Interim Report on e-Shala Digital Education Programme, assessing programme roll-out, stakeholder engagement and early indications on programme outcomes, based on a sample study of 131 schools spread across 24 districts of Karnataka State, India.
INTERIM REPORT ON E-SHALA DIGITAL EDUCATION PROGRAMME

EXECUTIVE SUMMARY

This is the report of an interim study of a sample of the 750 schools where e-Shala Digital Education Programme is currently operational. The study suggests that the e-Shala model has achieved significant progress in operational roll-out and user engagement. The model has successfully delivered over 50,000 school-days of Digital Education in rural Karnataka, via the sampled 131 schools alone. Stakeholders are eager to engage and to be not just passive consumers, but active participants and co-creators of the learning material and its delivery. Their responses confirm that the programme addresses an important requirement of 21st century learning.

Schools have reported a median rating of 71% on the overall usage of the e-Shala system, and high rates of usage of Science and Math content. An average of 2.8 service visits is reported, indicating regular engagement with the service provider. Teachers have engaged strongly with the content. The e-Shala digital kit is found to be viable, functional and effective. Thus, there is overall strong promise of delivering holistic education while enhancing the quality of learning, and adoption of sustainable energy technologies while doing so, in line with the e-Shala Programme Vision.

The short study has yielded several insights into the nature of the preferred e-Learning model, the role of teacher vis-à-vis the system, the time frame and other conditions for impact to be achieved. Teachers see the Digital Learning Kit as an aid, rather than a substitute for themselves. They expect the system to provide resources, information and demonstrations that they are themselves unable to provide. The requirements are also different across subjects; in language, the system may serve as a large screen for collective reading; for science it is seen as a medium for demonstrating experiments and models; in Mathematics, it is perceived as needing to be more than a display of solved problems.

Teachers would like to co-create content, based on their actual needs. If such a role is made possible for them, the engagement with the content would further increase, also leading to sustainability for new content generation. Teacher Training, if strengthened, will also help better clarify and align the usage mode with preferred and effective pedagogies, as well as increase engagement and use.

The project impact is a function of length of active engagement, which in turn depends upon effective engagement. In addition, impact measurement will require active measures to ensure that proper institutional records are maintained, with regard to the impact parameters such as attendance, enrolment, pass percentage, etc. for the entire impact period. Thus, impact measurement requires a combination of programme execution and administrative measures, as well as incubation and stabilization time for the programme. These may be kept in mind while designing an impact study.

The present e-Shala rollout across 750 government schools, given its scale and successful operational model, may be able to offer an ideal ecosystem for such a study and may be instrumental in establishing the success factors for digital education using solar energy, as a means to bridge the digital divide.
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I: PROGRAMME OBJECTIVE & OUTLINE

e-Shala is a Digital Education Programme (DEP), ideated by Menda Foundation and executed by the SELCO Foundation in partnership with SELCO and CLT, and sponsored by the Menda Foundation and other funding partners. The project delivers technology-enabled learning to middle and high-school classrooms in rural and semi-urban areas, thereby creating new learning opportunities for rural teachers and students, and bridging the digital divide.

The programme is delivered in a partnership format, the programme components being: Content, Technology, Funding and the overall programme management.

Menda Foundation is the programme ideator and partner in funding and overall project monitoring. Additionally, Menda Foundation supports in identifying other funders and partners who can support the project financially or logistically.

SELCO Foundation is the programme ideator and responsible for overall management and communication with key stakeholders.

SELCO is responsible for identification of schools, implementation and maintenance of the systems.

Children’s Lovecastles Trust (CLT) is the knowledge partner, and the CLT-ePathashale is used in this project. This content is available for Grades 5 to 10 in 3 subjects – Math, Science and English Grammar – in either English or Kannada.

The content is in line with the National Curriculum Framework and syllabus prescribed by the Government of Karnataka and enhances learning in the classroom with visual explanations of concepts and videos.

I.1 Programme Objective

The programme seeks to provide a holistic solution and intends to achieve benefits in several fronts:

- To improve the quality of classroom teaching
- To enhance learning effectiveness and ability to visualize leading to better understanding and retention of the subject
- Acts as a resource material and facilitates lesson planning
- Application of energy efficient technology powered using solar energy leading to a reliable and sustainable solution
I.2 Programme Outline

The eShala project was designed to overcome the barriers to popularisations of digital education:

- Limited access to reliable power supply makes it difficult to use digital tools in a planned manner.
- Lack of reliable content that can be integrated seamlessly with day-to-day classroom teaching.
- Lack of appropriate training to teachers on using computers and other digital resources leads to schools restricting use of computers to teach only the basics.

The project includes a systematic selection of deserving schools, implementation of a highly energy efficient LED digital projector in the identified classroom with syllabus based digital content that aids in day-to-day teaching, solar powered infrastructure to ensure predictable usage and sustainability of the solution, supplemented by a detailed teachers’ training program to equip teachers with the knowledge and expertise required to deliver quality and effective teaching using the implemented tools.

The program brings together different stake holders who are critical to the success of the project: a Knowledge partner in CLT, Funding and Ideation partner in Menda Foundation and Ideation, Implementation and Maintenance partner in SELCO making it a very unique project.

I.3 Programme Timeline

The programme started in 2014, as a pilot in a single school in Bangalore. Subsequently it was fine-tuned based on feedback from the pilot and implementation was taken up in rural under-served schools in a programme mode. As on November, 2016 the programme has reached out to 750 schools.
II: BACKGROUND TO PRESENT STUDY REPORT

From the inception of the e-Shala programme, it was determined that a detailed impact assessment study would be undertaken to measure the success of the project, capture learning, and plan for future scale-up.

An Impact Study that rigorously examines the learning outcomes based on testing and comparing an experimental group with a control group of students is being separately undertaken. The present study is an Interim Feedback Report, which seeks to provide information to stakeholders on the programme roll-out, engagement, challenges and early insights.

II.1 Overall Study Questions
The overall study questions pertain to the impact of the programme in terms of:

- Improvement in the quality of classroom teaching, leading to increased attendance and reduced drop outs
- Enhancement of learning effectiveness and ability to visualize, leading to better understanding and retention of the subject
- Improvement in lesson planning on the side of teachers
- Sustainability of the technical solution including use of solar energy

These questions are long-term in nature, complex and to be answered keeping in mind similar experiments being conducted in different parts of the world. The present study is limited to answering a limited set of questions pertaining to the operational aspects of the e-Shala programme.

II.2 Present Study Questions

The following were identified as the research questions for the purposes of the present study:

1. IMPLEMENTATION: Are the Digital Education Kits in use? Are there implementation related challenges and how have these been addressed?
2. ENGAGEMENT: What is the general reception to the programme, among school administrators, teachers and students? Is there engagement with the programme?
3. INSIGHTS: Are there any early insights into what works, and what does not, and are any significant course-corrective measures indicated at this time?

The report seeks to answer the questions listed above, based on feedback from 131 schools where the programme has been operational for over 1 year. The information thus provided may be useful to the programme partners in formulating strategic guidance and management inputs.
II.3 Literature Review

This study report was designed keeping in mind the programme scope and objectives outlined in various programme documents. In addition, attention is paid to the discussion of the overall challenges and achievements in answering questions relating to digital education, as outlined by Jennifer Olson et.al. of Michigan State University. The authors highlight that e-Learning can help bridge the digital divide, but poor infrastructure in rural areas is a major hurdle. The absence of reliable grid power is an example of the infrastructure gap, and the present project addresses this gap by using a decentralized model of solar power. The authors highlight the transformative impact of e-Learning, even while acknowledging that the mode of adoption has to be linked to extant pedagogical practices, which may be different in different countries. In other words, teachers will require time to adapt to the technology solution and to adopt new teaching styles, or influence the technology model so as to best complement their preferred teaching practices.

Linda Nixon et.al., in collaboration with Microsoft Research India, have documented learning outcomes from e-learning experiments conducted in India and concluded that the early findings do justify investments into scaled up programmes, of the nature of the e-Shala programme. Intel, via its White Paper on Education Transformation, likewise asserts that ICT-enhanced learning can benefit students, teachers, families, societies, and economies, but emphasizes local adaptation. In particular, this study emphasizes the role of e-Learning in imparting skills for the 21st century, implying that e-Learning is no longer optional, but it is increasingly becoming the norm.

These study reports guide the present study in the following directions:

1. Adopting a dynamic view of the Digital Education Programme, rather than a static approach. i.e. the users will influence the solution and there will be mutual adaptation and adoption
2. Using an expanded time-frame for evaluating the true impact in terms of learning outcomes and secondary outcomes
3. Actively listening to user feedback
4. Identifying the challenges with a view to finding solutions or critical elements
5. Identifying success factors

The rest of the report focuses on understanding issues pertaining to Adaptation, Engagement and Challenges.
III. STUDY METHODOLOGY

III.1 Selection of Respondents

Currently, 750 schools in various districts of Karnataka State are using the e-Shala Digital Learning Kit. However, for the purposes of the study, it was decided to focus only upon the schools which have been using e-Shala for over 1 year. Accordingly, the survey was conducted in 131 schools. The schools are spread across 24 districts, giving a wide range of socio-economic and educational backdrops to the study.

As can be seen from the table, very few districts had a single school; and over half the schools had been using the e-Shala kit for well over 21 months (median project duration of 645 days). This makes the analysis fairly robust at the school and district level. At the same time, care should be taken in generalizing findings from the school/s to the district, where only a handful of schools have been studied. A stratified sampling strategy has not been followed.

<table>
<thead>
<tr>
<th>District</th>
<th># Schools</th>
<th>Project Duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krishanagiri</td>
<td>1</td>
<td>479.0</td>
</tr>
<tr>
<td>Bijapur</td>
<td>4</td>
<td>494.0</td>
</tr>
<tr>
<td>Gulbarga</td>
<td>2</td>
<td>503.5</td>
</tr>
<tr>
<td>Dharwad</td>
<td>3</td>
<td>510.0</td>
</tr>
<tr>
<td>Kundapur</td>
<td>2</td>
<td>530.0</td>
</tr>
<tr>
<td>Raichur</td>
<td>2</td>
<td>533.0</td>
</tr>
<tr>
<td>Davanagere</td>
<td>2</td>
<td>569.0</td>
</tr>
<tr>
<td>Ramanagarama</td>
<td>7</td>
<td>569.0</td>
</tr>
<tr>
<td>Bidar</td>
<td>16</td>
<td>572.0</td>
</tr>
<tr>
<td>Sirsi</td>
<td>4</td>
<td>589.0</td>
</tr>
<tr>
<td>Belagavi</td>
<td>10</td>
<td>597.6</td>
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<tr>
<td>Mysuru</td>
<td>1</td>
<td>599.0</td>
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<tr>
<td>Haveri</td>
<td>4</td>
<td>605.5</td>
</tr>
<tr>
<td>Chikkamagaluru</td>
<td>1</td>
<td>606.0</td>
</tr>
<tr>
<td>Shivamogga</td>
<td>2</td>
<td>620.5</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>1</td>
<td>629.0</td>
</tr>
<tr>
<td>Koppal</td>
<td>1</td>
<td>629.0</td>
</tr>
<tr>
<td>Dakshina Kannad</td>
<td>2</td>
<td>645.0</td>
</tr>
<tr>
<td>Chitrardurga</td>
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</tr>
<tr>
<td>Ballari</td>
<td>9</td>
<td>665.7</td>
</tr>
<tr>
<td>Gadag</td>
<td>28</td>
<td>681.5</td>
</tr>
<tr>
<td>Tumakuru</td>
<td>1</td>
<td>689.0</td>
</tr>
<tr>
<td>Hassan</td>
<td>9</td>
<td>696.3</td>
</tr>
<tr>
<td>Bangalore</td>
<td>8</td>
<td>756.5</td>
</tr>
</tbody>
</table>

III.2 Data Collection

A questionnaire was designed keeping in mind the objective of this Interim Assessment. A team of 15 people was formed to collect the primary data from the school. The team was trained on methods of collecting the data before the visit to the schools. The time span for data collection was 25 days.

The data was collected from various stakeholders in the school to get a balanced view and include all aspects of the impact of the program.

III.3 Data Analysis – Quantitative

The Survey questions were of the following kinds:

1. Logistical information – pertaining to programme start date, classes, etc.
2. Usage information – pertaining to overall system usage, subject-wise usage and reasons for not using
3. Technical Set-up related – pertaining to missing or malfunctioning components and overall condition of the Digital Education Kit

The Survey responses were transmitted into excel format and subjected to data analysis in excel. The questionnaire responses on usage were scaled and converted to percentages, for ease of comparison. The text responses were analysed using Content Analysis, as described below.
III.4 Data Analysis – Qualitative

Content analysis is a research tool used to determine the presence of certain words or concepts within texts or sets of texts. Content analysis was performed upon the unstructured text responses. Conceptual analysis techniques were used, as follows. The text was manually scanned for keywords and a long list of keywords was prepared for each of the categories: Headmaster, Teacher and Surveyor. A computer programme was written to generate a frequency count of the key words. The keywords were scaled depending upon frequency. The scaled keywords are presented. They give a graphical indication of the frequency with which various concepts cropped up in the responses. The visuals may be interpreted as the top themes in the minds of respondents.

III.5 Case Studies

In order to get an even better feel for the programme implementation, it was decided to undertake three case studies, one from a well-engaged school and another with community involvement, examples of a ‘success story’, and one from the other end of the scale. The purpose of these narrations would be to identify success factors, as expressed in the language of the users, and challenges or key hurdles. The Case Studies were developed in line with a pre-defined short and specific template.
IV: QUANTITATIVE ANALYSIS

IV.1 System Usage & Engagement

<table>
<thead>
<tr>
<th>District</th>
<th>Overall Rating</th>
<th>English Grammar Rating</th>
<th>Math Rating</th>
<th>Science Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dharwad</td>
<td>100%</td>
<td>61%</td>
<td>83%</td>
<td>83%</td>
</tr>
<tr>
<td>Kundapur</td>
<td>100%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
</tr>
<tr>
<td>Dakshina Kannur</td>
<td>100%</td>
<td>50%</td>
<td>100%</td>
<td>50%</td>
</tr>
<tr>
<td>Bijapur</td>
<td>88%</td>
<td>46%</td>
<td>75%</td>
<td>71%</td>
</tr>
<tr>
<td>Haveri</td>
<td>88%</td>
<td>46%</td>
<td>71%</td>
<td>71%</td>
</tr>
<tr>
<td>Hassan</td>
<td>85%</td>
<td>43%</td>
<td>74%</td>
<td>69%</td>
</tr>
<tr>
<td>Gulbarga</td>
<td>75%</td>
<td>42%</td>
<td>50%</td>
<td>75%</td>
</tr>
<tr>
<td>Raichur</td>
<td>75%</td>
<td>67%</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Shivamogga</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Bangalore</td>
<td>75%</td>
<td>36%</td>
<td>38%</td>
<td>48%</td>
</tr>
<tr>
<td>Belagavi</td>
<td>73%</td>
<td>55%</td>
<td>62%</td>
<td>68%</td>
</tr>
<tr>
<td>Bidar</td>
<td>72%</td>
<td>38%</td>
<td>37%</td>
<td>39%</td>
</tr>
<tr>
<td>Sirsi</td>
<td>71%</td>
<td>50%</td>
<td>42%</td>
<td>63%</td>
</tr>
<tr>
<td>Gadag</td>
<td>68%</td>
<td>56%</td>
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</tr>
<tr>
<td>Ramanagara</td>
<td>64%</td>
<td>5%</td>
<td>36%</td>
<td>45%</td>
</tr>
<tr>
<td>Davanagere</td>
<td>50%</td>
<td>17%</td>
<td>17%</td>
<td>33%</td>
</tr>
<tr>
<td>Mysuru</td>
<td>50%</td>
<td>33%</td>
<td>0%</td>
<td>50%</td>
</tr>
<tr>
<td>Koppal</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
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<tr>
<td>Chitradurga</td>
<td>50%</td>
<td>45%</td>
<td>42%</td>
<td>42%</td>
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<td>Tumakuru</td>
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<td>Ballari</td>
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<td>46%</td>
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<tr>
<td>Krishnagiri</td>
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<td>Chikmagaluru</td>
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<tr>
<td>Uttara Kannada</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Note: All numbers are district-level averages. All scores standardized to scale of 0-6. Median values highlighted in yellow, scores above 85% in green, below 35% in red.

Data from 131 schools where the e-Shala programme has been running for over 1 year was analyzed. The average period of use is 1.7 years. Usage metrics displayed in the table below pertain to the frequency of reported usage of the Digital Education System. Usage reporting metrics were standardized across the categories “Overall”, “English Grammar”, “Mathematics” and “Science”, to enable ease of comparison.

In terms of usage, it appears that Science content is the most-used, followed by Mathematics, and English Grammar trails somewhat. There is considerable variability across districts and also across schools, although greater variability is seen in the Mathematics content usage. At this juncture the reasons for such variability are not known, but this may be something to bear in mind and investigate further. Several comments have been received about how Mathematics and English content may be improved, reported elsewhere. There is greater engagement with Science content, across the board, and it is borne out by the figures in this table.

IV.2 System Downtime & Related Issues

In 83 out of 131 (63%) of the schools, the system functioned without interruption. The distribution of down-time across the remaining 45 schools is as shown in the graph.

Overall, on average, we have a system down-time of 1 month across the 131 schools. The weighted mean share of system lost days is 4.8%. That is, on average, only 4.8% of the total available system time per school was lost due to system malfunction of one or other kind, including missing system components. Causes of system down-time are...
Other than misplaced components, the predominantly reported reason for non-use is component or device related; device failure/missing device. While various reasons are given for the system not being used, predominantly it appears that some technical issue was cropping up. However, lack of competence to use may also be a significant reason.

It is observed that the portable components were most frequently reported as missing. This includes devices like the tablet, memory card and mouse. In two cases the projector was reported to have been taken away by a teacher.

In addition to missing components, the respondents reported malfunction of the system, as another cause of system non-use or down-time. The top of mind recall of malfunction pertained to Tablet, followed by TV/Projector, Memory card, Panel, Mouse, and Battery.

In addition to the above, the following were identified as other malfunctioning components. However, it is difficult to attribute a share of the down-time precisely to these. They are noted only for the purposes of completeness.

<table>
<thead>
<tr>
<th>Other causes of malfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraneous</td>
</tr>
<tr>
<td>Servicing Time</td>
</tr>
<tr>
<td>Speakers</td>
</tr>
<tr>
<td>Difficulties in operating</td>
</tr>
</tbody>
</table>
IV.3: Servicing

The median number of days since last service is 162, which is about 5.5 months. The median number of service visits is 2 (see chart on right), which means that half the schools had more than one service visit. The average number of service visits per school is 2.8. In 10 cases, record of service visits has not been maintained by the school.

As shown in the content analysis (in the next section), however, the surveyor observations of the system are largely favourable, predominantly reporting that all complaints have been addressed in a timely fashion.

IV.4: Impact on Teaching - Learning

Information was gathered on teacher perceptions with regard to the role of the Digital Education System in enhancing the teaching-learning process. On the whole, the perceptions appear to be favourable, with the median rating on “Helps in Lesson Planning”, “Makes it Easier to Explain Concepts”, “Enhances Teaching Skills”, “Helps in Managing Teacher Absence” and “Increases Student Interest”, being 8 (on a scale of 1 to 10) or higher.
The accompanying charts show how the e-Shala kit is perceived by teachers. From the first chart, which summarizes all the other charts, it is evident that the majority of the 131 ratings received are on the higher side of ratings (yellow colour). “Ease of Explaining Concepts” and “Increases Student Interest” appear to be the top benefits that teachers experience. The subsequent charts below show the details. All the charts also have long tails to the left, indicating that there were instances where this opinion was not shared. More of a spread is seen in the chart on “Managing Teacher Absence”, which would suggest that the use of the Digital System as a substitute for teachers is not the dominant or preferred trend, which may be in line with expectations. However, there is no negation of any of the proposed benefits of the system.

These findings have actionable implications, which are taken up in the section on Conclusions & Recommendations.
Data was also collected on hard impact numbers in terms of enrolment, drop-out, pass percentage and attendance. However, the accompanying charts show that no conclusions can be drawn from the data provided.

Unlike perceptional data, hard impact data must be verified and validated, for which systems and checks and balances must be put in place ahead of the survey. In view of objective of this study, which is to provide a bird’s-eye view rather than a precise account of impacts, the available data has been collected and analysed. Two records were omitted due to missing data, thus the sample for this analysis is 129 schools.

It can be seen from the accompanying dot-plots, the reported increases in each of these parameters is offset by reported decreases and the values cluster around zero, which occurs roughly in the middle. The mean change in enrolment for example (after accounting for one extreme value) is 1.4, which is negligibly different from zero. The mean change in pass percentage is 3.4%, in attendance rate is 2.6% and in the number of drop-outs is -1.9. Not much credence can be given to these numbers in view of the large dispersion and roughly symmetrical arrangement of the observations around 0.

In the case of the reported change in drop-out numbers, only 13 non-zero values were found, and well as 33 zero values and an overwhelming 75 cases of missing data are found. The missing data may be due to reluctance on the part of the schools to share what they consider sensitive data. In some cases, the data was not maintained in an easily shareable form. No firm conclusions are therefore derived on the impact in terms of drop-outs.
V: CONTENT ANALYSIS

The methodology of ‘Conceptual Analysis’ has been used to get a high-level overview of the top themes dominating the comments of the different stakeholder categories at the ground level.

V.1: Top themes of Head Teachers

It is observed that the top theme in the comments made by head-teachers pertained to students, benefits for students and adoption by students. They were also concerned with the relevance and usefulness of the content to the teachers. Their over-riding concern was that the system should make the class better, learning and teaching easier, should be of help to the students, particularly for teaching science.

V.2: Top themes of Subject Teachers

Teacher’s comments were very much focused on Subjects, and Syllabus. In particular, teachers were eager to discuss Science content, although they expressed interest in language, social science and math content. They are keen to see the link between syllabus and content to be strengthened. Teachers made frequent references to students in their comments, and were keen to see technical improvements that would enhance the experience. It is obvious that they would like to have a system which merges with their teaching style, so that it can be seamlessly integrated into their daily work.

V.3: Top observations of Surveyors

The comments in this section focused on easily observable points regarding the system, trouble-shooting, service requirements, outstanding complaints and so on. They often recorded
their comments in terms of ‘nil’ outstanding complaints or ‘properly functioning system’. They also recorded regular or irregular use, absence of components and so on, and added qualitative observations about the usage of the system in the school, which are captured in the next section.

V.4: Felt Needs of Head Teachers

30 specific comments and recommendations were made by head teachers. We produce most of the comments verbatim, although some manipulation of text was done in order to make it tractable and searchable.

Head teachers offered 10 distinct comments on content, 4 on syllabus, 3 on engaging users, 2 on the interface with teachers, and 2 on other infrastructure required. Some of the displayed comments do overlap, but they are nevertheless shown to convey the sentiment shared by the Head Teachers.

Head Teachers clearly see the e-Learning modules as an aid for teachers. Thus, they seek more content, more helpful explanations, more demonstrations of experiments, and so on. Clearly, they want the digital content to convey ideas and situations that the teacher has faced difficulty in doing. Further, they would like the system to align well with the updated syllabus.

Equally interesting, the Head Teachers convey the requirement that the system be engaging and amenable to teacher-guided content. Head Teachers also convey the requirement that the system be more effective in terms of sound and overall user experience.

V.5: Felt Needs of Subject Teachers

A total of 129 suggestions were received from Teachers, many of which were specific and can be understood in context. We reproduce many of the comments in a form that is close to their original statements.
Teachers focus on the system as an aid to their efforts. They have several comments on content, wherein it can be seen that they would like to expand the content, add more subjects, add more topics in each subject, and align closely with the updated syllabus. They appear to almost want it to be a sort of Google of the classroom, so to speak, in the sense that they would like to turn to it for all types of questions and solutions. In some comments, teachers have also asked for internet connectivity.

It is evident that teachers would like the material to offer a better experience, and this reflects the general high expectations in terms of delivery of digital content. Managing and scoping expectations seems to be a necessary direction for further thought on the part of the programme stakeholders. At the same time, it is clear that the product will need to be benchmarked with other relevant e-learning content, for longer-term sustainability.

Distinct comments from teachers have been segregated into comments on Content (15), Delivery (12), Features (5), Syllabus (17) and Technical Kit (6), for ease of reviewing, but these categories are not water-tight.

V.6: Suggestions of Surveyors

The surveyors have also added their comments in this regard. A total of 19 comments were received, which are summarized as follows:

We conclude this section with the following remarks:

It is clear that the user groups, namely Teachers, Head Teachers and the Service Engineers have vital feedback to offer on the Digital Education system. Not all suggestions may be viable, but since these stakeholders are important partners in the programme and their feedback, if taken seriously, may provide vital clues to the long-term success and sustainability of the e-Shala programme.
VI: CASE STUDIES

VI.1: Case Study – 1 : Strong Relationship with Service Provider

*Anjuman Muslim Ghosha Higher Primary School, Kundapura, Udupi*

Anjuman Muslim Ghosha Higher Primary School is located in the town of Kundapura, Udupi district. E-Shala program was implemented here in June 2015 for the grades 5, 6 and 7. The school has grades from 1-7, and is managed by the Anjuman Trust. The school receives Government aid for the grades 1-5. There are a total of 8 teachers of which 5 are government-appointed and the remaining are appointed by the Trust. The students in the school include children from villages as far as 10 km from Kundapura and children from migrant families from the slums nearby. The school owns two buses which are used to pick up and drop students. The students are provided with free education along with mid-day meals, uniforms and other stationery needed for their studies.

SELCO’s Kundapura Energy Centre is one of the oldest branches of SELCO and has excellent track record in terms of its reach out and service in its area of operation. The branch had installed a lighting system 14 years ago in a mosque managed by the Anjuman Trust. Further, several of the school teachers have previously been customers of SELCO and several homes around the school have SELCO systems installed. Hence the school administration knew well about SELCO and its activities even before adopting the e-Shala program.

The school is using the e-Shala system very effectively and the same is used to teach the students every day. The school feels that the program is an excellent addition to the facilities already provided in their school. The Head of the school feels that the system is very effective in teaching concepts to the children and it helps in retaining the attention of the students. This according to them has been the major reason for them to use the system regularly. However, she also feels that new and dynamic content which includes activities, rhymes, songs and stories to be included as the students will lose interest if the same is repeated every time. The teachers in the school also agree with their head madam and are of the opinion that the other subjects also need to be included as part of the content. The school is happy with the service provided by SELCO.

According to the local SELCO personnel, the success of the program is due to the relationship between the school, SELCO and the donors and all of them have to show keen interest in the success of the program. The school administration or teachers are in regular touch with the personnel of SELCO, there is a regular update about the system’s working and usage. This helps the school to indicate of any problems and also for SELCO to solve them quickly. The school being satisfied with
the program has informed other schools in the area about the program and they too have approached to have the program implemented in their respective schools.

VI.2: Case Study – 2: Need for Teacher Training & Engagement

Morarji Desai Residential School, Channapatna Town, Mysuru

Morarji Desai Residential Schools (MDRS) are English medium high schools run by the Backward Classes & Minorities Department for students from backward communities. As the name suggests, these are residential schools for both girls and boys. Entry to these schools is based on an annual entrance test.

MDRS in Channapatna town is one such school which has a majority of students from Ramanagara and the neighbouring Mandya district. Majority of the students in this school are from a rural background. This particular school has both the solar Hostel Lighting program and e-Shala program implemented in December 2014 and May 2015 respectively.

The hostel lighting system has been in good use and is being used regularly by the students. However, the usage of the e-Shala system was stopped sometime after the installation. The main reason for this has been that the teachers and the staff in this MDRS during the installation and training of the e-Shala program were contract employees and they have now been replaced by the permanent staff. The outgoing teachers have not provided proper hand-over to the incoming staff about e-Shala and its usage. The new Principal of the school has no knowledge and hence not much interest about the program. As a result, SELCO has not been contacted by the school asking about the program. Further to this, as the system was not being used, some of the components like the memory card have been misplaced and the school has not taken necessary steps to have them replaced.

One of the major challenges for the e-Shala project has been the transfer/moving out of teachers or head masters who have been trained. When the teachers with the knowledge about the usage of the system are transferred, which generally happens in the Government schools, the new teachers do not know about the program and hence do not use it. As in this case, the schools do not inform the implementing or the knowledge partners about this change and the program fails.

On the contrary, in this particular school, the lighting system installed under the Hostel Lighting program has been used regularly even after the teachers have changed. The usage of the lighting system is very normal and does not require hand holding. However, the usage of e-Shala needs the teachers to be informed about the program and its usage.
VI.3: Case Study – 3: Significance of Community Involvement

Government Higher Primary School, Shagoti, Gadag

The e-Shala program was implemented in the Government Higher Primary School, Shagoti, Gadag in the month of August, 2014. This was one of the first schools to have the program implemented. Located in the village of Shagoti, the school has all its students from the village of Shagoti. About 90% of the students in the school are from below-poverty-line families. Apart from the facilities provided by the government, the school does not have any other extra facilities to teach the students. The addition of e-Shala system has been a boon to the school and the school administration makes sure that the system gets used 3-4 days in a week for all the three grades.

The Head of the school feels that the system is excellent tool to have the students interested in the subjects and retain their attention. He feels that the content for the other subjects also need to be provided as part of the program as it will have to the students interested to learn. The Head Master feels that the e-shala program provides very good exposure to the rural students about the advanced method of teaching.

The school has had issues with the system and has complained immediately to SELCO regarding the same. The issues have been attended to on time and have resolved immediately by the SELCO branch at Gadag.

During the implementation stage, the School Development and Monitoring Committee (SDMC) and the local village farmers group were involved in the project and explained about the benefits of the program. From then the SDMC and farmers group have taken active interest in the program and have made sure that the school uses the system to have the desired results. This active involvement by the school, SDMC and local farmers group has been the major reason for the success of the program and for the system to work efficiently.
VII: CONCLUSIONS

The present sample study of 131 e-enabled schools under the e-Shala programme offers a sizeable set of data for analysis. Keeping in mind the objectives of the present study, we summarize our conclusions from the analysis of quantitative and qualitative data and case study under the three heads: Implementation, Engagement and Insights.

VII.1: Implementation of e-Shala

Implementation of e-Shala Digital Education Programme is evaluated with regard to a) Set-up and b) Servicing.

63% of the schools have reported uninterrupted use of the system, which is encouraging. Distributed across the 131 schools, the system down-time has been close to 5% only, which cannot be regarded as high. However, there seems to be a case to examine the schools which have reported higher than average down-time. There are 23 schools which reported over 3 months of system down-time. This includes 3 outliers where school building civil works were being undertaken, or teachers were completely replaced.

Misplacement of system components seems to be a major concern. 34% of the reported down-time cases appear to be on account of missing components. The portable components such as tablet, memory card and mouse are often reported missing; however the larger units such as TV monitor and projector have been reported missing in one case. Securing the system appears to be a required aspect of the programme.

It appears that the system is regularly serviced with a reported average of 2.8 services visits across the surveyed schools, whose average engagement with the programme is 1.7 years. This is in line with the expected 6-monthly service visit periodicity.

Regular visits by service personnel, combined with effective capacity building among the school staff (teaching or non-teaching) in keeping the unit in good working condition as well as in trouble-shooting appears to be an important factor in reducing system down-time.

VII.2: Engagement with e-Shala

All the reported data confirm the high level of engagement of teachers, Head Teachers and students with the e-Shala programme. Usage rates in the Math and Science are reported at over 60%, which means that they are used almost 4 times in a 6-day week. There is considerable variance across schools and some schools have reported 100% usage. The median overall usage rate of 71% is encouraging, and shows that half the schools use the system on 4 or more days each week.

Science content is most-used, with median usage at 63% across all the sampled schools. This is also borne out in the content analysis, where science content is found to be the most discussed theme among teachers. Users are expecting more, better and more-tailored content, which goes beyond the average knowledge or skill of teachers, in all subjects. In Mathematics, there is the expectation of doing something creative, other than solved problems. There appears to be demand for language
lessons, including English poetry and Kannada content. Many specific leads are provided by the teachers in their comments.

There is also a demand for more features in the content, including better animation and possibly more interactive elements, particularly for demonstrating science experiments. This highlights the pedagogical preference in this deployment, for e-Learning as a teaching aid, whereby the teacher can demonstrate laboratory experiments, for example, without having a laboratory.

Ease of explaining new concepts, engaging student interest, developing updated teaching techniques, and managing effectively with fewer teachers, etc. are some of the benefits that resonate with the teachers and Head Teachers. The requirement that the content be tailored towards the Board Syllabus echoes right across.

VII.3: Challenges & Insights

As may be expected, each data distribution has a long tail, showing that there is a wide range of opinions and usage trends. In the case studies, as well, it is brought out by teachers that refreshing the content periodically is required to sustain engagement. They have further highlighted the need to keep abreast of syllabus changes and to have more and diverse content.

System integrity, ownership and accountability also constitute a key challenge. As is seen in individual schools, this in turn requires well-trained teachers, a motivated Head Teacher, and if possible, an informed and engaged village community.

Since there are many different ways of integrating the e-Shala material into the existing pedagogy, teachers are using a variety of models. For example, some use it for revision only; some use it as a way of repeating the classroom session -- a practice which makes the session lengthy. One feedback that was received from teachers is that the e-Shala teaching is very time-consuming. This opinion originates from the lack of awareness of the pedagogical practices required for integration of digital tools in day-to-day learning. This lack of clarity could hamper the sustainable uptake of e-Shala.

Some teachers view and operate the system like an entertaining animated video, or as a way to keep the class busy when the teacher is not available. While each of these modes of use may have a pedagogical justification, the co-existence of multiple modes of use dilutes the objective and inevitably the impact. This challenge may need to be addressed via appropriate orientation of the teachers during the training sessions. It may also require some give-and-take between the content developers and the users.

Impact measurement of the e-Shala programme is a task that requires specific attention. Ensuring that accurate records are maintained of attendance, enrolment and pass percentage before and after an intervention is a pre-requisite for precise impact measurement. The current study does assess these outcomes.

Moreover, impact measurement is dependent upon effective usage, which is in turn dependent upon how engaged the teachers are with the content. As has been expressed by one of the Head Teachers, “there should be freedom to develop content”.

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IX: RECOMMENDATIONS

The present study suggests that the e-Shala programme has achieved significant progress in both operational roll-out and user engagement. The implementation model is working and has successfully delivered over 50,000 school-days of Digital Education in rural Karnataka. The responses confirm that the programme addresses an important requirement of 21st century learning. Stakeholders are eager to engage and to be not just passive consumers, but active participants and co-creators of the learning material and its delivery.

This is a positive trend, and if harnessed well, may lead to the flowering of a creative process whereby technology, content knowledge and execution skills come together, to deliver holistic education and enhance the quality of learning, as well as the adoption of sustainable energy technologies while doing so, in line with the e-Shala Programme Vision.

IMPLEMENTATION: The Digital Education Kits are in use across the set of 131 schools sampled, where the e-Shala programme has been on average operational for 1.7 years. Implementation can be strengthened by taking the following measures:

IX.1: Secure and ensure ownership and accountability for the Digital Education Kit. Institutional measures may be invoked to establish a formal recognition of the assets created, and their safe-keeping, usage logging and return after use.

IX.2: Strengthen links between the Service Provider and the schools, for example, institutionalization of a half-yearly review of the system usage. The exchange of information and ideas at such a meeting may help all stakeholders to stay on the same page, maintain interest, resolve problems, share successes, as well as to infuse updated technology and solutions. Recognition of effective partnerships via an Awards programme would also be beneficial.

IX.3: Trained personnel, particularly teachers, from each school are key to ensuring the upkeep and regular usage of the system. Refresher training every, say, 2 years may be a tool to assess the use of the e-Shala and bring on-board more trained teachers. Training should also include clarity on the pedagogical approach. Further, training must take into account the different needs and situations of the schools and teachers. A one-size-fits-all model of training may not be effective. Training must be adapted to suit the capacity and competence of the teachers, and infrastructure available.

ENGAGEMENT: Head Teachers, Subject Teachers and Students are engaged with the Digital Education Kit and are using it approximately 3 times per week, on average. They are enthused by the possibilities offered by the kit and are eager to offer suggestions and participate in developing solutions, including new or supplementary content.

IX.4: Science content may be strengthened with more focus on situations and concepts that teachers find challenging to explain or describe. This includes demonstration of experiments and models. Many such items already exist, but there appears to be a demand to increase the share of such content.

IX.5: Language content may be strengthened, in particular, English poetry, Kannada lessons be added, as the students can then read or recite from one screen, rather than from individual books.
**IX.6:** Content is matched to the syllabus requirements, but may be periodically updated to reflect changes in syllabus. A library of content may be created and accessed, so that teachers have a wider set of usable e-Shala content.

**INSIGHTS:** The short interim study has yielded several insights, into the nature of the e-Learning model preferred, the role of teacher vis-à-vis the system, the time frame and other conditions for impact to be achieved, etc.

**IX.7:** Teachers see the Digital Learning Kit as an aid, not a substitute for themselves. This is how the programme is designed, as well. Teachers expect the system to provide more resources, information and demonstrations that they are themselves unable to provide. The requirements of teachers and their perception of the role of the system, may be studied in greater detail and taken into account in developing tailored content. The requirements are also different across subjects; in language, the system may serve as a large screen for collective reading; for science it is seen as a medium for demonstrating experiments and models; in Mathematics, it is perceived as needing to be more than a display of solved problems.

**IX.8:** Teachers would like to co-create content, based on their actual needs. If such a role is made possible for them, the engagement with the content would greatly increase, also leading to sustainability for new content generation.

**IX.9:** The project impact is a function of length of active engagement, which in turn depends upon effective engagement as earlier discussed. In addition, impact measurement will require active measures to ensure that proper institutional records are maintained, with regard to the impact parameters such as attendance, enrolment, pass percentage, etc. for the entire impact period. Thus, impact measurement requires a combination of programme execution and administrative measures, as well as incubation and stabilization time for the programme. These may be kept in mind while designing an impact study.

**IX.10:** Many studies have been conducted and much has been written about e-Learning, but it remains a challenge to provide strong empirical evidence. If properly strengthened, the present e-Shala rollout across more than 750 government schools, given its scale and successful operational model, may be able to offer an ideal ecosystem for such a study and may be instrumental in establishing the success factors for digital education using solar energy, as a means to bridge the digital divide.
# APPENDIX – 2: LIST OF SCHOOLS SURVEYED

<table>
<thead>
<tr>
<th>Sl No</th>
<th>School Name</th>
<th>Address</th>
<th>District</th>
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<tbody>
<tr>
<td>1</td>
<td>KSS High School</td>
<td>Gajendragad, Gadag</td>
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<td>Chadaruvalli, Sagara, Shimoga</td>
<td>Shivamogga</td>
</tr>
<tr>
<td>62</td>
<td>Govt. Girls Higher Primary School</td>
<td>Akkilalur, Hanagal, Haveri</td>
<td>Haveri</td>
</tr>
<tr>
<td>63</td>
<td>Dr. Basavaraj Kerodi English Medium High School</td>
<td>Hamsabhati, Hirekerur, Haveri</td>
<td>Haveri</td>
</tr>
</tbody>
</table>
64 Model Higher Secondary School
Hunumanatti, Ranebennur, Haveri
Haveri

65 Shri Swami Vivekanand Kannada & Angla Madyama Hrira Prouda Shale
Shiralakoppa, Haveri
Haveri

66 Govt Higher Primary School
Tanigehalli, Holalkere, Chitradurga
Chitradurga

67 Vidya Vikas English Medium Higher primary School
Nayakanhatta, Chitradurga
Chitradurga

68 Govt Higher Primary School
S H Gollalla, Holalkere, Chitradurga
Chitradurga

69 Govt Higher Primary School
B. Durga, Holalkere, Chitradurga
Chitradurga

70 Morarji Desai Secondary School
Medehalli, Chitradurga
Chitradurga

71 Govt Higher Primary School
T Nulera, Holalkere, Chitradurga
Chitradurga

72 Govt Higher Primary School
NG Halli, Chitradurga
Chitradurga

73 Govt Higher Primary School
Kalaghatta, Holalkere, Chitradurga
Chitradurga

74 Sri Anjanay Swamy Sumyoutha Padavi Purva College
Talya, Chitradurga
Chitradurga

75 Anugraha English Medium Higher primary School
Neralgunte, Challakere, Chitradurga
Chitradurga

76 Govt Higher Primary School
Arashighatta, Holalkere, Chitradurga
Chitradurga

77 Govt. Girls Higher Primary School
Mayakonda, Davangere
Davanagere

78 Govt. PU College & High School
Bilichod, Davangere
Davanagere

79 Morarji Desai Residential School
Doddamalavadi, Ramanagara
Ramanagara

80 Morarji Desai Residential School
Gollahalli, Ramanagara
Ramanagara

81 Morarji Desai Residential School
Mullahalli, Ramanagara
Ramanagara

82 Morarji Desai Residential School
Hulikatte, Ramanagara
Ramanagara

83 Government High School
Arasankunte, Ramanagara
Ramanagara

84 Morarji Desai Residential School
CPT Town, Ramanagara
Ramanagara

85 Morarji Desai Residential School
Ramanagara
Ramanagara

86 Govt Higher Primary School
Kuppuru, CN Halli Tumkur
Tumakuru

87 Divya Deepa Trust
Mysore
Mysuru

88 Govt. Higher Secondary School
Nellur, Hosur, Krishnagiri, Tamil Nadu
Krishnagiri

89 Vidyya High School
Yadalli, Sirsi, North Karnataka
Sirsi

90 Govt. Higher Primary School
ShriRAGA, Tq. Siddapur, Dist.N.K
Sirsi

91 Govt. Higher Primary School
Harsikatta, Siddapura, Sirsi
Sirsi

92 Sir Kalika Bhavani English Medium High School
Kansur, Siddapura, Sirsi
Sirsi

93 Siddapur Raita Sangha Night School(primary Section)
Siddapur, Bidar
Bidar

94 Sai Baba Raitq Sangha Night School (Primary Section)
Navallasapur, Bidar
Bidar

95 Sai Baba Raitq Sangha Night School (Primary Section)
Navallasapur, Bidar
Bidar

96 Shri Muralidhar Maharaj Raita Sangha Night School (Primary Section)
Villasapur, Bidar
Bidar

97 Jai Kisan Raita Sangha Night School(Primary Section)
Nagur, Bidar
Bidar

98 Shri Revapaikha Raita Sangha Night School(Primary Section)
Jainapur, Bidar
Bidar

99 Shantalinigeshwara Raita Sangha Night School(Primary Section)
Fatehpur, Bidar
Bidar

100 Basava Raita Sangha Night School(Primary Section)
Jirgha K., Bidar
Bidar

101 Kajapura Raita Sangha Night School(Primary Section)
kajapura, Bidar
Bidar

102 Basaveshwara Raita Sangha Night School(Primary Section)
Nagur, Aurad, Bidar
Bidar

103 Nandi Raita Sangha Night School(Primary Section)
Nagur, Aurad, Bidar
Bidar

104 Jai Hanuman Raita Sangha Night School(Primary Section)
Daddapur, Bidar
Bidar

105 Jai Bhavani Raita Sangha Night School(Primary Section)
Kappikiri, Aurad, Bidar
Bidar

106 Shivasakthi Raita Sangha Night School(Primary Section)
Maharajawadi, Aurad, Bidar
Bidar

107 Bhavaswamy Raita Sangha Night School(Primary Section)
Jojana, Aurad, Bidar
Bidar

108 Borgi Raita Sangha Night School(Primary Section)
Borgi, Aurad, Bidar
Bidar

109 Vishwa Jyothi Vidya mandi English Medium High School
Gulbarga Road, Sedam, Gulbarga
Gulbarga

110 Shree Jnanakshi Primary School
Irakalmat, Manvi, Raichur
Raichur

111 S. S. Nandikal Govt. High School
Hirevaddathi, Gadag
Gadag

112 Smt. Shantabai Mallappa Govt. High School
Bannikoppa, Gadag
Gadag

113 Govt. High School
Yekalasapur, Gadag
Gadag

114 Smt. F. F. Hiremath Govt High School
Bannikoppa, Gadag
Gadag

115 Bheemaraddi Alavandi Govt. Girls High School
Beddathgi, Gadag
Gadag

116 Hulki Co-operative Education Societies High Schools
Harthi, Gadag
Gadag

117 Govt. Higher Primary School
Beladadi, Gadag
Gadag

118 Shri Sharanaabasappa Shivalingappa Sappande Kannada Medium High School
Shakapur, Jevargi, Gulbarga
Gulbarga

119 Shri Veereshwar and Kannada High School
Maski, Lingasugar, Raichur
Raichur

120 anjuman Muslim Gosha Higher Primary School
Ferry Road, Kundapur
Kundapur

121 Anjanman English Medium School
Near Post Office, Gangolli, Kundapur
Kundapur

122 Govt. Higher Primary School
Ramthirthnagar, Opp. Shivalaya, Belagavi
Belagavi

123 KLES Pre Primary & Primary Kannada Convent School
Galataga, Chikodi, Belagavi
Belagavi

124 KLES SC Patil kannad Medium Convent School
Anekal, Chikodi, Belagavi
Belagavi

125 KLES P R Chikodi Secondary School
Galataga, Chikodi, Belagavi
Belagavi

126 KLES Kannada Medium High School
Kerur, Chikodi, Belgaum
Belgaum

127 KLES Dayand Hiremath Kannada Medium Convent School
Kerur, Chikodi, Belgaum
Belgaum

128 Navaprabha Birds Rural Residence School
Tukkanatti, Gokak, Belgaum
Belgaum

129 Govt. Higher Primary School
Belvantar, Kalaghati, Dharwad
Dharwad

130 Govt. High School
Belvantar, Kalapathagi, Dharwad
Dharwad

131 Govt. Higher Primary School
Uppinakki, Kalapathagi, Dharwad
Dharwad
E-Shala Interim Report

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