was not to be, and the consortium had to work with the lineman whose knowledge and exposure was limited to basic installation and repairs.

The personnel deployed by the ISP in the last mile were shared between different locations. Getting their attention to attend to problems was an issue. Often, the connections would break due to line cuts and road cutting and other reasons. It was not clear if the ISP personnel followed any laid down standards for cable laying. In spite of the obvious challenges of the last mile cable laying in rural areas, it was expected that the ISP would ensure some certainty of connectivity. On many occasions, there was disagreement over the status of a particular connection whether working/not working. These conflicts never got resolved and led to those connections getting billed on a monthly basis even without the service being rendered. The disagreement over working and not working connections lingered on endlessly leading to frustrations as there was no solution in sight because there was no scope for any immediate and quick arbitration. The provision and choice of modem had compatibility issues. Those provided by the ISP were not compatible with the ICT solution installed in schools (no wifi capability). The consortium incurred expenditure in installing alternative vendor's modem to suit the scenario. Also, the fluctuations in bandwidth was common resulting in abrupt interruptions in streaming video. This perhaps necessitated fine tuning of configurations in upstream equipment in exchanges, in order to ensure proper share of upstream bandwidth. However, such experiments were never even entertained, leave alone doing it. Rigid policies on part of the ISP lacked the experimental spirit required for the success of such complex projects.

The alternate private mobile ISP did start off earnestly but got bogged down eventually as they could not bear the cost of experimentation in rural areas. With no government departmental assurance for business opportunity upon the success, the private mobile ISP did not show enough commitment. Even though the mobile data bandwidth offered was mostly in 2G/Edge range which would not suffice for video streaming, at least a consistent low speed connectivity would have helped the messaging between different software applications to work.

Eventually, with no alternatives, and with so much dependent on reliable data connectivity, the consortium struggled to progress on interaction in the project. The project got launched based on the premise that the DSL connectivity would be provided by the government departments and the ISP. When the ISP announces support for a service, it is assumed that its customers would bank on the assurance of service. However, it turned out to be a false sense of assurance. With the consortium focusing on the all-important purpose of creating multimedia animation content for 3 different subjects and 6 different classes (5–10), and providing good teachers, it was not a planned activity to invest time and money into experiments on providing connectivity.

In spite of the various challenges, the project was appreciated for delivery of multimedia content through satellite in the 3 subjects for classes 5–10. The project won the prestigious WSIS Prize (World Summit on Information Society) in 2015, by ITU, for the category of E-Learning. The ISP did not provide quality cellular service in a significant number of schools, as an alternative to its DSL solution. Alternative cellular service provider in those schools were private ISPs and the department did not want to engage a private cellular service provider. Had the ISP and the government department fulfilled their responsibilities, it would have been an extremely impactful experience in terms of takeaways from the project, effectiveness, costs and uncertainty. A video-based interaction supported by the application would have enabled better interaction and also allowed the students to have access to a record of the question asked and response given. This could have been part of a searchable library or FAQ. An alternative was indeed figured out with just a voice support; the student would give a missed call and would receive a call from any one of the free moderators. The alternative required not so trivial modifications to the software. This costed time and money which was at the expense of the consortium partner.

It cannot be expected that alternatives will be figured out all the time for all scenarios. Also, not all private companies will be ready to bear expenditure for lapses for which they are not responsible. Companies may go strictly by the MOUs and agreements without being flexible. This may result in conflicts leading to arbitration which again affects productivity and adds to costs. Even figuring out alternatives requires the staff to apply their mind, brainstorm and come out with a solution. All these efforts add up to unplanned costs. Hence it is better that, each member organization, be it government or private, delivers upon their responsibility, so that members can focus more intensely on their own areas of expertise. In the context of this case study, many experiments were conducted to discover broadband solutions, which were beyond the scope and responsibility of the consortium members (like the experiment on NOFN, and the trials with private mobile ISP).

Power Supply

Apart from reliable data connectivity, the provision of uninterrupted power supply is also a crucial need for the success of ICT projects. With rampant power cuts in rural areas, alternate standby arrangements are necessary. A typical power supply solution consists of the State Grid, Inverter, Battery and the Solar Panel. The ratings for the above components will depend upon various factors like—the load, the duration for which the power backup is needed, the extent of grid state supply available and the general sunlight conditions. The ratings are crucial as the investment on the solution is required to ensure that the purpose of uninterrupted power supply is satisfied.

The provision of quality power supply needs to factor in the following aspects.

1. Unpredictable state power supply
2. Lack of adequate sunlight hours, especially during monsoon
3. Quality of battery and its maintenance
4. Damage to externally mounted solar panels
5. Inadequate charging of battery due to premises supply being turned off daily
6. No proper indication of amount of battery backup available in order to ensure reliable service
7. Misuse of power backup for purposes other than what it is designed for.
8. Single phase power supply
9. Inadequate earthing results in equipment producing light shocks and also potentially can damage the equipment
10. During long vacations and holidays, the battery is not charged and it often goes dead. There is often very little understanding and concern by the existing system. This calls for a separate arrangement which add to the cost of power.

(Note: Reliable UPS systems with sensors for alerting failures are available, but the costs are high.)

The grid power provided by the government is not a 24/7 service and suffers from power cuts running into a few hours at least every day. This compelled the consortium to explore alternative solutions based on solar power involving solar panels, inverter and batteries. This had cost implications including that of regular maintenance. Also, the earthing provision was missing in many schools. This caused light shocks and also damage to equipment. The provision of earthing was not an easy exercise and involved significant efforts.

Infrastructure

Lack of adequate infrastructure is one of the key issues that rural schools in developing countries face when implementing ICT-based projects. This holds true both in terms of quantity and quality. The following issues were observed:

- Theft or damage to the infrastructure is seen in many institutions. This makes caretaking of the infrastructure an additional overhead and prohibits students from freely accessing the infrastructure.
- There is lack of classrooms to accommodate the students and thus they have to function from temporary facilities.
- Some students have to travel long distances to reach the schools. Dependency on public transports and their timings, constrains the students from being flexible with their timings in order to accommodate any special classes through tele-education.
- General infrastructure elements like—benches, lighting, ventilation have been observed to have issues in some schools.

Operational Issues

The disadvantage of remoteness is a major cause that impacts the smooth progress of projects in rural areas. For a private agency delivering services in rural areas, the need for being adequately organized becomes imperative. There are operational challenges. Owing to the distributed nature of institutions, reachability is an issue. Conveying information in a timely manner becomes difficult. Monitoring of progress of work is a challenge as the institutions are many and spread out. Depending upon the institutions that are being serviced, it requires a team of dedicated workers who need to follow-up. This increases the costs. Some areas may not be serviced by certain mobile operators, resulting in difficulty to reach the personnel in remote areas. Management of distributed workforce requires setting up of divisional and zonal hierarchy and setting up of offices, which in turn increase the costs. Payment of salaries and sundry expense claims to personnel becomes a challenge. Absence of banking facilities adds to the complexity.

Automation, web and mobile based applications, to some extent ease the operational challenges but the technology comes with its own challenges. The private organizations in the consortium seemed to struggle with operational issues and management of their human resources. Challenges of managing remote workers and tracking their performance imposed tough problems. Given the complex nature of the project, the staffing of skilled and motivated employees needed better funding and timely release from the government department. The private organization was already saddled with the responsibility of the last mile and setting up everything from scratch. The government departments with its administrative and operational presence in the last mile institutions, could have supported the consortium in a more positive manner.

Motivational Issues
The attitude of those involved in the project influences the outcome. Leaders who are passionate are found to positively impact the motivation of the entire project team, irrespective whether they are government or private. The support from top management of institutions, and policy makers, is also critical to the success of any education project. In many instances, stakeholders were required to be reminded several times of any responsibility to be fulfilled. It was an expectation by the stakeholders that the concerned party would follow-up on pending tasks. This compelled the agencies to invest in manpower to track and follow-up. Decision making was often delayed which adversely affected the project. Transfer of key persons responsible for the project, introduced intermittent delays. Some stakeholders were not interested in taking the project forward. They lacked the motivation and the drive to take initiatives and proactiveness was missing. Procedural lapses resulted in significant delay in payment to agencies by the government department. This resulted in salary delays to field staff which in turn led to loss of manpower severely affecting the project.

The project would have benefitted by a proactive involvement of the officials in government departments. They could have involved themselves in a more integrated manner given the important purpose of improving quality education. Even though at the school level many teachers were enthusiastic about the way the program was progressing, the officials at the government department level did not support the project adequately, and there was a disconnect with the overall purpose of the project itself. Sticking to strict academic plan was not a priority for the government department. Delays imposed on payments that were due to the consortium, resulted in many operational issues resulting in manpower loss and inconvenience to the staff of the consortium. As the consortium was burdened with the crucial responsibility of providing quality content and good teachers, many unplanned tasks resulted in loss of focus, also cost escalations and diversion of manpower. So, it can be observed that though the projects were bolstered by the presence and participation of the private organization, the significant dependencies on the government departments continued to persist in the rural areas.

4 Conclusion

Rural areas are disadvantaged in many aspects when compared to the urban developed parts. In spite of the ICT intervention efforts, to address this gap, the potential of ICT has hardly been exploited in rural areas. The challenges exist in terms of the inconsistencies in availability of quality power supply and data connectivity, which are the basic necessity for technology to work. The broadband availability is not satisfactory. There are many areas not served by the Digital Subscriber Line or other comparable technologies, which is required for stable bandwidth. The cellular wireless data access is inadequate to guarantee consistent and satisfactory access to content. Apart from technology challenges, the administrative setup which has to serve the people is also not efficient. Infrastructure woes exist in public organizations. Meager and inefficient administrative system imposes unexpected, unplanned costs on the parties who come forward to address the rural-urban divide. Slackness in decision making, unexplained delays, denial of services, and operational inefficiency, together make it very difficult, ultimately threatening to make the entire initiative infeasible. Estimates done before the commencement of the project, quickly become inadequate due to the unexpected costs. Provision for unplanned infrastructure related purchases, travel expenditures, escalation in manpower count, all contribute to the unmanageable expenditures affecting the feasibility of the project for private enterprises. Delays in decision making, monopoly of some services, arbitrariness in decisions, delays in payments and various dependencies on government, drive the private enterprises to resort to alternative options that again escalates the costs. This has a snowballing effect, that makes the private parties frustrated leading to gradual compromises and ultimately fall in quality and demise of the projects. The other outcome of this desperateness is the possibility of the private parties resorting to compromises that drastically impact the quality of the product and the service. This leads to possible unfair practices creeping in, which is a more serious aspect to worry about. Inability of the government agency to provide the required services all by itself or with the help of private partner is impacting the education service delivery for the rural citizens.

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