READING PROGRAMS IN THE DIGITAL AGE

THE CASE FOR PRINT/DIGITAL FORMAT NEUTRALITY

Worldreader Global Insights
Rachel Heavner and Zev Lowe
ABSTRACT

In pursuit of inclusive and quality education opportunities for all, this paper highlights the importance of access to books and the need for a format neutral approach to reading programs in the Global South. Format neutrality allows for the provision of books in both analog (paper) and digital formats. In this paper we highlight the ways in which a variety of organizations are using the digital reading ecosystem to contribute towards education for all. We highlight four areas that we believe support a greater embrace of technology: the dramatic increase in the availability of local content, the overall cost effectiveness of digital reading programs, improved access to reader data, and accessibility for the print disabled. The paper also identifies areas where costs are likely to drop even further in the years to come due to market forces. Finally, we offer recommendations for the international education community to leverage digital formats alongside print materials in reading programs to promote greater scale and cost effectiveness.

ACKNOWLEDGMENTS

We would like to thank the following people for their support and contributions to this report:

Judith Baker, Literacy Consultant at African Storybook
Farah Mahesri, Senior Education and Project Specialist at Worldreader
Darina Lucheva, Digital Production Manager at Worldreader
David Risher, CEO at Worldreader
Jeremy Simon, Director of School and Library Reading Programs at Worldreader
Ziyao Tian, Stanford University
Brad Turner, Vice President, Global Literacy at Benetech
Matthew Vanderwerff, Deputy Director, Information and Media at IREX
Danielle Zacarias, Director of Content and Publisher Relations at Worldreader
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>01</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>01</td>
</tr>
<tr>
<td>Introduction</td>
<td>03</td>
</tr>
<tr>
<td>What is Format Neutrality?</td>
<td>03</td>
</tr>
<tr>
<td>1. The Creation of Locally-Relevant Content</td>
<td>05</td>
</tr>
<tr>
<td>1.1. Creating Content in Local Languages</td>
<td>05</td>
</tr>
<tr>
<td>1.2. Building a Local Publishing Ecosystem</td>
<td>07</td>
</tr>
<tr>
<td>2. Cost Reduction and Improved Efficiency</td>
<td>09</td>
</tr>
<tr>
<td>2.1. Content Creation, Printing, and Dissemination</td>
<td>09</td>
</tr>
<tr>
<td>2.2. Edits and Revisions to Materials</td>
<td>12</td>
</tr>
<tr>
<td>2.3. Track and Trace in Content Delivery</td>
<td>13</td>
</tr>
<tr>
<td>2.4. Cost-Efficient Digital Reading Program Design</td>
<td>13</td>
</tr>
<tr>
<td>3. Data Collection and Use</td>
<td>15</td>
</tr>
<tr>
<td>4. Accessibility</td>
<td>18</td>
</tr>
<tr>
<td>4.1. Accessibility for the Print Disabled and Visually Impaired</td>
<td>18</td>
</tr>
<tr>
<td>4.2. Accessibility for the Physically Disabled</td>
<td>20</td>
</tr>
<tr>
<td>Conclusion: The Demand for Digital Reading</td>
<td>21</td>
</tr>
<tr>
<td>References</td>
<td>23</td>
</tr>
<tr>
<td>Appendix I: Summary of Approaches and Organizations that Leverage the Digital Reading Ecosystem</td>
<td>27</td>
</tr>
<tr>
<td>Organizations Using Digital Reading to Collect Data on Readers</td>
<td>28</td>
</tr>
<tr>
<td>Organizations Using the Digital Reading Ecosystem to Create Locally Relevant Content</td>
<td>29</td>
</tr>
<tr>
<td>Appendix II: Digital Reading Program Roadmap</td>
<td>31</td>
</tr>
</tbody>
</table>
INTRODUCTION

Aspiring readers and learners need books. Yet access to relevant reading materials has long been a barrier to education and lifelong learning around the globe, particularly access to language-appropriate and properly-leveled books in educational settings. Despite the dedication of funding and programmatic resources to solving this issue, the problem persists. Meanwhile, digital books have become commonplace in Global North countries, and the technology needed to access those books is now spread throughout lower-resource environments, thanks in large part to the ubiquity of mobile phones and the ever-decreasing cost of e-readers and tablets. This digital reading ecosystem now encompasses digital content, digital technologies, and digital reading initiatives that are working together with analog reading programs to improve access to books around the globe.

The collective goal of the international education community is “inclusive and quality education” and the promotion of “lifelong learning opportunities for all.”¹ We highlight the ways in which a variety of organizations are using the digital reading ecosystem to contribute towards this goal by providing locally-relevant books, building up local publishing ecosystems, realizing cost-savings due to increased efficiencies, using data systems that provide real-time feedback and user tracking, and providing accessible content to those with print disabilities². Format neutrality allows for the provision of books in both analog (paper) and digital formats. The advantages of digital books in certain contexts, combined with cost data and growing demand from governments, make the case for format neutrality clear. Providing room for the digital reading ecosystem through format-neutral programming will only serve to benefit those in need of inclusive and quality educational opportunities throughout their lives.

WHAT IS FORMAT NEUTRALITY?

This paper makes the case for format neutrality, which in this context encourages the international development community to remain neutral regarding print versus electronic books for reading or literacy programs. To take a firm stance on one format versus the other would artificially constrain programmatic solutions. Some learning environments may be better suited to digital books, while others may require paper books. Thus in designing reading programs, we advocate for format neutrality. As there are cases in which print content makes the most sense, there are innovations and points of access only possible with digital. The Case for Format Neutrality means being agnostic about how people access their books to create space for forward thinking innovation as we work towards a more literate world.

¹ United Nations, 2016
² For a summary table of some of these initiatives and their contributions to the digital reading ecosystem see Appendix I.
While more research around the cost-effectiveness of digital reading programs is recommended, the possibilities of the digital reading ecosystem explored in this paper outline that there is enough existing evidence to consider the following questions when designing development-based reading programs:

1. Which format has locally-relevant content in the languages of instruction and what is the scale of the program in question?

2. What level of data is needed on the reading behavior of participants in the program?

3. Is the final version of an educational resource being distributed or is it likely that changes and regular updates will be needed?

4. Does the population you are serving include those with print disabilities who require accessible content?

The sections of this paper will explore the digital reading ecosystem in more detail in order to inform some of these questions and support the case for format neutrality.
1. THE CREATION OF LOCALLY-RELEVANT CONTENT

It is widely agreed among the international educational community that locally relevant content is correlated with building a culture of reading and improving educational outcomes. Content in a language that one understands is even more critical to developing literacy skills and transferring those skills to a new language. However, the application of local languages in lifelong learning and education has been an ongoing issue in post-colonial Africa, Asia and South America. In Africa, for example, appropriate reading materials in local languages that are suitable for and familiar to young children are critically scarce. Vibrant local publishing industries are crucial to filling that gap. Creating local and regional content requires solid investment, but today’s digital reading ecosystem has the capacity to help address the drastic shortage of content, by facilitating the creation of locally-relevant content in a relatively easy, timely, and inexpensive way.

1.1. CREATING CONTENT IN LOCAL LANGUAGES

A number of initiatives that are based in and focused on Sub-Saharan Africa and South Asia have successfully leveraged the digital reading ecosystem to create content in commonly used minority languages. When combined with Creative Commons (CC) licensing and crowd sourcing, a digital-first approach contributes to the proliferation of content in contexts where it is direly needed.

Creative Commons (CC) licensing is an agile type of copyright license that allows third-party creators outside of the authors and publishers in the book publishing industry to iterate on, create and disseminate derivatives of content.

While organizations like Code have done notable work to bolster local language print publishing in the Global South, African Storybook, Book Dash and StoryWeaver have all helped address the shortage of contextually appropriate books for early readers by leveraging the digital reading ecosystem to rapidly create and disseminate CC content that can be more easily translated into new languages. African Storybook works with readers, parents, teachers, librarians and literacy development organizations to publish newly generated and versioned stories on their website, which provides open access to hundreds of storybooks and thousands of translations in 73 languages, 68 of which are indigenous African languages.

---

³ Ouane & Glanz, 2010; Results for Development & International Education Partners, 2016.
⁵ Ouane & Glanz, 2010.
Working across South Africa, East Africa, Zambia, Ghana and Ethiopia, the initiative takes the approach of marking the content they have curated with a stamp of quality assurance and relies on readers to surface the best independently created content by using a book rating system and comments section.

Book Dash in South Africa works closely with African Storybook to further create and disseminate content. Book Dash organizes regular book creation events, or Book Dashes, which gather volunteer creative professionals to create new children’s stories in local languages. They leverage the digital reading ecosystem by publishing the storybooks on the Book Dash website where they are made available for free translation, downloading, printing, and distribution. Many of the stories have been distributed digitally through Book Dash’s partnerships with FundZa, the Project for the Study of Alternative Education in South Africa’s Nal’ibali campaign through their MXit app, and Worldreader.

StoryWeaver, an initiative of Pratham Books in India, has done much the same thing. Through StoryWeaver, Pratham has created a digital platform which provides free access to good children’s CC stories that are written in languages close to the culture of kids in South Asia and are set in surroundings familiar to them. Similar to African Storybook, Pratham Books has embedded tools for content creation on the StoryWeaver website, such as an image bank and story templates, which allow people to write storybooks, adapt the content into other languages and versions, and publish it on the website. The organization works with parents, teachers, librarians and some renowned authors and illustrators to facilitate content creation. In the words of Suzanne Singh, Chair of Pratham Books, “The goal is to bring together content users and content creators to create a participatory culture that will catalyze the creation of more content” (2016).

---

8 Treffry-Goatley, 2015.
9 Attwell, 2014.
10 Worldreader, 2016(bi)
In Ethiopia, IREX’s Hacking Literacy approach works with local software developers to create local language early reading apps. Through a challenge approach—similar to hosting a hackathon—software developers are paired with literacy experts and compete to create apps that build letter recognition and awareness, vocabulary, and comprehension. Some of the content is sourced from partners—including African Storybook—and some is original. The best apps are awarded prizes and IREX experts work with the developers to finalize and deploy them online for free and through a shared use model at libraries so they reach marginalized populations. These apps ensure that early readers gain access to more text and materials in the mother tongue and have fun while reading.12

While these local content creation engines often focus their efforts on selling paper books, they have recognized that by leveraging the digital reading ecosystem they can enable more content creators to contribute to book creation, reach a wider audience of readers, and receive better feedback on the content they are creating. This has allowed for higher quality locally-relevant content available in more languages to more readers.

1.2. BUILDING A LOCAL PUBLISHING ECOSYSTEM

While leveraging CC and crowd-sourcing for content-creation have led to a number of cost reductions for local content creation in the Global South, building a sustainable and widespread culture of reading in communities requires a strong local publishing industry where authors and publishers are compensated for the creation of high-quality and relevant content for their communities.

Worldreader works closely with hundreds of local publisher and author partners to acquire and create content for their school, community library and mobile phone reading programs. Their digital library currently has over 5,000 books for school and library e-reading programs and over 40,000 books in over 43 languages available for free on their mobile phone app. They have employed a tiered pricing model that allows them to pay local authors and publishers for their content while still driving down the price of their packaged books to the end user by leveraging open-source and donated books from some of the world’s top trade and textbook publishers. This allows cost reductions for implementers and continues to provide a steady profit to the local publishers.

12 M. Vanderwerff, Personal communication, November 3, 2016.
In a continued effort to support local book creation partners, Worldreader holds yearly digital reading summits in East and West Africa to build capacity among local publishing partners and provide trainings on creating digital content. By working with local publishers and authors across Sub-Saharan Africa, India, and South America to digitize their content, Worldreader has opened up an international market for these publishers to sustain their local business through international book sales without incurring shipping and printing costs. Publishers in Ghana are being paid to have their books in Kenyan schools and libraries and have opened new reader markets in Nigeria and South Africa, a development that has been made possible through the digital reading ecosystem.

The FunDza Literacy Trust is a South African nonprofit that provides another model for leveraging the digital reading ecosystem to create and distribute local content that has potential for bilingual or multilingual programs. Their Developing Young Writers program aims to enable young adults from South Africa to create content and publish it on FunDza.mobi, “a library on a phone” accessible to a wide range of data-enabled phones. Their Growing Communities of Readers program utilizes the extensive reach of mobile technology to deliver quality, locally-generated content. The organization is required to create or commission a large portion of its content “because very little local literature is made available to the general public through traditional publishing or book-selling channels”. Through FundZa, digital publishing on mobile phones has created a new production channel for local content in South Africa. FundZa has produced at least one new locally-relevant story per week for the last two and half years, which has resulted in an extremely well-resourced mobile library and a new platform for local South African writers to be paid for their content.

Initiatives like the ones mentioned above have created a compelling recent argument for a local content structure that is enabled by the digital reading ecosystem, has the potential to address the dearth of local-language content, and can involve both digital and paper books.

---

13 The FunDza Literacy Trust, n.d.
With the advance and proliferation of technology, the digital reading ecosystem comes with a set of advantages from which format-neutral reading programs can benefit. These include cost reductions in content creation, printing and dissemination, shorter turnaround for content edits and revisions, as well as a means to address the track and trace burden in content delivery.

2. COST REDUCTION AND IMPROVED EFFICIENCY

2.1. CONTENT CREATION, PRINTING, AND DISSEMINATION

The book publishing industry is often faced with barriers related to the viability of producing a certain type of content, especially when it comes to content in local languages. One of the consequences has been the pushback to local-language educational programming, and the scarcity of content in local languages is often cited as a major source for this trend. “Economies of scale for African-language publishing are hard to attain when the market for a language is still small,” summarizes a UNESCO report, supporting the use of African languages and multilingual educational programs in Africa.

Format neutrality has the potential to alleviate some of the print-related barriers that publishers are faced with in content creation, printing, and dissemination, by reducing or stripping overhead costs. As outlined in a research study commissioned by the William and Flora Hewlett Foundation on the impact of open-licensing on the early-reader book ecosystem, “the use of online content creation tools and workflows means that content creation teams (authors, illustrators, editors, and language experts) no longer need to be located in the same geographical space or to use the traditional linear workflows of the old publishing value chain”.

This new format-neutral ecosystem has allowed content creation teams to be geographically spread and enabled local content creators to be more actively involved in the development of early literacy materials with production and printing support from better equipped publishers. As noted by Butcher et.al., “In this new model of production, [ordinary] people work cooperatively to create, translate, and distribute content to readers without relying on market pricing or managerial hierarchies to coordinate their common enterprise.”

---

16 Ouane & Glanz, 2010, p.42.
19 Ibid.
Additionally, initiatives like the ones described in point 1.1. above illustrate that creation, production and dissemination costs associated with CC books can be reduced to a minimum, in exchange for the one-time cost of an e-reading device. Their model also reduces the cost for print books to the cost of printing alone. With the proliferation of digital technologies, content distribution has become more affordable and sustainable, requiring a simple push of a button versus a distant journey on a poorly constructed road.

**Digital Hardware in the Global South**

Hardware costs have gone down substantially over the past several years, and numerous studies have outlined the advantages of certain hardware for different programs. When thinking about reading initiatives, e-readers, tablets and mobile phones have proven to be the most successful hardware tools. Rumie, a non-profit that makes access to free digital education possible for underserved communities worldwide, provides tablets at the cost of roughly USD 50, including hardware and interactive educational content (textbooks, educational games, and videos). Worldreader, through a partnership with Amazon, is able to provide donated and discounted Kindle e-reader replacements for schools and libraries in its programs in the USD 30-40 range after warranty with books available to a project account indefinitely at no additional cost. Low-bandwidth phones sell for as little as USD 10, and smartphones including accessible Android devices in the USD 30 - 50 range. ZeduPad, an educational tablet that comes pre-loaded with Zambian learning tools and applications for learners, runs for roughly USD 120 and includes the entire Zambian primary-school curriculum for grades 1-7 in 8 local languages and English, is Wi-Fi enabled, and additionally comes with iSchool multimedia lessons, adult literacy, health education, and farming applications. When compared to a program that would provide these resources on paper, the cost would climb exponentially and require more hands-on instruction from teachers. A major concern with these devices is battery life. Battery life is generally 5 hours at the low end (e.g. Rumie tablets) and up to one month on Worldreader's Kindle e-readers when offline and depending on device usage.

Through increasingly connected societies, digital systems have allowed authors and educators on the ground the tools they need to create exactly what they require for their classes or library collections. In this way digital publishing has provided an easy set of tools that are getting more affordable every day. As ‘digital native’ kids continue to graduate from colleges they come equipped with these digital tools, even coming from remote villages. Digital is considered a ‘forgiving’ creation platform because it allows even end users [in the case of openly licensed books] to adjust content and then print -- i.e. insert local examples, graphics, names, vocabulary; edit out errors; and create wholly new texts based on the originals. This flexibility matters because some early literacy and numeracy requires hundreds of hours of practice, and one book can become many books for additional practice.

The Siyavula initiative in South Africa leverages mobile phone and other technologies, which in today’s world many people often own, to reduce textbook distribution costs. The project allows pupils from grades 4-12 to download mathematics and science textbooks and presentations on a number of e-reading devices (mobile phones, tablets, PCs, flash drives, CD-ROMs) for free. Written by volunteer professionals, the

--


21 The Rumie Initiative, 2016.

22 J. Baker, personal communication, October 25, 2016.
textbooks are provided to schools free of charge. This method saves the government money, costing just USD 2.80 to print and distribute when no devices are available, versus the USD 10.50 a book they previously had to pay. Siyavula has shown that locally-produced digital content is appropriate and low-cost, and can remain open access in order to benefit a greater number of learners. This distribution structure, enabled by today’s digital reading ecosystem, can result in lower prices for the end users of content. A good example is eKitabu, which has created a market for digitized local content in Kenya through their online reading platform. The organization has innovated to create a model that lowers the cost of delivering books for education in local languages by over 50% through their open architecture and partnerships.
2.2. Edits and Revisions to Materials

Cost-effective edits and revisions are a key advantage to a format-neutral approach to reading program design. The digital reading ecosystem significantly reduces the time and cost associated with correcting errors and revising lesson materials. The founder of eLimu, Nivi Mukherjee, stresses this as a major selling point for digital, telling IDG Connect in an interview, “The whole idea behind digital content is that you don’t have to wait a whole year to correct a spelling mistake. You can change that mistake immediately.”

Case Study: Bridge International Academies

Bridge International Academies is one of many organizations leveraging technology for revising materials in real time. Teachers teach using a standardized curriculum in the form of scripted lesson plans on data-enabled tablets. This tablet technology allows Bridge to monitor lesson pacing, record attendance, track assessment scores, and update or add lesson scripts in real time. This data is then uploaded daily onto a central server where it can be reviewed to identify teacher training needs and improve the academic model. Bridge used the success of real-time lesson plan updates to build a model for student e-readers in their classrooms. The e-reading program allows students a minimum of 30 minutes a day of reading time to build a culture of reading and improve literacy in their classrooms.

Opportunities for editing and revising content efficiently can be incredibly beneficial to governments implementing educational programs. For example, in Ghana, the language of instruction policy has changed a dozen times since independence. This has meant frequent adjustments to curricula and leveled readers. The ability to digitally adjust and upload content through a local server, internet connection, or flash drive makes it much more likely for early educational programs to stay on track and materials to stay up to date. Boresha Limited in Kenya has demonstrated this through their e-learning interventions that provide a similar learning benefit to textbooks through educational software aligned with the Kenyan government’s 8-4-4 curriculum at 10% of the cost. This is largely due to the revision benefits of digital content. The company advertises that, “any changes in the curriculum or new content can easily be uploaded and disseminated to the learners and the teachers immediately.” The agility of digital content and offline servers can thus drastically improve the quality and speed of educational materials revision and re-distribution to help avoid costly investments in material improvements that rarely make it to schools on time.
2.3. Track and Trace in Content Delivery

The track-and-trace burden relates to challenges of distributing books in low-income and infrastructure countries in which, oftentimes, when textbooks and supplemental reading materials are ordered and shipped, they do not end up in the hands of the students who need them. As outlined by the All Children Reading Grand Challenge for Development, “The first step in solving this problem is the ability to track books in transit and trace them to their destination.” The digital reading ecosystem has the capacity to simplify the track-and-trace process by consolidating hundreds of books into one device, resulting in less physical items to ship. It also provides for automated track-and-trace processes when devices are connected to Wi-Fi or a 3G network. Furthermore, once hardware is delivered or acquired, books can be easily sent to the devices when they are connected to the Internet or a local server. All this makes physical delivery of devices an easier and one-time cost and uploading new books to devices an automated and lower-cost process.

Much of these digital distribution pipelines need to be researched better at scale and analyzed more closely for cost efficiencies. Since the majority of the digital reading programs outlined in this paper are focused on one district and often individual school and library settings, there is not yet a clear basis for comparing the track and trace of digital books to the track and trace of paper books in a country-wide school based educational intervention. Nevertheless, a number of digital innovations continue to add promise to improved efficiencies in the book distribution pipeline. Radio-frequency identification (RFID) for example, uses radio waves to identify objects or people by tagging them with a small electronic device that contains identifiable information. The tags cost as little as a few cents and allow for real-time book or device tracking. If used on a large scale, the additional costs of tagging and tracing 100 books vs. one e-reading device loaded with 100 books would have huge implications. With a format-neutral approach, these types of digital solutions could affordably ensure that books are reaching the schools and students they are intended to serve. Putting such a system in place on a large-scale basis would require a number of local capacity-building processes led by governments, but the long-term impact would have huge implications for a number of education systems in the Global South.

2.4. Cost-Efficient Digital Reading Program Design

Cost savings as a result of digital reading programs are now a reality. In a recent study, Results for Development and International Education Partners showed that in school reading programs where all students participate in structured reading activities, providing each student with 42 books on one e-reader is estimated to be about 30% less expensive than a comparable program with paper books (USD 10.23 instead of USD 14.17).

---

30 InnoCentive, 2015.
31 InnoCentive, 2015.
If the school or student already owned devices, the cost per student falls even further, to USD 7.43 for digital programs. Literacy specialists recommend a student to book ratio of 1:1 or 2:1 in order to have a successful reading program. This ratio allows students enough contact time with the books to get the reading practice they need to succeed in school. While a number of cost analyses need to be done to further explore the move to digital reading programs at the national level, they are already showing great potential for cost reductions and improved reading programs in multilingual schools throughout the Global South.

Government Case Study: Kenya’s Digital Reading Programs

The Kenyan government has made real progress in outlining policies that support digital reading. Inspired by studies that have shown that the use of e-materials in learning could expedite the provision of education to poorly served areas, the Kenya Institute of Curriculum Development (KICD) digitized standard one content in late 2015. The Kenyan Ministry of Information, Communication and Technology selected 150 schools to conduct a pilot, which started at the end of February 2016. This will later extend to a targeted 22,000 schools around the country. This move by the government has set the stage for the provision of digital content in schools across Kenya. Kenyan publishers have proven very responsive and hopeful that this government-driven initiative will be sustainable.

Through the Kenya National Library Service and a partnership with Worldreader, Kenya’s libraries have also begun to go digital. The LEAP (Libraries, E-Reading, Activities, Partnership) digital library project strategically aligns Kenya’s libraries with technology to provide new innovative services for digital reading. Aimed at building up a culture of reading in Kenya, the two-year project builds on Worldreader’s successful e-reader LEAP pilot, which tripled visitors in eight libraries in Kenya. Launched in April 2016, the initiative will make more than 580,000 digital books in Kiswahili and English available to Kenyan communities in 61 libraries over the next two years. The program includes a training component from Worldreader that will equip librarians with best practices to deploy the devices and engage with local communities, before turning the program over to the Kenyan government to sustain.

Worldreader has designed a project with a cost-effectiveness analysis component to hypothesize what the cost of a digital reading program might look like at scale. Preliminary cost data are very promising when devices are shared across grade levels with 2-4 students sharing devices in each classroom. Over 5 years at a school, the cost of a tablet and books per student in a digital e-reading program can go as low as USD 1.67, with 4 students sharing a device loaded with 200 books across 3 grade levels. Worldreader is in talks with funders to conduct this study, in order to measure the effect of the project on literacy improvements, and thereby to be able to gather cost-effectiveness data.

---

33 Results for Development & International Education Partners, 2016, pp.41-42.
34 Worldreader, 2014
35 Worldreader, 2016
Governments, organizations, school administrators and funders all need to show that their interventions are having a measured impact. Embracing format-neutrality will allow education stakeholders to access better data through digital systems. The digital reading ecosystem continues to innovate to provide relatively instantaneous data on reading behavior and engagement. Digital platforms like Jellybooks, FunDza, MXit, Worldreader, eLimu and Bookly are able to collect instantaneous data on reader reactions to book content in order to understand what content is most engaging and appropriate for certain demographics of readers in different places all over the world. Getting this level of data from the paper book market would require a series of costly and time-consuming focus groups and interviews. At the same time, collected data on digital books can go a long way toward helping publishers make informed decisions about the print versions of their digital titles.

MXit in South Africa and Worldreader are able to collect similar usage data through their respective mobile reading apps. By using MXit, the most popular social network among teens in South Africa, to distribute digital books, reading initiatives like Bookly, FunDza and m4Lit have been able to pull data on audience impact and reader behavior, including page views, reactions to books across age groups, gender, and geographical regions. Worldreader similarly gathers information on how, how long and where readers engage with specific books. For more information on each of these initiatives, refer to Appendix I.
Unlike traditional paper book libraries, digital libraries are able to use data to feature engaging content in certain regions and provide feedback to publishing and author partners to determine market demand and improve book quality and reader experience. FunDza and Worldreader have leveraged mobile platforms to place in-app surveys at the end of books for reader feedback and data collection. Likewise, Pratham Books in India leverages digital books to determine market demand for local content. This way, they reduce printing costs by only printing books that demonstrate a market demand. Thus, the accessibility of digital book data is feeding the local print book market in a symbiotic relationship. Through partnerships with telecoms companies these mobile features can also be used to push content to student devices weekly in line with curricula. The Nal’ibali initiative in South Africa has taken this approach.

As outlined in the 2016 Millions Learning Report from the Brookings Institute, “One of the best weapons against the status quo is actionable data” (p.98). They go on to highlight the value of this data for local markets, “Worldreader’s use of e-book sales data has been key in demonstrating the viability of digital publishing to African publishers, by proving the existence of a robust local market and a nascent international one”(p.98). Through usage tracking and mobile surveys, Worldreader has been able to answer questions about who is reading on Worldreader Mobile in the Global South, why people are reading, readers’ attitudes and habits around reading, and what type of texts people read the most. The data collection process found that although mobile readers in developing countries are primarily male, women spend far more time reading on mobiles than men. Likewise, mobile reading was found to positively impact children, and people who read on mobile devices read more in total (UNESCO, 2014).

FunDza discovered similar findings through their mobile data collection including, “that all participants were highly motivated to read: an average of almost 700 pages were read, per user, over the four-month period. Interestingly, girls were found to read more than boys: the average number of pages read by girls was 804 versus 277 for boys” (p.21). Both platforms have successfully provided access to books and begun to build up a culture of reading in hard to reach communities. Worldreader sees over 400,000 monthly readers from 50+ countries come through its web application on a monthly basis, and FundZa measures over 20,000 unique readers per week with readers sometimes leaving up to 800 comments a day on the stories they have read in the app.

A number of digital reading interventions like War Child, Dreambox, and Snapplify have taken these data capabilities a step further through gamified apps that track learner engagement and assess progress.
War Child leverages its digital learning tablet-based app platform to gather learner data. They log data directly from their digital learning devices and are able to conduct correlation analysis between user behavior logged data and student test performances at the beginning and end of their technology supported interventions. The logged data can be collected offline and includes information on the frequency of app usage, number of mistakes made, and the percentage of a game or activity that was completed. Similarly innovative, through an offline server DreamBox is able to provide classroom and student reports to teachers and school administrators based on device data and digital assessment performance. These reporting dashboards not only make a good case for data collection of user behavior, but also provide insights for teachers and administrators to identify special demands from individual students or groups (classroom, grade, school, district) that need special attention.
4.1. ACCESSIBILITY FOR THE PRINT DISABLED AND VISUALLY IMPAIRED

According to the World Health Organization, 285 million people worldwide are estimated to be visually impaired, including an estimated 46 million children and young adults. Approximately 90% of the world’s visually impaired live in low-income settings and fewer than one in ten children with a visual impairment goes to school. As outlined by the President of the International Council for Education of People with Visual Impairment (ICEVI), the unavailability of textbooks and other curriculum materials in accessible formats is a major obstacle to the learning disabled, blind and partially sighted children being able to attend school. Educating these populations requires the use of technology or books in audio or in braille which are quite hard to come by in much of the Global South. The technology exists, it is just an issue of getting accessible and affordable devices into the hands of print disabled learners around the globe. Accessible technologies incorporate large print and audio options, but go beyond that with screen readers, braille displays, and screen magnifiers.

Working with these different populations of people with print disabilities means access to inclusive education and accessible technologies that can be tailored to a reader’s needs and level of impairment, a feat that is only possible with newer technologies. Many of the most efficient accessible specialized devices, including screen readers and braille displays are expensive, yet there are a number of organizations working to provide low income populations with disabilities with access to these tools. There are also mainstream tools that provide accessible formats to print disabled and visually impaired people who choose audio. Those tools run on Android and iOS phones and tablets, and on computers. They can play an audio file, provide audio synchronized with highlighted text, and provide adjustable fonts and text sizes. While the specialized devices may be financially out of reach for many in the Global South, the mainstream tools are low cost and, in some cases, free.

Benetech has done a great deal of work to create an accessible international library of content inspired by a finding in 2001 that only 5% of print materials worldwide were produced in accessible formats and thus

---

47 Perkins School for the Blind, n.d.
49 Perkins School for the Blind, n.d.
50 Low, January 2015, p.19.
51 Personal communication, Brad Turner, November 30th, 2016.
usable by people with visual impairments, physical disabilities and/or learning disabilities that require special formatting and/or features. In response they started their Bookshare program and have built the world’s largest online library of accessible books that can be used on a variety of digital devices including tablets, mobile phones, and computers by the print disabled (including the blind, visually impaired, and learning disabled).52

Perkins International, a branch of Perkins School for the Blind and the creators of the Perkins Brailler, a braille typewriter, has led a variety of technological innovations for the visually impaired including the SMART Brailler. The SMART Brailler is a digital device for learning that offers visual, audio and tactile functions built for persons with visual impairments. It allows the user to save files, login with an account and ask interactive test questions to help visually impaired students learn.53 The new device translates the braille into roman letters audibly and on an attached screen to help students learn faster and allow for better communication between the visually impaired and sighted teachers or parents. The device is compatible with 11 different languages.54

A number of innovations have also been adapted to facilitate reading for those with dyslexia and other learning disabilities that can lead to a print disability. These innovations include the BeeLine Reader 55 and Spritz 56 that have designed interactive and alternative fonts and coloring to help readers process text more easily and more quickly. These programs along with the discussed accessibility features and content for the print disabled that meets EPUB3 and DAISY standards 57 provide a level of interactivity and adaptability that is only possible through the digital reading ecosystem.

52 Benetech, 2016.
54 Perkins Solutions, 2016.
55 BeeLineReader, 2016.
56 Spritz, 2016.
57 The DAISY Consortium is an organization that strives to make e-books accessible for everyone by contributing to the development of open accessible standards (DAISY, EPUB 3) and supporting inclusive publishing efforts around the world. Visit www.daisy.org for more information.
4.2. ACCESSIBILITY FOR THE PHYSICALLY DISABLED

There are a number of physical disabilities that can also be aided through digital innovations for those with motor and coordination disabilities who have trouble turning a page or holding a book. A basic e-reader or phone with touch screen technology can be used to turn a page with a simple touch. The King George VI Centre in Zimbabwe that serves physically disabled and deaf students provides a good sample for this model. The center uses e-readers to provide students with access to books in order to reduce physical challenges associated with page turning and provide greater adaptability in font size and style. A number of pointing tools can also be leveraged to manipulate these digital outlets to improve accessibility to digital content for people with cerebral palsy and other more severe physical disabilities.

These innovations among others are leveraging technology and the digital ecosystem to improve learning and provide a space for reading and access to information for populations with disabilities.
CONCLUSION: THE DEMAND FOR DIGITAL READING

“The examples of digital disruption and subsequent innovations in content creation and printing of materials illustrate that there are new, exciting ways in which this industry can be helped to develop that can simultaneously meet the goals of early literacy initiatives and contribute to growing local publishing capacity. If, however, large-scale literacy initiatives simply continue to invest in traditional publishing value and supply chains, the likelihood of building this capacity locally will be undermined, as these new ways of operating will typically be overlooked by such initiatives.”

With format neutrality we envision a world with thriving local-publishing ecosystems, the leveraging of digital tools to improve access and impact of reading programs, and the accessibility of content for the underserved. Digital books now make it easier for us to create and distribute local-language materials, lend themselves to a more efficient supply chain, and provide data for decision making. The advantages of digital books, combined with cost data and growing demand from governments, make it clear that digital formats should be considered alongside paper in the design of any reading program. While paper books will always have their place, the advantages of digital books are too many and too strong to ignore. Digital reading is here to stay, and will only serve to benefit those in need of inclusive and quality educational opportunities throughout their lives.

As the final decision makers on educational materials acquisition and program planning, local governments will play a vital role in moving digital reading forward. As supported by a survey report on ICT and education in Africa by InfoDev and the World Bank, most ICT education sector policies in Africa recognize the need to develop local digital content and to build digital literacy in their populations. Digital reading interventions accomplish both these goals. Yet, as governments continue to take advantage of the value adds and cost reductions that digital reading programs allow, clear strategies to facilitate transitions and build the necessary capacity to support digital reading must be put in place.

In order for format neutrality to be properly leveraged to improve access to books, we must invest in systems that support the scaling of digital initiatives and build local capacity to sustain and adapt for a future that is already building around technology and innovation. This process requires:

---

60 Butcher, Hoosen, Levey & Moore, 2016, p.31.
1. Further cost-effectiveness studies on different digital reading program models vs. paper-based reading program models.
2. Building trainings and capacity building for digital reading programs at the government level and among local digital content creators and publishers in the Global South.
3. Consensus around formatting for digital books within the development community (e.g. EPUB3) to streamline book sharing and distribution and reduce digital conversion costs.
4. Further research on technical investment costs and archiving for digital reading programs.
5. Continued investments in innovation to improve access and distribution of books.

As we build up and streamline the digital reading ecosystem, it is important to remember the real goal of these interventions - getting books in the hands of learners to support sustainable, equitable education and lifelong learning for all. With the correct support from local and national governments and educational organizations to make some basic educational infrastructure changes, accessible digital solutions will continue to expand and have real, lasting impact at scale.
REFERENCES


• J. Baker, personal communication, October 25, 2016.


• Vanderwerff, M, Personal communication, November 3, 2016.
## APPENDIX I: Summary of Approaches and Organizations that Leverage the Digital Reading Ecosystem.

<table>
<thead>
<tr>
<th><strong>CORE APPROACH</strong></th>
<th><strong>DIGITAL EDGE</strong></th>
<th><strong>SAMPLE INITIATIVES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Providing Locally-Relevant Books</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Locally Relevant Content</td>
<td>Create and/or crowd-source high-quality local-language books at low-cost. Pass on cost-savings to end-users through free openly-licensed books or low priced commercial models.</td>
<td>Lower production costs for books, with volunteer labor, low-cost distribution and no print-runs.</td>
</tr>
<tr>
<td>1.2 Bolstering the Local Publishing Industry</td>
<td>Contribute to the creation of a strong local publishing industry where authors and publishers are paid to create high-quality and relevant content.</td>
<td>Apply tiered-pricing and licensing models to pay local authors and publishers, and invest in building local capacity.</td>
</tr>
<tr>
<td>2. Cost Reductions and Improved Efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Content Creation and Dissemination</td>
<td>Reducing or stripping overhead creation, print and distribution costs through crowd-sourcing and creation designed around user need.</td>
<td>Eliminating high print run costs for small batch publishing in local languages and leveraging digital technologies to collaborate for higher quality locally-relevant books.</td>
</tr>
<tr>
<td>2.2 Content Revisions</td>
<td>Correct mistakes and make revisions to materials at lower-cost and with much faster turnaround times.</td>
<td>Editing and redistributing content is comparatively simple and rapid by eliminating the need for print runs.</td>
</tr>
<tr>
<td>2.3 Track and Trace</td>
<td>Verify that books have arrived using digital tracking mechanisms.</td>
<td>Providing further digital books in bulk at the touch of a button, making physical delivery a one-time event and lowering distribution costs and complexity. Lower warehousing costs.</td>
</tr>
</tbody>
</table>
2.4 Cost efficient device sharing models

Share books across grade levels and classrooms to provide cost-effective solutions for reading programs in schools. Devices can hold hundreds of books allowing devices to be shared and loaded with books for different grade and reading levels in a variety of languages.

Worldreader, IREX, Bridge International Academies, Pencils of Promise.

3. Data Collection and Use

Feedback to publishers to improve book quality and curate book collections to increase engagement, use popularity metrics to decide which books to print, and track learning outcomes through data mining and automated assessments.

Digital books provide automated, real-time information on reader behavior and engagement and allow real time assessment of learning outcomes.


4. Accessibility for the Print and Physically Disabled

Making reading content available to people with a variety of physical and print disabilities and visual impairments through text-to-speech, audio, font adjustments, and braille and light displays.

Flexible formatting, audio components, touch screen interactivity and adaptability open the door to learning and reading for people with a variety of disabilities and visual impairments.

Benetech (Bookshare), Perkins International, BeeLine Reader, Spritz.

ORGANIZATIONS USING DIGITAL READING TO COLLECT DATA ON READERS

JELLYBOOKS offers e-books to readers for free on any digital reading device, under the condition that readers agree to sync their usage data with Jellybooks. They then use these data to provide feedback to publishers and readers to better identify market demands and improve reader experience. Data collected include number of readers who finish a book, where readers stop reading a book if they lose interest, which chapters are the most popular, which days of the week people are commonly reading and for how long during each session.62

WORLDREADER uses an application optimized for inexpensive phones to reach children, families and adults on devices they already own. This is a low cost approach that severely reduces the cost of transporting books to their final destination by relying on the increasing ubiquity of mobile infrastructure to transmit books electronically. It is also an incredibly effective way of enabling readers to read more and read better.

62 Jellybooks, n.d.
Worldreader has developed web and Android-based applications available free at read.worldreader.org. The app provides access to books in over 43 languages across genres including Caine Prize winning short stories, Harlequin/Mills & Boon romance, practical how-to material from PACE, Sesame Workshop children’s books, life-saving health information from the WHO, Global Strategies for HIV Prevention, CK-12 textbooks and more.63

ORGANIZATIONS USING THE DIGITAL READING ECOSYSTEM TO CREATE LOCAL RELEVANT CONTENT

AFRICAN STORYBOOK, for example, is a South African-based initiative that helps address the shortage of contextually appropriate books for early reading in the local African languages by leveraging the digital reading ecosystem to rapidly create and disseminate CC content. The project allows users of the African Storybook website to create their own versions of children’s stories, by using the website’s image bank or drawing their own illustrations, translate stories for early reading into an African language, or adapt them for a different reading level or context. The initiative also works with parents, teachers, librarians and literacy development organizations in Southern and Eastern Africa to both develop stories and learn from their use.64 Newly generated and versioned stories are published on African Storybook’s website, which provides open access to hundreds of storybooks and thousands of translations in 73 languages, 68 of which are indigenous African languages.65 The initiative takes the approach of marking the content they have curated with a stamp of quality assurance and relies on readers to surface the best independently created content by using a book rating system and comments section.66

BOOK DASH is another South African-based project that uses the digital reading ecosystem to create new African storybooks for children that anyone can freely translate into African languages and distribute under a CC license. It organizes regular book creation events, or Book Dashes, which gather volunteer creative professionals to create new children’s stories in local languages. The organization plays a critical hands-on role in vetting content creators.67 Afterwards, the story books get published on the Book Dash website and are made available for free translation, downloading, printing, and distribution. Many of these stories have been distributed digitally through Book Dash’s partnerships with FundZa, the Project for the Study of Alternative Education in South Africa’s Nal’ibali campaign through their MXit app, and Worldreader.68

63 http://www.worldreader.org/what-we-do/worldreader-mobile/
64 Norton, 2015; African Storybook, n.d.
67 BookDash, n.d.
68 Attwell, 2014.
69 Worldreader, 2016b
**STORYWEAVER** is an initiative of Indian not-for-profit publisher Pratham Books and serves as a digital platform which provides free access to good children’s CC stories that are written in languages close to the culture of kids in South Asia and are set in surroundings familiar to them. The stories span a variety of genres -- from tickling children’s imagination to exploring educational concepts -- and can be read digitally, downloaded onto digital devices, or printed. Similar to African Storybook, Pratham Books has embedded tools for content creation on the StoryWeaver website, such as an image bank and story templates, which allow people to write storybooks, adapt the content into other languages and versions, and publish it on the website. Likewise, the organization works with parents, teachers, librarians and some of the country’s renowned authors and illustrators to facilitate content creation.

**BLOOM** is another project that has begun to leverage the digital reading ecosystem to fulfill the demand for content in local languages worldwide. An initiative of US-based SIL International, Bloom is based on a notion that “learning to read well, and developing a love of reading, takes lots of books” and aims to provide low-literacy language communities with books in their own languages. Bloom’s online Book Library provides a collection of CC shell books from around the world for individuals and organizations to translate from the source language into a local language as well as simple templates and a picture dictionary to create new versions. Their library contains hundreds of books in local African and South Asian languages, among others. Initiatives like this have allowed organizations like World Vision to access a variety of resources and adapt them to the context of local communities. The contextualized resources are then uploaded into the resource library for others to adapt, use digitally, or print on demand.
APPENDIX II: Digital Reading Program Roadmap

Theoretically, there are many advantages to building digital reading programs, but practically, what does it take to build a successful and sustainable digital reading program? There are three important steps to building out a digital reading program that leverages local content, data collection and cost reductions:

**STEP 1: Designing and completing a pilot program.** Each geography is different and with it come specific challenges in terms of electrical infrastructure, security, training, and linguistic and material needs. A pilot program will help outline these challenges and build paths to surmounting them before a digital reading program is able to scale and grow.

**STEP 2: Government agencies realize the benefits and start to adopt digital platforms and create policies around digital materials distribution and creation.** Just as the head of eLimu has put pressure on the Kenyan government to approve digital publishers who are authorized to put up educational content according to pre-decided guidelines, certain policies and pipelines need to be established at the government level in order to sustain and build a successful digital reading initiative. These policies include: digital curriculum publishing guidelines, selection of locally appropriate hardware, established internet connectivity and distribution networks, training and capacity building for teachers, administrators, library staff and other implementers, and the establishment of digital data collection and security protocols.

**STEP 3: Entire large scale government adoption** - A brave new world where cost savings are even greater and sustainable. While this third and final step has not yet been fully realized, as noted in the case studies outlined above, governments like Kenya, South Africa, and Zambia are getting closer and closer to this final step every day. Likewise, education providers like Bridge International Academies and Pencils of Promise have successfully leveraged digital reading initiatives to improve lesson plans and generate reading initiatives in their classrooms.