Theory of change: Driving a digital school in rural Pakistan
by Ashir Ahmed and Jason Sargent

Abstract
This paper reports the findings of the initial phase of a longitudinal study that aims to investigate barriers to digital literacy in rural Pakistan. The research employs the Theory of Change to plan various stages of a digital literacy program for young children living in a remote area of Pakpattan, Pakistan. A Digital Access Vehicle (DAVe) was deployed as an innovative tool to introduce digital literacy for those who were unable to travel to the project’s NGO partner headquarters to access DAve’s array of digital technologies. An interpretive case study approach is used to perform in-depth analysis of the subject under investigation by conducting one-on-one interviews and focus groups with key informants. The contributions of this research are twofold: (a) it operationalizes the Theory of Change to systematically plan a social impact project in a resource-constrained developing country; and (b) it creates a better understanding of barriers hindering digital literacy of young children in rural areas of a developing country such as Pakistan.

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1. Introduction

Despite increasingly high levels of connectivity and access to digital technology in developed countries, digital literacy in rural areas of developing countries still remains a strong concern for many (Haenssgen, 2018). This concern is important as research suggests that digital literacy has the ability to stimulate social inclusion, employment opportunities and empowerment of young people (LaRose, et al., 2012), and perhaps overcome geographic isolation (Correa and Pavez, 2016). However, the urban-rural digital divide exists even between groups with the same socioeconomic status and this reflects that lower education and income in rural areas is not the only factor affecting their slower adoption of information and communications technologies (ICT) (Ball, et al., 2019). Although digital literacy and access to information and communication technologies is critical for socioeconomic development of rural populations, barriers in promoting digital literacy programs for people living in those areas (Chinapah and Odero, 2016) including technological, geographical, behavioural, social and cultural barriers (Bhatnagar et al., 2000; Kenny, 2002; Shafique and Mahmood, 2008). In recent years, Pakistan has witnessed tremendous growth and penetration in ICT, but unfortunately most of the growth has been restricted to metropolitan areas, leaving rural areas digitally disconnected. This motivates researchers to investigate why rural areas in Pakistan are left behind in adopting ICT and
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what are the barriers and challenges hindering digital literacy in rural Pakistan. The key question addressed in this research is:

1. How can digital literacy be promoted in rural Pakistan?

To address this research question, a subsequent research question is proposed:

1.1 What are the barriers and challenges in promoting digital literacy in rural Pakistan?

The Theory of Change (Weiss 1995) was employed to address these research questions in a methodical manner. Theory of Change is a theory-driven approach to programme designing, planning and evaluation that starts by making explicit how a programme will achieve its effects by describing hypothesised steps (such as activities, outputs and outcomes) along a causal pathway; this theory guides the design, implementation and evaluation of the programme. In essence, the theory describes how a programme brings about specific long-term outcomes through a logical sequence of intermediate outcomes. Theory of Change ensures that various phases (namely ‘problems’, ‘activities’, ‘outputs’, ‘outcomes’ and ‘desired states’ or ‘impacts’) of a social project are identified, connected and planned correctly. Theory of Change explains how activities undertaken by an intervention (such as a project, program or policy) contribute to a chain of results that lead to intended or observed impacts. Generally, Theory of Change is developed using a background mapping approach which starts with long-term impact and then maps required processes of change as well as medium- and short-term outcomes and outputs (Breuer, et al., 2016). These elements are usually presented in diagrams or narrative summaries, as shown in Figure 1.
Generally, Theory of Change is developed during the planning stage but can also be useful for monitoring and evaluation. An effective application of Theory of Change can help develop better key evaluation questions, identify key indicators for monitoring, identify gaps in available data, prioritize additional data collection and provide a structure for data analysis and reporting.

The current evolution of Theory of Change draws on two streams — (a) evaluation; and (b) informed social action. From the evaluation side, the theory is an aspect of programme theory, a long-standing area of evaluation though. Programme theory (Funnell, 1997) approaches urge a more explicit focus on the theoretical underpinnings of programmes, clearer articulation of how programme planners view linkages between inputs and outcomes, and how programmes are intended to work, to improve evaluations and programme performance (Funnell and Rogers, 2011). The interest in the particular strand of programme theory that is known as ‘Theory of Change’ has no doubt been influenced by seminal practical guidelines. ‘The Community Builders’ Approach to Theory Development’, developed by Anderson (2006) as part of the Aspen Institute’s initiative, involved evaluators and community development programmers in applying programme theory concepts to the evaluation of complex community initiatives (Connell and Kubisch, 1998). In the late 1990s, the U.S. based evaluation social enterprise Act Knowledge (https://actknowledge.com/) partnered with the Aspen Institute to establish a practical, Theory of Change-based evaluation service to social programmes and continues to be one of the leading providers, with a well-defined methodology. However, as James’ (2011) highlights, in international development, the current interest in the Theory of Change as an approach represents the convergence of another, equally long-standing strand of development thought. Since the 1960s, informed action for social change and participatory approaches have advocated a conscious reflection on theories of development, as a basis for social learning and action.

The presence of these different traditions that are blended in the evolution of Theory of Change approaches may explain why such a wide range of organisations, from donor agencies to small civil society organisations, have taken it up (Vogel, 2012). Despite taking on 10 very different starting points, driven by different motivations and using differing vocabularies and processes, organisations working in international development and related fields have found Theory of Change thinking a useful approach for exploring and clarifying their thinking about change and how they contribute to it in a particular context (Vogel, 2012).

The layout of Theory of Change (Figure 1) is used in this study to plan and design a project that helped project planners to draw clear connections among the problems that they are trying to address — activities, outputs and outcomes and how they can holistically contribute to achieving a desired state (or impact).

The next section of this paper explains the concept of digital literacy in general and specifically in Pakistan before introducing the concept of a Digital Access Vehicle (DAVe), along with its components and activities. Next is the overview of the application of Theory of Change with the rationale and justification to use it in this study. The research methodology and design is then explained with comprehensive details on the site case, data sources, data collection and analysis method before presenting detailed discussion on key findings. Finally, the paper ends with a conclusion, limitations and direction for the future research.

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2. Research background

a. Defining digital literacy

Generally, the terms ‘ICT literacy’, ‘ICT competence’, ‘digital literacy’ and ‘digital competence’ are used interchangeably. According to the International ICT Literacy Panel (2002), ICT literacy is: “using digital technology, communications tools and/or networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society”. Furthermore, Claro, et al. (2012) defined ICT literacy as: “the capacity to solve problems associated with information, communication and knowledge in digital environments”. Similarly, ICT competence refers to: “higher order learning processing competences that integrate technical and application skills” (Zhang and Zhu, 2016). Ferrari (2013) states that digital competence can be summarized as the: “ability to cope with
information, communication, content creation, safety and problem solving” and these application skills include the basic use of software, ability to be creative and innovative, solving problems and thinking critically with the Internet and computers (Aesaert and van Braak, 2015). In an educational context, according to Hatlevik and Christophersen (2013), digital literacy is defined as: “students’ ability to use technology, and to make use of technology to process, acquire, evaluate information, produce and communicate information with digital technology”. For the purpose of this paper, we are using the definition of digital literacy proposed by Hatlevik and Christophersen (2013) as it fits well with the research context.

b. Digital literacy in Pakistan

Pakistan has a population of more than 180 million. Children under the age of 14 years represent 35 percent of the total population. According to UNESCO’s 2016 Global Education Monitoring (GEM) report, there were 21.5 million out-of-school children in Pakistan of which 5.6 million were primary school age (UNESCO, 2016). According to the 2016 statistics, the general literacy rate of Pakistan was approximately 58 percent. The literacy rate among the female population in Pakistan is less than 50 percent as compared to 70 percent of the male population. Taking into account rural and urban divides, the literacy rate is understandably higher in urban areas, i.e., 74 percent when compared to 49 percent literacy in rural areas (Khattak, 2017). With almost half of the country’s population illiterate, one can imagine losses for not being digitally literate, at a time when ‘knowledge is power’. Therefore it is imperative to focus on literacy, especially digital literacy, that could play a significant role in the empowerment of any nation (Khattak, 2017). Before introducing an intervention to deal with the distinct lack of digital literacy in rural Pakistan, it is critical to understand barriers and challenges that hinder digital literacy (Martin, 2008). Problematically, there is no main barrier or challenge affecting the promotion of digital literacy (Ameen and Gorman, 2009). Rather, there are various factors such as economic, social, geographical and cultural factors that contribute to low levels of digital literacy. Considering the complex nature of the problem in hand, a systematic approach is required that can help in designing digital literacy programs in a methodical manner. The Theory of Change was deemed suitable for this purpose as it advocates the identification of various phases required in creating the desired result and hence uses an overarching approach to plan a digital literacy program for rural Pakistan.

c. Digital Access Vehicle (DAVe)

For school-age children in the Pakpattan region covered by this research project who were provided with first-hand experiences with digital devices such as personal computers, laptops, iPads and robots, this in fact served as a first ever encounter with word processing applications such as Microsoft Word as well as Paintbrush and video games for many. This experience was facilitated by using a Digital Access Vehicle (hereafter DAVe) — equipped with various digital devices, which introduced ICT to schools with no access to ICT and students who were unable to travel to less remote areas to access these technologies. Given that schools are the key location where children in these remote communities spent their time, the digital literacy program (via DAVe) was deployed in local schools. To make this project a sustainable and permanent resource, digital literacy programs in local schools showcased the value of digital literacy and engaged with local communities to establish a self-sponsored, self-managed IT facilities model. The DAVe deployed a digital literacy program through a mobile transport platform to initially facilitate digital literacy and education delivery to students in remote communities of targeted site in Pakistan (known as Pakpattan). A map of Pakistan highlighting the location of the case site (Pakpattan) is shown in Figure 2.
The project was carried out in collaboration with an Australian university, an Australian not-for-profit organisation (Tayyiba Institute) and a Pakistan-based community organization (Roshani Welfare Society). The project trial was conducted over the period of two weeks in early 2019. During this phase, the partner organization in Pakpattan identified and recruited 4 x primary schools (from grades 1 to 8) located in the district of Pakpattan (the case site). A majority of those schools had a shortage of basic educational infrastructure such as school buildings, furniture and necessary classroom equipment, let alone computers and access to the Internet. The DAVe, maintained and supported by the partner organization, was equipped with multiple digital devices (see Table 1). DAVe travelled from the partner organization’s base to the selected schools (within 40 km. of the NGO’s location) with the intent of providing unprecedented intimate access opportunity for students to acquire hands-on exposure to computers and other digital technologies, particularly the Internet, and with the objective of beginning to build levels of digital literacy amongst the student cohort.

### Table 1: Components and activities of DAVe.

<table>
<thead>
<tr>
<th>Components of DAVe</th>
<th>Activities of DAVe</th>
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</table>
The DAVe consists of 10 x laptops, an iPad, WiFi capabilities with a smart router, a projector screen, 10 x headphones, a printer and a dash robot. DAVe has the capability of accessing the Cloud through a BRCK (an integrated hardware and software device for mobile WiFi connection) or equivalent device. In essence, DAVe is a moveable Cloud which facilitates access to the Internet for students when no Internet connectivity is available in rural schools. During the trial period of the project, DAVe visited four selected schools and introduced digital technologies to students. Since a majority of those students had never used computers before, simple painting activities using paint and paper were introduced as ice-breaking activities between students and the project team before any of the computing related activities were introduced. Once students settled in, they were offered a ‘tasting of digital technologies’ by providing access to the computers, printer, robot and iPads. It is important to note that the students were not assessed for their expertise in using computers but rather encouraged to use technologies in a more relaxed manner and for fun.

After the completion of the trial period, DAVe was assigned to make weekly visits to each of the selected schools to allow students to have a consistent and familiar learning environment. The project provided continuous monitoring and evaluation to track the project, providing a richer picture of student and project progress. This data included the number of weekly visits made by DAVe, number of students attending training sessions, students’ satisfaction, number of consultation sessions with local communities and progress toward the establishment of self-sponsored digital labs in local schools. All this data was collected by a partner organization in Pakpattan and later sent to researchers in Australia for further analysis. It was envisaged that data reported from the DAVe project could be used to make a case to local and regional governments and local and global NGOs for additional funding and resource support for female education in the southern Punjab region of Pakistan. Table 2 depicts the key components of Theory of Change developed for DAVe project.
The following section explores and describes various components of Theory of Change and their relevance for this study.

**Problem:**

The Roshani Ki Kiran project aims to investigate the low rate of digital literacy in rural Pakistan. Before a solution to the underlying problem was proposed, a better understanding of the problem itself was required. This project aimed to develop a better understanding on the determinants of digital literacy and investigated contributing factors that hindered digital literacy in rural Pakistan. The problems stated in this section of Theory of Change guided the development of relevant activities, outputs, outcomes and desired state (impacts).

**Activities:**

Activities refer to actions undertaken to address a given problem. A digital school in a van (the DAVe) was the central component of this project and provided digital literacy to children studying in remote areas of the selected site. Considering the lack of trained staff that can deliver digital literacy, the project set up a computer lab at the selected site that aimed to train the trainers (school staff) — at no cost to them. The DAVe and the computer lab also showcased the value of digital literacy to the general community to earn their support for such initiatives. The project ensured that the DAVe was equipped with an appropriate suite of technologies and school children used those technologies in a prescribed manner. The students’ time to take part in digital literacy sessions was approved by each participating school in an attempt to make sessions successful, effective and valuable.

**Output:**

Outputs refer to key deliverables and measurable effects of the DAVe project. The outputs ensured that the activities were undertaken successfully and effectively and were likely to create the desired impact of improving digital literacy in rural Pakistan. For instance, in the first three months, at least one staff member from each of the participating schools was trained in the basic use of computers. This staff member would later help other members of staff to learn...
computer skills and would be responsible to teach computer classes to the school children. The project also donated a desktop computer to each of the participating schools to ensure that they can start digital education for selected children (grades 5, 6, 7 and 8 were initially selected for digital education programs). This project expected each school to participate in digital literacy activities by providing required resources such as teachers, space and IT equipment for a smooth running of the project.

**Outcomes:**

The term ‘outcome’ refers to short-to-medium term changes that the project aims to make. It was anticipated that within one year of the project commencement, the participating schools would successfully demonstrate the value of digital literacy to their students and local communities and would manage to establish their own dedicated computer labs for students with the support of local communities. Starting with the students of grades 5, 6, 7 and 8, another measure to gauge the successful outcome of the project was to roll out digital literacy programs to all students (from grades 1 to 8) in the selected schools.

**Desired state (Impact)**

The successful implementation of the project and achieving the anticipated outputs and outcomes, the project is likely to be used as a ‘role model’ that can be followed by other schools. Other non-profit organisations were likely to join hands for the promotion of digital literacy in rural Pakistan. It was also likely that the successful implementation of the project would help change people’s (especially living in rural areas) perceptions about digital technologies and offer more support for such initiatives and contribute to improving the digital literacy rate in rural Pakistan.

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### 3. Method

**a. Case site**

The District of Pakpattan was selected for the first deployment of the DAVe project. Pakpattan is located about 205 km. from Multan and 184 kilometres by road, southwest of Lahore, Pakistan. According to 2017 census data, Pakpattan has total population of 1,823,687 including 1,535,591 people living in rural areas (one school for 3,907 children) and 288,096 people in urban areas (one school for 321 children). Interestingly, the female population constitute 61.07 percent as compared to a male population of 38.93 percent, supporting the project’s deliberate focus on female students. This aligns with UNSDG’s Goal 4 (Quality education) and Goal 5 (Gender equity). The literacy rate in rural areas (especially among the female population) is less than 12 percent. Unfortunately, there is no official data available on the rate of digital literacy among rural females, but anecdotally, it appears to be near to none. Considering the important, yet underprivileged, community sector (women of rural areas) of district Pakpattan, the DAVe project intentionally targeted this community sector for the initial deployment of the project.

As part of pilot project, four schools were selected for the DAVe deployment. All those schools were within 40 km. of Pakpattan. In addition to the schools’ willingness to participate in the research project, additional inclusion criteria for schools were:

- should be located within 40 km. of the host organization (to ensure that the project team can visit the school and come back to the base within a day);
- should have students in grades 5 to 8;
- should not have existing IT infrastructure; and
- should not have a component of digital literacy in their existing curricula.

Each school was visited once a week. The initial phase of the project included a total of 178 students (from grades 5, 6, 7 and 8) from the four selected schools. Table 3 provides a list of schools visited in four days (based on the order of visits):

<table>
<thead>
<tr>
<th>Table 3: Details of visited schools.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>178</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>School ID</th>
<th>Sector</th>
<th>Students’ cohort</th>
<th>School level</th>
<th>number of students</th>
<th>students in pilot</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Private</td>
<td>Boys and girls</td>
<td>Primary</td>
<td>326</td>
<td>56</td>
</tr>
<tr>
<td>B</td>
<td>Private</td>
<td>Girls only</td>
<td>Primary</td>
<td>142</td>
<td>33</td>
</tr>
<tr>
<td>C</td>
<td>Government</td>
<td>Boys only</td>
<td>Primary</td>
<td>217</td>
<td>42</td>
</tr>
<tr>
<td>D</td>
<td>Private</td>
<td>Boys and girls</td>
<td>Primary</td>
<td>198</td>
<td>47</td>
</tr>
</tbody>
</table>

**Research methodology and design**

This research follows an interpretive case study approach (Cavaye, 1996; Walsham, 1995; Yin, 2014) to investigate the issue in its natural settings. Semi-structured interviews (Longhurst, 2003; Schmidt, 2004) and focus groups (Clarke, 1999; Guest, et al., 2013) were used to collect data from key informants of the selected schools. Considering the purpose of this study, the qualitative data was collected from school principals (or delegates) in the form of one-on-one semi-structured interviews and from parents, teachers and community members in the form of focus groups.

In three schools, the one-on-one interviews were conducted with school principals, whereas in the absence of the principal in the fourth school, one of the senior school teachers filled in for the principal. Each interview took around 45–60 minutes, and was digitally recorded. For the convenience of participants, all interviews were conducted in Urdu (Pakistan’s national language). One of the researchers is native Urdu speaker and proficient in the language. In addition to one-on-one interviews, four focus groups were also conducted. Each focus group consisted of community members, parents of children attending that particular school and school teachers. Each focus group took around 60–90 minutes, conducted in the school building, digitally recorded and facilitated by the researcher. Similar to the interviews, the focus groups were also conducted in Urdu. Table 4 provides an overview of key participants in interviews and focus groups.

<table>
<thead>
<tr>
<th>School ID</th>
<th>Interviews</th>
<th>Focus groups with community members</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Principal</td>
<td>Role: M (52 y) Gender: M (52 y)</td>
</tr>
<tr>
<td>B</td>
<td>Principal</td>
<td>Role: F (49 y) Gender: F (49 y)</td>
</tr>
<tr>
<td>C</td>
<td>Class teacher</td>
<td>Role: M (27 y) Gender: M (27 y)</td>
</tr>
<tr>
<td>D</td>
<td>Principal</td>
<td>Role: M (37 y) Gender: M (37 y)</td>
</tr>
</tbody>
</table>

**Data analysis**
The objective of data collection and analysis was to gain a better insight into the existing understanding of barriers to digital literacy in rural Pakistan. The data collected through semi-structured interviews and focus groups was analysed using qualitative techniques. All data collected from key informants was conducted in Urdu (Pakistan’s national language). A translator was not required to translate from Urdu to English as one of the researches was of Pakistani origin and competent in Urdu and English. Once all of the interviews and focus groups were conducted, they were translated into English, transcribed in full and analysed by using thematic analysis (Fereday and Muir-Cochrane, 2006), using NViVo.

4. Findings

Findings from one-on-one interviews

The project trial constituted of visits to four schools (one school a day). During these visits, one-on-one interviews were conducted with the school principal or delegate to attain better insights into barriers hindering digital literacy in those schools. Considering the low socio-economic status of these schools, financial constraints were assumed to be the most important factor restricting the promotion of digital literacy. However, data collected on financial constraint only partially supported that particular assumption. For instance, when asked about financial constraints, the principal of school A replied:

“It is true that we have very limited funds available to run the school. However, it is also true that digital literacy has never been the priority for us. We started our schools with just one room a few years ago and now the school consists of six rooms and a small play area. If we had computer education in our top priorities we could have started it; though it wouldn’t have been very easy.”

The principal of school B echoed the same sentiment and highlighted financial constraints faced by the school. However, she also mentioned that after seeing DAVe in action and witnessing the value of ICT, digital literacy was something that her school would consider very seriously, despite the shortage of financial resources. She further stated:

“In the past, we never thought to introduce computer education in our school. After seeing the digital school in a van, computer education is something for us to think about in coming days and weeks.”

School C is a government school. In the absence of the school’s principal, a senior class teacher answered this question in this fashion:

“Government schools are managed very differently from private schools when it comes to budget allocations. The budgetary decisions are made by the provisional governments with very limited options for individual school to decide where and how to spend the available budget. Recently, the government made an announcement regarding the promotion of digital literacy in all government schools. The details of the policy and the actions are yet to be seen.”

When asked about financial constraints in digital literacy at school D, the views of the principal were:

“We (the school) have very strong ties with the local communities. All important decisions, such as what resources the school needs, why we need and how those resources can be acquired; are discussed with the local community. If agrees, they (communities) contribute in acquiring those resources. In the past, we never realised the need for computer literacy. But after seeing students and staff interest (in the digital school in a van) and discussing the potential use of computers...
(with the project team) we are very much interested in having computer education for our students.”

Participants were also asked about other issues such as geographical, technological and social constrains and their impact on digital literacy in their schools. Below are some of the important findings:

“One of the key issues regarding digital literacy is the lack of qualified staff who are available and willing to teach computer to our students. The people in the town who know computers moved to big cities to get better jobs. None of our existing staff is trained to teach computers in our school.” [Principal, School A]

It was further added:

“We never received enough interest from parents to teach their kids about computers. The main reason is, they (parents) don’t know much about the importance of computers and don’t see much value in digital literacy for their children.” [Principal, School A]

“Honestly, we have no idea how computer could be used in our school. We struggle to fit digital literacy in our existing curriculum especially when we don’t have trained staff who can help with such initiatives. It is especially difficult for us as we are girls only school and all our staff are female. There are not many (if any) female teachers available in the town who can come and teach our girls. I don’t think if the families of our students would be interested in getting digital literacy for their children anyway.” [Principal, School B]

“For us, everything depends on government policies. We are here to execute the government policies. The only thing that could potentially change government policies is a push from the people. The political will and the government priorities are the most important thing for our school; digital literacy with no exception.” [Class Teacher, School C]

“Being far from the main town is a big disadvantage. Locally we don’t have enough resources and the right people who can teach computers unless we train our staff first; that is very difficult as the closest computer institute is 40 km. away from school. For our staff, travelling to more than 80 km. a day is not feasible. Another issue is that the parents are not very supportive to teach computers to their kids. For us, it is not only one issue but a group of issues that has stopped us in using computers in our school.” [Principal, School D]

Findings from focus groups

Four focus groups were conducted as the part of data collection strategies. The aim of the focus groups was to capture the views of local communities and school teachers (other than principals) in group settings. The composition of each focus group can be found in Table 4. When asked about digital literacy at the school, one parent stated that he did not see much value in computer education for his son (studying in school A). After completing his schooling:

“my son has to help me in my retail shop. He doesn’t need computer education to do the business. As long as he can read and write, he will be fine.”

Another parent from the same focus group expressed her concerns about the use of computers by her children. According to her:
“The computer is the next level of evil as compared to mobile phones. Kids can access anything and everything on mobile phones and I think they can access more evil things on computer even more easily. My daughter is not great in studies. I don’t think she would be able to cope well with computer education at school. I would expect her focus on her regular education in order to pass school tests.”

One of the school teachers participating in the focus group suggested that:

“Most of our students struggle with their studies. A vast majority of them (if not all) have to do some after-school work. Some kids help their parents in the fields, in their businesses and even some kids have to do some work by their own as well. It would be very difficult for the kids to focus on something new when they are already struggling to learn the basics.”

School B was a girls-only school; according to some of the parents in the focus group computer education would not be very important for girls. According to one of the parents:

“It is more important for girls to know the household stuff as compared to learning computer use. They are not supposed to do a professional job. We wish for them to get married soon after finishing their high school and look after their families.”

Another parent shared the same sentiment:

“I don’t think computer education will help my daughter live a better life.”

Though there was not much support from most of the parents, one teacher stated that:

“Our girls are quite passionate about learning computing. If we have computers in the school and if parents support their girls, our students can learn computing quickly and effectively.”

She further added:

“The key issue is that no one in the school can teach computing. We need to learn computing before we can teach others — securing a computer is another issue to deal with.”

School C was a government school. Though the school had strong connections with local communities, the involvement of those communities in school policies was very limited. However, when the participants were asked about their preferences for digital literacy for their kids, one of the parents stated:

“I wouldn’t mind if there was free computer education at the school. I wouldn’t be able to pay any extra fees for computer education.”

Another parent stated:

“My understanding is that kids use computers only for playing games. Computers in the school may divert students’ attention from studies to playing games; that doesn’t sound a great idea to me.”

One of the school teachers suggested:

“It is the government’s responsibility to provide computers and other relevant resources to each of the schools. Digital literacy is critical for
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The participants of the focus group at School D were relatively more supportive for digital facilities compared to the first few focus groups. One parent stated:

“We don’t know how to use computers. If our children learn this technology, they might be able to do the things that we never thought to do. I am happy for my kids to learn computers at the school — at no extra cost. Additional cost for computer education wouldn’t be affordable for us.”

Though one parent was in support of digital education, she raised some concerns as well:

“My key expectation from the school to help my son to learn the basics (of education) and pass the exams. I don’t want school to spend too much time on computers and compromise on regular education. I am okay with computer education as long as there is no effect on the basic education of my son.”

5. Discussion

This study extends the existing understanding on barriers in digital literacy in rural areas of Pakistan. Before the commencement of the project, the pre-conceived notion was that a lack of financial resources was the key barrier in achieving digital literacy. However, data collected from key participants (school principals, teachers and parents) suggested that, although the lack of financial resources is a legitimate barrier, it was not the most important factor affecting digital access in those communities. Since these are well-knitted and well-connected communities, they generate resources collectively if they really want something to be done. Sponsoring a school building, installing a drinking water filtration plant and the construction of local roads are just a few initiatives that were made possible solely by community efforts. In the case of digital literacy, the key issue emerged as the parents (specifically) and the communities (in general) did not realize its value and hence digital literacy was never a top preference. On this account, the DAVe proved very affective in demonstrating the value of digital literacy to parents and the overall communities and played a role in changing perceptions about digital technologies and their use. Moreover, it was also found that a shortage of qualified people with digital literacy skills was another key issue. Those qualified in digital literacy preferred to move to large cities, leaving a huge vacuum in local communities. Creating job opportunities for computer teachers in local schools could potentially help some computer-literate people remain in and contribute to their local areas. In terms of significance, the next barrier was the lack of financial resources. Although the financial barrier was not the most important constraint, it was still an important factor to consider for developing digital literacy. It is beyond the financial capacity of a single individual or institution to cover all of the financial expenses required to setup digital infrastructure; hence, any internal or external financial support could have significant positive impact on the outcome of the initiative.

This study also revealed the importance of community support for new initiatives such as introducing digital literacy programs in local schools. In order to provide reliable, sustainable and effective programs, a thorough consultation process with and support from local communities is critical. The findings drawn from this study highlighted the complexities involved in social impact projects and stressed the need of employing a rigours theoretical framework (such as Theory of Change, in this case) to plan such initiatives. Moreover, the study also amplified the need of considering secondary stakeholders such as parents and community members along with primary stakeholders such as schools management and school children for setting up digital literacy programs in rural areas.

6. Limitations and directions for future research
The scope of this study was to report initial findings of a longitudinal study emphasizing the planning phases of a social impact project. The study highlighted key social issues (for example, low rates of digital literacy) through an exploration of the Theory of Change activities and outputs. However, Theory of Change outcomes and impacts have not been realized, recorded and documented at this stage of the longitudinal study.

Over the last few months, the project has continued collecting and analyzing data to monitor and evaluate outcomes and initial impact created by the project. This includes the number of weekly visits made by the DAVe, number of students attending training sessions, student satisfaction, number of consultation sessions with local communities and progress made toward the establishment of self-sponsored digital labs in the local schools. Future reports will describe the findings on outputs, outcomes and the impact created by the Roshani Ki Kiran DAVe project.

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