



**USAID**  
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# BEST PRACTICES FOR DEVELOPING SUPPLEMENTARY READING MATERIALS

**FINAL REPORT**

**FEBRUARY 2014**

This report was produced for the United States Agency for International Development by blueTree Group, representing JBS International, Inc.

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**DISCLAIMER:**

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

## ACKNOWLEDGMENTS

Various expert organizations have provided valuable contributions to this research paper, including insights into their choices in the selection and provision of supplementary reading materials.

We wish to thank Room to Read, TNO, the Molteno Institute for Language and Literacy (Molteno), Pratham Books, literacy expert Helen Abadzi, and SIL LEAD and literacy expert Abby Blanton for their pedagogical and practical contributions to the topics discussed. This research has benefited from numerous consultations with and feedback from different members of their teams. Our gratitude also goes out to Tessa Welch from the African Storybook Project, Arthur Attwell from Paperight, Brett Simpson from the Breadbin Interactive Freedom Toaster, educationalist Dr. Michael Rice, and Danielle Zacarias from WorldReader for sharing their knowledge and passion for improving the quality of education by unlocking the potential of digital reading materials in places where access is now very limited. The selection of these experts was based on their field experience in developing countries and their focus on providing supplementary reading materials to children.

The first chapter of this paper has been written by Nelia de Villiers, education expert from Jika Training and Communication. Her excellent research skills combined with practical experience in South Africa produced valuable insights into issues of font types and sizes and letter and word spacing. The remaining chapters were written by the blueTree Group, whose graphical knowledge is derived from working across the world. Cost indicators are provided by the Paarl Media Group, a professional printer that operates in a developing country context, providing insights into the operational and management challenges of local and regional printers.

This research aims to provide a solid base for discussion on how best to improve reading skills among early grade readers in developing countries; it is hoped that this work will serve as a building block for future research and collaboration on this important topic.

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## ACRONYMS

ACALAN	African Academy of Languages
CMYK	Cyan, magenta, yellow, and black (the four colors used for printing)
CoC	Chain of Custody
FSC™	Forest Stewardship Council
GSM	Grams per square meter
ICDL	International Children’s Digital Library
NGOs	Non-governmental organizations
NISO	National Information Standards Organization
OERs	Open Educational Resources
PEFC	Programme for the Endorsement of Forest Certification
PRAESA	Project for the Study of Alternative Education in South Africa
PUR	Polyurethane glue
SABDC	South African Book Development Council
SAIDE	South African Institute for Distance Education
SIL	Formerly the Summer Institute of Linguistics, now SIL International
StAAf	Stories Across Africa
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Netherlands Organisation for Applied Scientific Research)
USAID	United States Agency for International Development
USD	United States dollars

## GLOSSARY

**Amblyopia** is commonly known as "lazy eye." The eye appears healthy, but visual information is not transmitted or recognized properly through the visual and neural systems.

**Automaticity** can be defined on three levels: on the letter level it implies quick and effortless identification of letter sounds, on the word level it implies quick and effortless word recognition or decoding, and on the text level it implies a fluid pace in reading connected text.

**Book Poverty** is used to refer to the extremely low textbook-to-pupil ratio in developing countries.

**Critical Word Factor** is a function of the high-frequency words and the decodability of words targeted in the curriculum.

**Dyslexia** is a chronic neurological disorder causing inability or great difficulty in learning to read or spell, despite normal intelligence. It inhibits recognition and processing of graphic symbols, particularly those pertaining to language.

**Early Grade Readers** are defined in this paper as the pupils in the first 3 years of primary school.

**Font** is a particular size, weight and style of a typeface.

**Information Recall** is the ability of people to access stored information without being prompted or reminded.

**Interface** is an intermediary by which two systems communicate with one another. People and computers cannot (yet) communicate effortlessly. Humans interpret information on the basis of, for example, words and images, whereas computers read information through codes and numbers. An interface translates one set of information into understandable information for the other.

**Milling** refers to the process when pages are folded into a signature: the sides that will be glued into the cover will be cut to make the edges rough so the glue can set properly.

**Orthography** is a standardized system of using a script to write a particular language. It includes issues such as spelling, hyphenation, capitalization, word breaks, emphasis, and punctuation.

**Scale** is defined in this paper as the size of the print run. Various scales merit different production methods.

**Script** is a system of writing used for one or more languages.

## INTRODUCTION

Goal 1 of the USAID Education Strategy aims to improve the reading skills of 100 million children in the primary grades by 2015. This paper captures the highlights of existing research concerning best practices in certain areas of supplementary reading materials development for early grade students. It covers the issues of font type and size, letter and word spacing, color and its cost implications, trim sizes and binding methods, paper, production methods and scale, and the potential possibilities of a digital platform of supplementary reading materials.

Existing literature, including empirical studies, relevant journal articles, and reports from international organizations, informed this paper. Information was systematically collected, then checked, validated, or refuted by expert organizations working in the field. Consulting with expert organizations was particularly valuable since the focus is on providing supplementary reading materials in a wide variety of countries and languages and many decisions are made at the country level.

In general, findings from the review indicate a lack of research on the effects of the visual format and design of reading materials, especially in the context of providing reading materials to children in developing countries (Praphamotripong, 2010). Final guidelines for effective supplementary reading materials would benefit from further research and field-testing to provide empirical evidence of impact on the development of literacy skills.

Access to reading materials is key to learning outcomes, especially in developing countries. To develop automaticity, children need to be exposed to sufficient and appropriate text, and they need to be afforded the time and opportunity to practice reading in school and at home. Appropriate design of reading materials will facilitate the learning process, support classroom instruction, and promote independent learning (Marinelli, 2011), provided that the content of the materials is appropriate for the context, as well as the age and reading level of the student. Content and readability are critically important to facilitate the learning process, but they are not the focus of this paper.

The first chapter of this paper discusses appropriate font types and sizes based on script and grade level, as well as best practices for letter and word spacing. The second chapter discusses the impact of using color and associated cost implications. In the third chapter, appropriate trim sizes and binding methods, which can significantly reduce the price and improve the durability of reading materials, are discussed. The fourth chapter covers the importance of paper selection, which influences the unit price of paper and sustainability. It is important to consider environmental responsibility and source paper from sustainably managed forestry. The fifth chapter discusses different production methods and scale from international and local perspectives. Finally, Chapter 6 introduces the possibilities of providing a digital repository of reading materials to increase access and the issues that should be considered in the design of such a platform. Chapter 7 sums up the conclusions and Chapter 8 provides recommendations for future research.

Overall, this paper provides suggestions for the design and physical characteristics of reading materials. In reality, however, local access to publishers or printers that can comply with these criteria might be limited and various factors may prevent external sourcing. The trend toward local sourcing exacerbates the need for local capacity-building efforts to ensure sufficient capability to comply with this set of criteria.<sup>1</sup> In the short term, some concessions may be unavoidable. Chapter 7 provides a table with do's, don'ts and alternatives to summarize the various considerations.

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1. USAID has changed its default geographic code from 935 to 937, which prescribes the sourcing of goods from low-income and lower-middle income countries, excluding upper-middle income countries such as China and South Africa. The World Bank allows the government to decide whether it prefers National or International Competitive Bidding of contracts less than 1 million USD.



## CHAPTER I. FONT AND FONT SIZES, WORD AND LETTER SPACING FOR USE IN SUPPLEMENTARY MATERIALS

### I.1. INTRODUCTION

A review of existing literature shows that little empirical research exists on the impact of font type and font size on supplementary materials (Praphamotripong, 2010). The information that exists generally focuses on the development of textbooks and not supplementary materials. However, since the purpose of supplementary materials is two-fold, to be instructional and to provide learners with reading practice, the principles that apply to textbooks may also apply to supplementary materials. This section reviews the impact of various visual elements on reading and identifies best practices.

Just as visual elements interact to produce effective materials, content interacts with visual features. Therefore, in order to produce effective supplementary materials in terms of cost and function, key educational issues must be considered. It is not the purpose of this research paper to discuss these issues in depth.<sup>2</sup> However, the topics mentioned below should inform best practices in the creation of supplementary reading materials.

1. Decodable texts gradually increase in difficulty as children learn more letter sounds (Davidson, 2014). Critical word factor refers to leveling of text. As most of the research has been done in developed countries, the "critical word factor"<sup>3</sup> should be adapted to reflect the abilities and developmental needs of children in developing countries. The different language contexts also need to be taken into account since some languages have longer words. These considerations complicate the matter of setting a critical word factor standard for readers (Hiebert & Fisher, 2007).
2. The use and value of principles underpinning the success of leveled readers, such as the Fountas & Pinnel System (Fountas & Pinnell, 2013). These principles include:
  - a. It is essential to match books to readers;
  - b. An analysis of what the reader needs to be able to do at each level to read with accuracy, understanding, and fluency;
  - c. The realization that, when the text poses enough challenge—but not too much—the child has opportunities with effective, explicit teaching to build his or her network of effective problem-solving actions.

### I.2. FONT TYPE: SERIF VERSUS SANS-SERIF

In comparing studies on the impact of font type on ease of reading, it is clear that adults and young children react differently. According to Gasser, Boeke, Haffernan, and Tan (2005), adults scored higher with serif fonts (such as Courier and Garamond) and children who are learning to read develop their reading rates faster when the text is printed in sans-serif fonts such as Helvetica. Helvetica was also found to be far less complex to understand than fonts in other non-Latin scripts such as Arabic, Armenian, Chinese or Hebrew. The features of different alphabets mean that they have varying levels of perimetric complexity, which is defined as the (squared) inside-and-outside perimeter divided by ink area. For example, the letter “*ſ*” written in *Kunstler* is more complex than the letter “D” written in *Times*; which is in turn more complex than “**D**” printed in *Times* bold.

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2. Davidson’s work discusses definitions of decodable and leveled text and their purposes.

3. Critical word factor is a function of high-frequency words and the decodability of words targeted in the curriculum.

This type of complexity influences whether a typeface is suitable for instructional texts or not. The higher the level of complexity, the less likely children are to remember information presented in the text. Table 1 below summarizes the complexity calculation for several scripts and fonts (Marinelli, 2011).

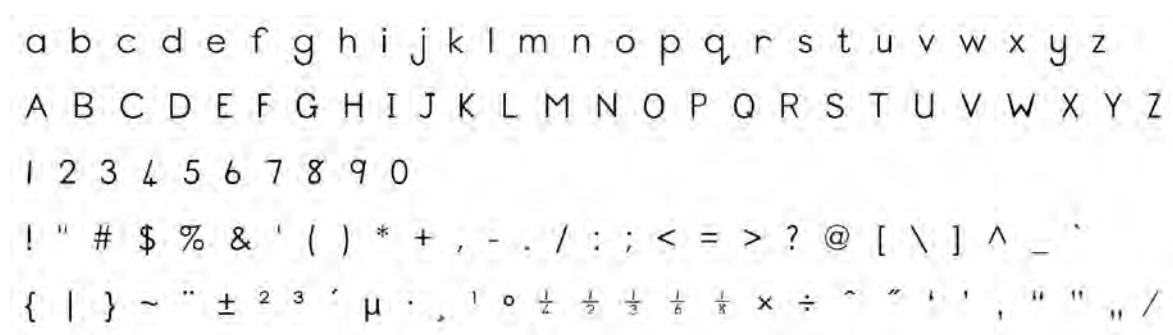
**Table 1: Complexity Calculations**

Alphabet font/script		Complexity
Courier	a	100
Helvetica	a	67
Arabic	ﻯ	137
Armenian	Ա	106
Chinese	你	199
Devanagari	अ	99
Hebrew	א	90

The uniform thickness of sans-serif fonts also supports children’s letter recognition because what they see in the book corresponds with what the teacher is writing on the blackboard and with what they are writing in their books (Keyes, 1993).

This consistency means that children are spending less time on decoding the typographic cues and more time on understanding the meaning of the text being read. In 2013, the South Africa Department of Basic Education developed workbooks in math and English for learners in grades R–3 (i.e., 5–8 years old) using a font type that was developed to precisely imitate the letters and numbers that children are learning to write (E. Fincham, personal communication, June 12, 2013). Although other fonts were similar, there were always one or two letters and numbers that did not match. An example of this font is included below.

**Figure 1: An Example of JP Typeface, Developed for Gr R – 3 Workbooks in South Africa**



The fonts most widely suggested by the research include Andika, Helvetica, Arial, Cordia New, or Levenim MT, which is an example of a non-English script. Recently, Andika was developed by SIL (formerly the Summer Institute of Linguistics, Inc., now SIL International), specifically to address the needs of beginning readers:

“Andika is a sans-serif, Unicode compliant font designed especially for literacy use, taking into account the needs of beginning readers. The focus is on clear, easy-to-perceive letterforms that will not be readily confused with one another” (Frank, 2013).

Other fonts also used to develop materials for early grade readers are ZNuscript and Myriad Pro. The table below gives examples of each font type mentioned above and information about features and availability.

**Table 2: Selected Font Types Suitable for Use in Developing Early Grade Reading Materials**

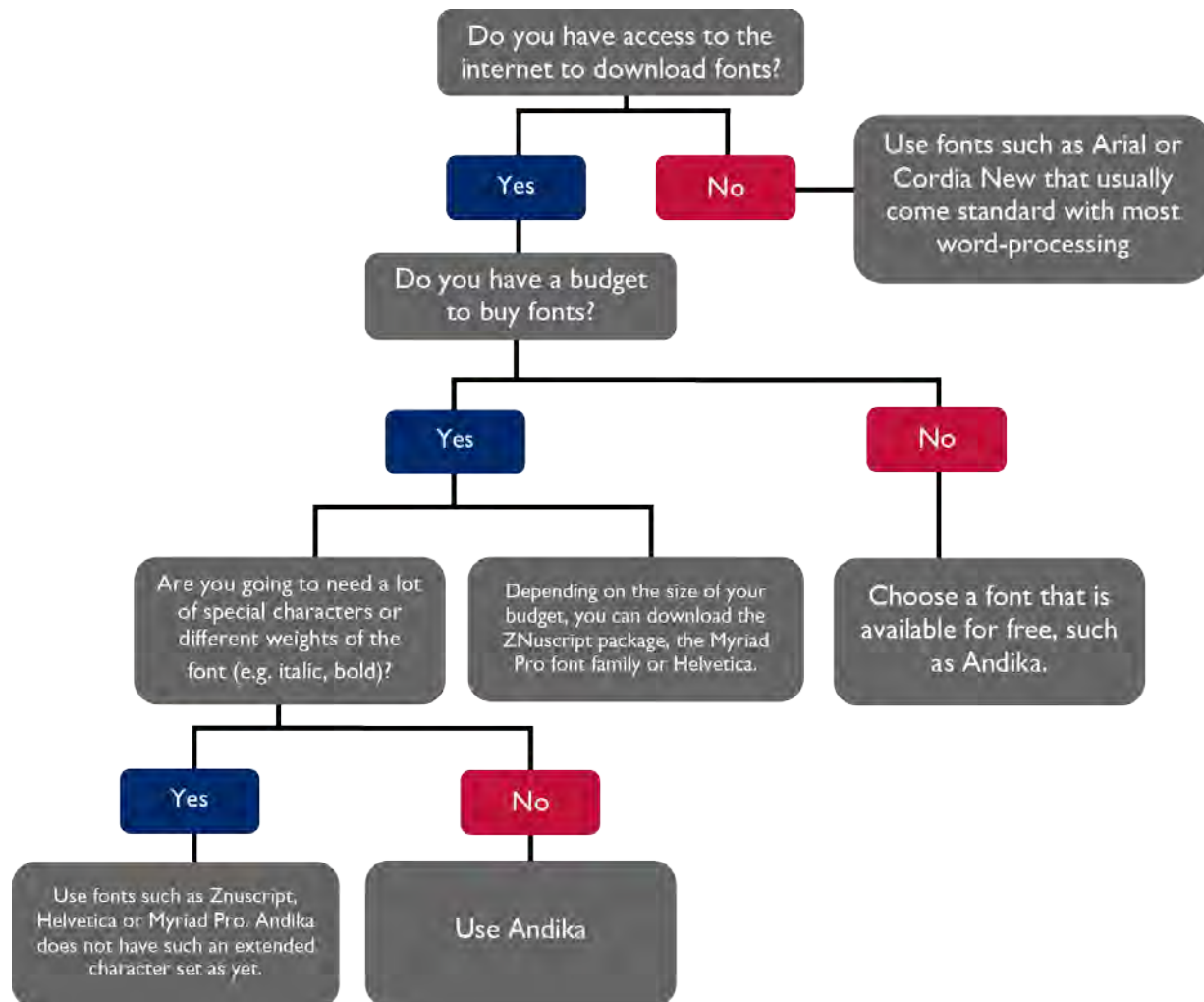
Font	Example	Notes on Features & Availability
Andika	Andika: Lazy dog	Limited range of special characters available. Available for free. Licensed under the SIL Open Font License through SIL international. Available for download: <a href="http://scripts.sil.org/cms/scripts/page.php?item_id=Andika_download">http://scripts.sil.org/cms/scripts/page.php?item_id=Andika_download</a>
Helvetica	The Quick Brown Fox Jumps Over The Lazy Dog.	Available in a wide range of variations. Available for download: <a href="http://www.linotype.com/526/helvetica-family.html">http://www.linotype.com/526/helvetica-family.html</a>
Arial	The quick brown fox jumps over the lazy dog.	Available in a wide range of variations. Usually available as part of the standard font range of common word-processing packages such as MS Word.
Cordia New	<b>The quick brown fox jumps over the lazy dog.</b>	Usually available as part of the standard font range of common word-processing packages such as MS Word.
Levenim MT	היטיס מתעופף	Available for download: <a href="http://font.downloadatoz.com/font,78165,levenim-mt.html">http://font.downloadatoz.com/font,78165,levenim-mt.html</a>
ZNuscript (developed by Zaner-Bloser)	The quick brown fox jumps over a lazy dog.,;÷× <small>ZNuscript</small>	A range of font variations (such as dotted letters or letters with arrows) that can be purchased to create worksheets and exercises for grade R to grade 4 learners. Accented characters for foreign languages and all symbols are available. Available from: <a href="https://www.zaner-bloser.com/zb-fontsonline-plus">https://www.zaner-bloser.com/zb-fontsonline-plus</a> or <a href="http://www.schoolfonts.com/cursive-font-blockletter/_Letters_zaner-bloser_style.htm">http://www.schoolfonts.com/cursive-font-blockletter/_Letters_zaner-bloser_style.htm</a>
Myriad Pro	the quick brown fox jumps over the lazy dog.	A sans-serif font type with extensive variations and features that is comfortable to read. Available for download: <a href="http://store1.adobe.com/cfusion/store/html/index.cfm?store=OLS-US&amp;event=displayFontPackage&amp;code=1706">http://store1.adobe.com/cfusion/store/html/index.cfm?store=OLS-US&amp;event=displayFontPackage&amp;code=1706</a>
Links to sites where a range of sans-serif fonts can be downloaded for free:		
<ul style="list-style-type: none"> <li>• <a href="http://font.downloadatoz.com">http://font.downloadatoz.com</a></li> <li>• <a href="http://www.fontspace.com/category/sans-serif">http://www.fontspace.com/category/sans-serif</a></li> <li>• <a href="http://www.fontsquirrel.com/fonts/list/style/Sans%20Serif">http://www.fontsquirrel.com/fonts/list/style/Sans%20Serif</a></li> <li>• <a href="http://fontzone.net/font-details/microsoft-sans-serif">http://fontzone.net/font-details/microsoft-sans-serif</a></li> </ul>		

A contentious issue when it comes to choosing fonts is illustrated by the table above—and that is the rather marked differences between the "a" and "g" of the different fonts. According to Wilkins, Cleave, Grayson, and Wilson (2009), the "two-story adult" forms of these letters may be preferred by children who are learning to read because they are less confusable. All of the fonts depicted in the table, except ZNuscript, distinguish clearly between the "a" and the "g." The manner in which Andika distinguishes

between the "a" and the "g" is preferable though, because it is also closely linked to the way in which students are supposed to learn to write the "a" and the "g."

The table above presents many options for choosing a suitable sans-serif font for the development of supplementary reading materials. However, practical considerations might influence developers' ultimate choice of font(s), especially in developing countries. The diagram below highlights some of the questions that might influence choice of font: Internet availability to access downloadable fonts, budget available to purchase fonts that are not free, and whether or not the fonts will be used for languages that require special characters.

**Figure 2: Choosing the Right Font for Supplementary Materials for Early Grade Readers**



### 1.3. FONT SIZE

Font size influences typographic tonality, which is the relative amount of ink per square inch/cm/pica. The less typographic tonality, the more "white space" there is on a page and the easier it is to read (Keyes, 1993). Typographic tonality is intricately linked with the issue of word and letter spacing, that is, the amount of words per line and the number of lines per page.

An increase in font size will improve reading rate until the rate of increase reaches a plateau, called the critical print size (CPS). The reading speed of learners aged 8–11 years is less dependent on letter size than that of 5– to 7-year-olds. As the print size decreased below the CPS, the reading speed of 5- to 7-year-olds decreased as well, whereas the reading speed of 8- to 11-year-old children was less dependent on letter size (Marinelli, 2011).

Another study shows that increased font-size might increase comprehension. Sentences were presented to a group of 7- to 8-year-olds in a font one size larger than is typical for use in materials for 5-year-olds. The difference in size was approximately 19 percent, which resulted in an increase in reading speed of 9 percent (Wilkins et al., 2009).

These studies support the recommendation that font sizes in supplementary materials for children in the early grades of school should be bigger:

*Overall, the results indicate that [font] size affects reading rate in English speaking observers during the first two years of schooling during which children optimize the visual processing involved in word decoding. In addition, they indicate that beginner readers require a much larger letter size to achieve optimal reading. The critical print size in this case is roughly 1.2 deg [degrees], considering a viewing distance of 40 cm (which is the distance spontaneously used by children); these letters measure around 0.84 cm, which is equal to 24 pt (post script points) (Marinelli, 2011, p.45).<sup>4</sup>*

**And**

*...the typeface in most reading schemes is typically too small for the rapid silent comprehension of simple meaningful sentences (Wilkins et al., 2009, p.410).*

There can be great variations in font size in children’s textbooks depending on language, since scripts differ in actual image size (i.e., the amount of space taken up); the appropriate font size will differ by script. Designers should “choose the maximum permissible line length that, when related to type size, will not obstruct the proper and sensible phrasing of the information” (Hartley, 1994, p. 920).<sup>5</sup>

**Table 3: Recommendations for the Choice of Font Size<sup>6</sup>**

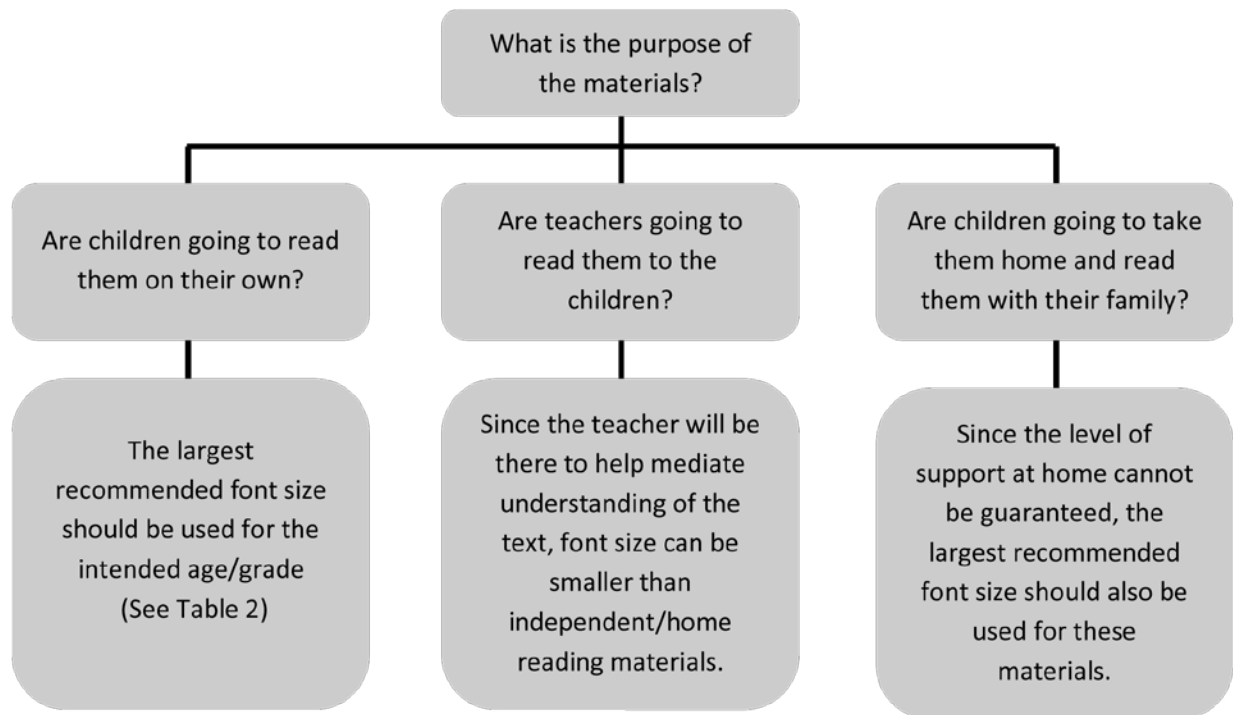
Visual Aspect	Grade R (± 5 years)	Grade 1 (± 6 years)	Grade 2 (± 7 years old)	Grade 3 (± 8 years old)
<b>Font Size</b> - Depends on script type; all sizes provided are approximates.				
English/Latin script	30-32 points	28-30 points	26–28 points	24–26 points
Thai/Arabic script	38 points	36 points	34 points	32 points

4. Although English is specifically mentioned here, Marinelli points out that this trend can also be found in books from countries where English is not the primary language.

5. For example, Room to Read offers guidelines, but leaves the actual choice of font and font size for individual countries to decide, depending on the language(s) desired for printing.

6. The grading system used in this table and in Table 4 is the current system used by the South African Department of Basic Education for group learners in the first phase of the schooling system.

**Figure 3: Font Guidelines are influenced by the Intended Purpose of the Supplementary Reading Materials.** (Use Figure 3 in coordination with Table 3 above.)



#### 1.4. WORD AND LETTER SPACING

Readability is defined as the “sum total of all those elements within a given piece of printed material that affect the success a group of readers have with it”(Dale & Chall, 1949, p.23). Although this report distinguishes between various visual characteristics (typographic cues) such as font, font size, spacing and color, it should be emphasized that these elements work together synergistically to help a child understand and use printed information. However, when considering an audience of students who are still developing their reading ability, too many typographic cues (which include the use of bold and italic text, color, pictures, page numbers, etc.) can become distracting. Fortunately, effective spacing enables readers to process more typographic cues. Changes in the surrounding white space makes features such as headings or bold text stand out more, increasing the extent to which learners can process this information (Keyes, 1993).

Spacing issues are relevant not only for words and letters, but also for the use of illustrations. It is crucial that designers of supplementary reading materials consistently use illustrations to reinforce the meaning of words, not just to increase the entertainment factor, or to fill up a page. Both text and illustrations should be positioned consistently to provide a “frame of reference within which the learner can move about, leave and return without confusion” (Hartley, 1994, p.18). Illustrations should also be used carefully when designing materials for those learning to read (Praphamotripong, 2010). Illustrations should relate to the text but should not allow the reader to figure out the text without having to read the words (Davidson, 2014). Moreover, if illustrations are not used to reinforce the making of one-to-one links between the picture and the words, then learners can be distracted from the central task of reading comprehension (Breznitz, 1988). This finding is supported by a 2002 study conducted by Brookshire, Scharff, and Moses. The study found that students given a text-only book performed better on text-only questions than students given the illustrations-only book did on the

illustrations-only questions. This suggests that text information is more important when it comes to comprehension than illustrations (Brookshire et al., 2002).

The spacing after story titles, between titles and text, between pictures and text, and between lines can also enhance learners' ability to understand the story. If spacing decreases hierarchically (proportionally), then learners can distinguish the "information chunks" more easily. For example, if the spacing between the main heading and the subheading is four lines, then the spacing between the subheading and the text should be two lines (Keyes, 1993).

Evidence from the literature suggests the following:

- Where the number of words per line and number of lines per page are concerned, the following guidelines apply:
  - For students in grade R ( $\pm 5$  years old), there should be approximately 2 to 4 words per line and 4 to 5 lines of text per page.
  - For students in grade 1 ( $\pm 6$  years old), there should be approximately 4 to 6 words per line and 4 to 6 lines of text per page.
  - For students in grade 2 ( $\pm 7$  years old), there should be approximately 6 to 8 words per line and 6 to 8 lines of text per page.
  - For students in grade 3 ( $\pm 8$  years old), there should be approximately 8 to 10 words per line and 8 to 10 lines of text per page.) (J. Katz, personal communication, June 20, 2013); word density patterns should continue getting tighter as the year and the grades progress (Praphamotripong, 2010).<sup>7</sup>
- This progression in word density is to ensure that learners gain enough exposure to reading practice to develop their reading acuity, speed, visual span and vocabulary development.
- Leveled texts facilitate early grade readers' access to reading material that is at their reading level. "They can be placed on a continuum of difficulty, from very easy to challenging. The difficulty of a text is increased through more and longer sentences that are part of longer paragraphs and, then, part of chapters or sections" (Davidson, 2014).
- Supplementary reading materials for students in grades R–3 should also feature double spacing between lines with three letter spaces between words.
- Spacing between letters should not be expanded by more than 10 percent (i.e., more than 1.28 times the width of the lowercase x used in the normal Courier text).

Studies by Perea et al. also conclude that small increases in inter-letter spacing relative to the default spacing (e.g., hotel vs. hotel) produce faster word identification times. This was not only true for adult skilled readers but also with young readers, and to an even larger degree, for young readers with developmental dyslexia (2012).

For learners with reading problems such as amblyopia, increased letter spacing alleviates the problems somewhat; however spacing should not be increased to more than two times the standard spacing. Space increases beyond that limit have a negative impact on learners' visual span—the number of letters that can be identified at a glance—since it moves some of the letters that form part of the word-unit into peripheral vision (Levi, Song, & Pelli, 2007). It must be noted here that an increase in word and letter spacing does not improve reading rates in children with dyslexia (Martelli, Di Filippo, Spinelli, & Zoccolotti, 2009).

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7. It is difficult to prescribe a standard here, since languages differ vastly. For example, some languages in South Africa have words that can be up to 16 letters long; also, in these languages, larger numbers of words are needed to express the same concepts as expressed by an English word, phrase, or sentence.



## I.5. JUSTIFICATION

Justified text is not ideal for beginning readers. Texts that are left-aligned (for Latin scripts) and right-aligned (for scripts such as Arabic or Hebrew) define clear spatial changes for learners, making it easier to discern certain "chunks" of texts such as the end of a sentence or the end of a paragraph (Keyes, 1993).

**Table 4: Summary of Recommendations: Letter, Word Spacing and Alignment**

Visual Aspect	Grade R (± 5 years)	Grade 1 (± 6 years)	Grade 2 (± 7 years old)	Grade 3 (± 8 years old)
<b>Note on number of words per line</b>	The number of words per line suggested below is based on studies in countries where the words are of an average length. These recommendations would not be suitable, for example in South Africa, where some of the languages have words with up to 16 letters in them. These languages may also need more words to describe concepts that would only take one or two words in English. Therefore, any development of supplementary reading materials should take into account the unique context of the region and the language(s) for which they are being developed.			
<b>Number of words per line</b>	Approximately 3 to 4 words per line	Approximately 4 to 6 words per line	Approximately 6 to 8 words per line	Approximately 8 to 10 words per line
<b>Suggested spacing</b>	Three letter spaces between words and slightly expanded spacing between the letters of each word. Standard spacing: the spacing used in normal Courier text: 1.16 times the width of the lowercase x. Do not expand the spacing between letters by more than 10 percent— i.e., more than 1.28 times the width of the lowercase x used in the normal Courier text.			
<b>Number of lines per page</b>	Approximately 4 to 5 lines of text per page	Approximately 4 to 6 lines of text per page; increase density from beginning of the book to end of the book	Approximately 6 to 8 lines of text per page; density does not increase as substantially as in grade 1	Approximately 8 to 10 lines of text per page; again, the density should remain more or less the same throughout the course of the year
<b>Suggested spacing</b>	Text should be left-aligned text (for Latin scripts) or right-aligned text (for Arabic scripts) with clear, hierarchical spacing between elements such as headings, paragraphs, and lines within a paragraph. If the standard spacing is double spacing between individual lines, then there should be 4 line spaces between paragraphs and 6 line spaces between headings/titles and the first paragraph/line of text. If there is only one paragraph on the page and a heading, then there should be about 4 lines of space between the heading and text.			
<b>Bold and italic text</b>	The use of bold and italic text (excluding titles) is not recommended for early grade reading material because they are additional typographic cues that must be processed by the student. Bold text also adds to the tonality of the page, so it should be used sparingly.			



## **I.6. CONCLUSION AND ISSUES FOR FURTHER CONSIDERATION**

This chapter reviewed the impact of different visual elements on reading, identified best practices, and provided guidelines on font and spacing for the development of supplementary materials for early grade readers.

To reiterate, important contextual considerations that need to be taken in account include the needs and abilities of targeted readers and language characteristics. Matching books with readers is critical, and differentiated instruction should be provided when possible. A text that is challenging but not out of reach for a young reader can improve problem-solving, if appropriate scaffolding is present. It is equally important to consider content selection, themes, vocabulary range, and other text characteristics in the development of supplementary reading materials, but these are beyond the scope of this paper.

The majority of the research studies reviewed support these considerations and mention the lack of field-testing of many of these practices in target settings. Therefore, it is strongly recommended that field-testing of the recommended visual characteristics take place before any guidelines are formalized, released, and implemented on a large scale.

Since language and culture is at the core of supplementary reading materials development, care should be taken not to generalize findings of field tests across all developing countries. However, in order to make field-testing a reality, a representative sample from each major demographic profile can be selected to take part in such a study.<sup>8</sup> Field tests could include research on how to design supplementary reading materials for learners who have never seen printed materials before, but have only been exposed to their teachers' handwriting on a blackboard.<sup>9</sup>

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8. In terms of leveling texts, Davidson suggests the creation of national systems for leveling existing texts; this would ensure guidelines conform to the characteristics of the language(s) used.

9. Recommendation of Penelope Bender, USAID Education staff, October 8, 2013

## CHAPTER 2. THE IMPACT AND COST IMPLICATIONS OF COLOR

### 2.1. INTRODUCTION

Textbooks and other learning materials in full color are more the norm than the exception in developed countries, especially during primary grades. Developing countries are increasingly providing colored materials as well. For example, in Ghana color is used for book covers only, whereas in Uganda, covers and content of English textbooks are multi-colored (Marinelli, 2011). The cost of materials is a serious issue in these contexts. In fact, the textbook-to-pupil ratio in developing countries varies from 1:1 to 1:15.<sup>10</sup> If the ratio is already alarmingly low for textbooks, very little access to supplementary materials can be assumed, with little money available for adding color.

Unfortunately, there is little research on the impact of color on the development of literacy skills or the learning process in general. The research that exists mostly dates back to the early 1990s, was conducted in the Western world, and is based on English as the language of instruction (Praphamotripong, 2010). As a result, there is little agreement on the impact of color on reading acquisition. Non-governmental organizations (NGOs) that publish and provide supplementary materials in numerous developing countries take different stances, ranging from embracing color to refraining from its use due to the additional costs. The preliminary findings of Pratham Books, Room to Read, and the Molteno Institute for Language and Literacy (Molteno), which are operating in the field, are discussed below.

### 2.2. POSITIVE CHARACTERISTICS OF COLOR

- Some research claims that color can motivate readers, especially young readers, and those with less reading experience (Hartley, 1994; Marinelli, 2011; Praphamotripong, 2010). An early study conducted by Sorrel (1974) said that children tend to reject non-colors, and more recent research suggests children prefer the aesthetic qualities of colored reading materials (Horton, 1991). Colored reading materials are thus considered more attractive to children than their black and white counterparts (Praphamotripong, 2010). This attraction has inherent value since it may instill a love for reading in young learners.
- Colors have the potential of improving classroom instruction and facilitating the learning process, provided they are used effectively. Research suggests that colors can “cue actions, facilitate discrimination among objects, stress relationships between objects, and enhance interest in the given topic” (Marinelli, 2011 p.74). This improves comprehension of instructional materials (Hoadley, 1990), speeds search (Keyes, 1993) and supports decision-making (Horton, 1991). Figures 4 and 5 demonstrate how color is perceived independently.
- The visual information structure of a text can be improved through the use of color and/or other cues; this structure reveals the underlying organization of a text, which helps in pre-processing the content (Horton, 1991; Keyes, 1993). (See Figure 6.)
- When using one or more colors to highlight text, it is important to make sure they are used consistently (Marinelli, 2011). Color usage should be as predictable as possible in order to not strain the short-term memory of the reader (Brockman, 1991).

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10. Observations are from the blueTree Group and partners in more than 17 developing countries, mostly in sub-Saharan Africa.

- Compatibility between the color and the target improves comprehension, for example, blue for the sky, green for a forest.<sup>11</sup> (See Figure 7.) But color codes can have different meanings in different professions and cultures. The color blue for example symbolizes masculinity for Americans whereas it refers to villainy in Japan (Brockman, 1991; Marinelli, 2011). Thomas Benjamin from Room to Read noted that the impact of color can also depend on children’s previous exposure to a print rich, colorful environment.

**Figure 4: Metro Map**



Color improves search-and-locate performance. “Color coding is a way to convey information quickly, which facilitates visual search. In this Washington D.C. Metro map, as with most schematic subway maps, color-coded lines represent the different rail lines. Visual searching occurs when we actively scan the environment to locate a specific feature among many distractors. In this case, color makes it easier to visually follow the path of a rail line, speeding up the search process” (Malamed, 2013).

**Figure 5: Color Grouping**



“In Figure 5, all verbs are colored red while other parts of the text are in black. Readers are expected to recognize and differentiate verbs from other word types in each sentence. In this way, as Vetter found, the addition of colors in classroom instruction improves student’s performance in recall, search-and-locate, decision tasks, and comprehension of educational materials” (Praphamotripong, 2010).

**Figure 6: Color and Structure**

1007 Visual Timeline: The Implementation of Miniaturization 014		Man's Life 024 Concept of Personal Time 025 Baby's Technology 026
1047 Particularities of Small Screens 030 Techniques to Increase the Screen Surface Area 030 How to Divide the Screen 031	Scaling Data Networks and Applications 038 Dynamic Organization of Space 040	Screen Resolution and Display Size Stability of Reading Items 043 Screen Size 044 Mouse Technology 045
1073 Physical Interaction 050 Interaction Techniques and Elements 052 Input Feedback 056 Natural Mapping: The Position of Control Elements 061 Natural Mapping: The Movement of the Control Elements 062 Motor Memory 063	User-friendly GUI Any Design? 064 The Input Solution 065 Interactive Interaction Elements 068 Alternative Forms of Physical Interaction 070	Touchscreen Technology 072 The Benefits of Natural Sensory

“Color is often used in technical documentation and textbooks to convey structure. Each chapter might feature a different colored heading and a block of the same color may appear on each page, making it easy to distinguish between chapters” (Malamed, 2013).

11. Room to Read indicated that they choose to use black and white materials for workbooks to reduce costs, and they only use pictures that are designed to be in black and white because the pictures might otherwise not make sense. To obtain evidence-based answers on the justification of additional costs, a field test is advised.

**Figure 7: Colors and Objects**

“We recognize objects more quickly when their colors reflect what we see in the physical world. Upon seeing an object that is colored differently, like a pink banana, it can cause cognitive dissonance that the viewer must resolve. Of course, you may intentionally use unusual colors as a creative, playful or dissonant approach. But if you are aiming for speedy recognition, as in this cover for a children’s book, use colors that are normally associated with an object or scene” (Malamed, 2013).

- Color combinations can have an impact on the legibility of the text. Black letters on a white background have the greatest contrast, which maximizes legibility (Hartley, 1994; Horton, 1991). For example, Praphamotripong (2010) describes Indian reading textbooks for grade 1 that contained letters highlighted in a bold font or color to emphasize letter sounds and scripts.
- A very early study conducted on American children from kindergarten to grade 6 demonstrated that although children prefer a colored picture to a black and white one, realism still takes precedence over color (Rudisil, 1952). When faced with the choice between a more realistic, non-colored picture and a less realistic, colored picture, children preferred the non-colored, more realistic one. Interestingly, the adults tested overemphasized the importance of color as compared to other qualities in illustrations. This shows that adults’ beliefs about what children prefer do not always correspond with the preferences of children.

### 2.3. NEGATIVE CHARACTERISTICS OF COLOR

- The use of color implies additional costs for illustrations, editing, and printing. In a resource-strained context, this raises serious questions about the justification for its use. Pricing depends greatly on context. As an example in Chapter 3 demonstrates, printing in full color is approximately 8 percent more expensive than printing in black and white. Printing a 32-page book, 420 x 275 millimeters in size, would then cost 19 cents (USD 0.19) instead of 17 cents (USD 0.17). Illustrations can also incur extra costs of approximately 3 cents (USD 0.19) per copy, so printing in color increased the price by roughly 10 percent.
- Inconsistent use or overuse of color can create visual overload and, therefore, interfere with reading comprehension (Hartley, 1994). By diffusing attention, the reader can become confused, negatively affecting reading performance. Keyes notes that badly used color is worse than none (Keyes, 1993).<sup>12</sup>
- Since color is perceived before other cues, color can take attention away from other important cues such as shape, location, and pattern (Marinelli, 2011). These cues can provide less expensive options that grab attention and aid instruction (Brockman, 1991).

12. Wilfredo Pascual of Room to Read adds that one should refrain from providing black and white materials that were designed to be printed in color. With the lack of color, meaning is lost and the text may be confusing. If one opts for black and white, make sure the material is designed accordingly.

Typographic cues (e.g., changing font type, putting a word in a bold font) can be considered part of general editing work and thus do not cost extra. However, research is needed to demonstrate whether these cues can be absorbed in the short-term memory of young readers.

- Texts in bright colors are difficult to read, which can lead to diminished comprehension (Brockman, 1991).<sup>13</sup>

## 2.4. CONTEXT

The four main advantages of using color include the following preliminary field findings:

- Color motivates children to pick up a book and enjoy reading instead of perceiving it as a scholarly task;
- Color in illustrations can aid object recognition, which facilitates better comprehension of the text;
- Color that groups similar elements places emphasis on what is being taught; and
- Color can strengthen structure of the visual information of a text (Hartley, 1994; Marinelli, 2011; Praphamotripong, 2010; M. Chaudry, personal communication, 5 June 2013).

However, the characteristics of reading materials for the early grades determine the applicability of the advantages of using color on reading acquisition. With regard to the first advantage, motivation is an important factor for instilling a love of reading from an early age. Second, reading materials for the early grades usually include many illustrations, increasing the importance of color and improving recognition of the object and the associated word.<sup>14</sup>

Grouping elements by color facilitates the demonstration of word classes such as vowels, making it easier for children to recognize the associated elements. This is especially helpful with languages that have long words containing many letters or that use many words to express a concept; colors can be used to group syllables or to highlight chunks of text for instruction (J. Katz, personal communication, 20 June, 2013). However, most text is printed in black and white to avoid prohibitive printing costs, which reduces the practical relevance of this advantage. Pratham Books, Room to Read, Molteno, and many other organizations that work with multiple language versions of one book consciously decide to put all text in black. When printing the translated materials, they only have to change the black plate, providing them the advantage of lower printing costs through continued economies of scale. The cost implications of using colored text are very important since the focus is on early grade readers in developing countries with many languages. Therefore, the limited practical application of using color to group textual elements might not outweigh the extra costs. Section 5 discusses the costs of color in greater detail.

Early grade reading material with content at an appropriate reading level will not contain complex visual information structures; therefore, the practical relevance of this last advantage is reduced further. To conclude, it is the motivational character of color and the facilitation of object recognition that matter the most with regard to the impact of color use on reading acquisition. Furthermore, the practical advantages refer to colored illustrations rather than colored text. The other, less relevant, advantages

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13. A quantitative analysis of the comprehension test questions and answers showed that few readers retained any comprehension of text printed in bright colors beyond the first few paragraphs.

14. Discussing the impact of illustrations on reading acquisition is beyond the scope of this paper, yet the existing research seems to suggest that illustrations need to inform the text in order to have added value (H.Abadzi, personal communication, October 16, 2013). Coloring an illustration can improve object recognition. When this illustration also informs the text, it can improve text comprehension.

can therefore not be weighed as strongly when striking a balance between the benefits and costs of color use. Additionally, the challenge remains that there is no empirical evidence of the extent to which color can improve reading acquisition.

The context in which the book is to be used, or its purpose, is also a determining factor in the use of color.<sup>15</sup> For example:

1. Pratham Books in India focuses on providing supplementary materials to instill a love for reading and to increase the number of children who have access to books. The primary focus is reading for fun rather than instruction. Their experience has led them to provide materials with colorful illustrations since color motivates a child to read for pleasure rather than to consider it a chore (M. Chaudry, personal communication, June 5, 2013). There is no existing research conducted in a developing country context to confirm or refute this, but field findings serve as an important indicator in this discussion.
2. Molteno has recently opted for using materials with colored illustrations also. The vast majority of children in South Africa who come from low-income households are seldom exposed to full-color children's books at home. Early grade reading texts are often the only children's "literature" to which they have access. Molteno seeks to provide children with the concomitant enjoyment that comes from colored pictures. In addition, the development of materials by Molteno is guided by what children themselves prefer. Based on Molteno's experience, children prefer colorful materials (F. Otuluja; D. Shezi; J. Katz, personal communications, 20 June 2013).
3. Room to Read has a dual focus: improving literacy instruction and instilling a love for reading in young learners. Room to Read workbooks feature black and white content pages with colored covers, reducing additional printing costs. The workbooks are instructional, and they have been very effective in literacy development, notwithstanding the content pages being in black and white. The focus is on learning to read, and a representative of Room to Read notes that color has little to do with reading (T. Benjamin, personal communication, June 5, 2013). However, when providing storybooks, readers, or picture books, Room to Read also opts for colorful illustrations.

## 2.5. COSTS OF COLOR USE

When analyzing the costs of color, the illustrator's and the publisher's costs should be distinguished from printing costs. It is important to remember that costs are highly dependent on context. These estimates are given to provide an idea of cost implications.

### Illustration costs

Since most organizations developing reading materials design the illustrations themselves or outsource the design, the question is whether illustrators charge extra for a colored illustration versus a non-colored illustration.<sup>16</sup> Table 5 provides a price overview.

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15. Accompanying teacher guides or read-aloud materials that are not directly used by children can be in black and white.

16. The price options for illustrations of Pratham Books are used for this discussion because the information about pricing in the literature is inconsistent and Pratham provides reading materials for early grades in a developing country context.

**Table 5: Price Overview**

Illustrations	Price range (Indian rupees)	Average price	Price for 32 pages/illustrations	Per unit price illustrations (20,000 copies)
<b>Black &amp; white</b>	500-1500	1000	32,000	1.6 (= USD 0.03)
<b>Color</b>	1500-3000	2250	72,000	3.6 (= USD 0.06)

The price is dependent on the illustrator; however, in the example above, the price of a colored illustration can be more than double the price of a black and white illustration (M. Aggarwal, personal communication, June 14, 2013). As another example, illustrators for a Dutch company indicated that the price depends on the complexity of the design, and there is no price difference between black and white and color (K. de Bakker, personal communication, June 25, 2013). Whether or not the design of colored illustrations incurs extra costs is, therefore, dependent on the context. In developing countries it often does incur extra costs; in this case, it is USD 0.03 (3 cents) more expensive for colored illustrations (M. Aggarwal, personal communication, June 14, 2013; T. Benjamin, interview, 5 June 2013).

### Printing costs

Apart from the illustration costs, printing in color increases the production costs. Modernization of presses allows more efficient, accurate color application with quicker turnaround and decreased waste. This reduces the costs of colored printing. Tables 6 and 7 demonstrate the price differences of black and white printing (with one color referring to black) versus two- and four-color printing. The costs of only printing a colored cover are included as well.

### International price offer

#### Color-costing scenario

Size: 297 x 210 mm (A4)<sup>17</sup>

Pages: 32 page self-cover

Paper: 80gsm bond

Binding: saddle stitched

Price: in South African rand<sup>18</sup>

**Table 6: Quantity 20,000**

Color scenarios	Description	Price for quantity above	Price variance to Option 1
Option 1	1-color printing throughout 32 pages	R 33,120.00	
Option 2	2-color printing throughout 32 pages	R 38,160.00	15.22 percent
Option 3	4-color printing throughout 32 pages	R 35,720.00	7.85 percent
Option 4	1-color printing throughout 30 pages, with outside 2 pages in full color	R 34,740.00	4.89 percent

17. The prices are provided for A4 size. Since supplementary materials are provided in A5 size as well, it is important to note that the same ratios apply; one just doubles the quantity of books. For example 40,000 copies printed in one color would still be priced at 33,120.00 South African rand. More information on trim sizes is provided in another section.

18. The overview is in the original currency to provide an exact idea of the costs, uninfluenced by currency fluctuations.

**Table 7: Quantity 250,000**

Color scenarios	Description	Price for quantity above	Price variance to Option 1
Option 1	1-color printing throughout 32 pages	R 277,270.00	
Option 2	2-color printing throughout 32 pages	R 284,270.00	2.5 percent
Option 3	4-color printing throughout 32 pages	R 298,790.00	7.76 percent
Option 4	1-color printing throughout 30 pages, with outside 2 pages in full color	R 283,620.00	2.29 percent

This international price offer demonstrates that printing in four colors is approximately 8 percent more expensive than printing in black and white. Two-color printing initially increases the price by 15 percent for 20,000 copies, which is reduced to a 2.5 percent price increase when printing 250,000 copies in two colors.

An option that Room to Read uses in its workbooks is to only provide the cover in color, increasing attractiveness but reducing the amount of color needed. For 20,000 copies this increases the costs of printing by almost 5 percent. However, the price increase is 2.29 percent when printing 250,000 copies. If faced with a limited budget, printing only the cover in color could be a suitable compromise, benefiting from the initial attraction that motivates a child to open that book while cutting costs (L.Ehret, personal communication, June 20, 2013).

Printer capacity can also account for large price differences. Tables 8 and 9 provide a cost overview for local printing in Rwanda. The substantive price difference is caused by differences in machine capacity. It is not necessarily color use that increases prices, but rather the general production process, less advanced machinery, and skilled labor that currently accounts for significantly higher costs. An upgrade of local printers would help decrease local price offerings.

#### Local price offer

Size: 297 x 210 mm (A4)  
 Pages: 32 page self-cover  
 Binding: saddle stitched  
 Price: in U.S. dollars (USD)

**Table 8: Quantity 20,000**

Color scenarios	Description	Price for quantity above	Price variance to Option 1
Option 1	1-color printing throughout 32 pages	\$ 14,800.00	
Option 2	2-color printing throughout 32 pages	\$ 14,800.00	0 percent
Option 3	4-color printing throughout 32 pages	\$ 15,400.00	4.05 percent

**Table 9: Quantity 250,000**

Color scenarios	Description	Price for quantity above	Price variance to Option 1
Option 1	1-color printing throughout 32 pages	\$ 112,500.00	
Option 2	2-color printing throughout 32 pages	\$ 112,500.00	0 percent
Option 3	4-color printing throughout 32 pages	\$ 117,500.00	4.44 percent



This table demonstrates that printing in countries with little graphic capacity can be significantly more expensive. The unit price for one- and two-color printing is USD 0.74 compared to USD 0.77 for full-color printing (Rwanda printer, personal communication) while the international price for the same material for one- and two-color printing is USD 0.17 versus USD 0.19.<sup>19</sup> However, it should be noted that if one were to print in country, it would be best to print in two colors since there is no price difference between black and white and two-color printing. This is especially important when considering the application of geographical code 937 that requires local printing.

To summarize, the comparison demonstrates the cost savings of using a printer with sufficient capacity. Since there is a trend towards local sourcing, local capacity-building efforts would contribute to reducing unit prices of books, improving quality, and providing more options in terms of color and binding techniques.

Internationally, the price of printing in full color is approximately 8 percent higher than in black and white, USD 0.17 for a black and white book when printing 20,000 copies and USD 0.19 for a colored book.<sup>20</sup> Although full-color printing is only 4 percent more expensive in Rwanda compared to 8 percent internationally, the latter is still the cheaper option, since the price per unit is considerably cheaper.

As discussed above, per copy, illustrations are USD 0.03 more expensive in color than in black and white, and full-color printing is USD 0.02 more expensive. Since the text will usually not be in color, it does not require any additional editing costs. In total, this means a colored copy is USD 0.05 more expensive than a black and white copy. Assuming the average total price of a supplementary reading material is approximately USD 0.50 (50 cents), one would pay 10 percent more for a colored copy, including publishing costs and royalties. The provider will need to decide whether the additional costs of color are merited. The purpose of the material and budget will influence the final decision.

## 2.6. CONCLUSION

Existing research suggests that color is attractive; color can differentiate the word or element to which one wants to draw attention; it can facilitate the grouping of elements; and it can increase interest in the reading material (A. Blanton, personal communication, June 20, 2013; Marinelli, 2011). Color can increase reading speed by enabling a reader to screen a text and focus on the highlights (Keyes, 1993). However, color must be used consistently and moderately; otherwise, it will create the reverse effect and distract or confuse the reader. With color, the rule of thumb is that less is more. Given the higher costs of providing both the text and illustrations in color, the practical relevance of the impact of color on early grade reading generally only applies to colored illustrations.

Notwithstanding the potential benefits of color, the approximate USD 0.05 increase in production costs could put considerable strain on already tight budgets of governments or organizations providing books. It is therefore important for development partners and host-country governments to carefully assess the potential benefits of using colored illustrations. Such informed decision-making is still complicated by the lack of research conducted in a developing country context and by inconclusive findings on how and to what extent color influences development of literacy skills (Buckingham & Harrower, 2007; VanAuken, 2006).

The positive and negative characteristics highlighted in the research reviewed are mainly based on the use of color as a visual cue in text or map reading, rather than in illustrations alone. Research focusing on the impact of color in illustrations only has not yet been conducted.

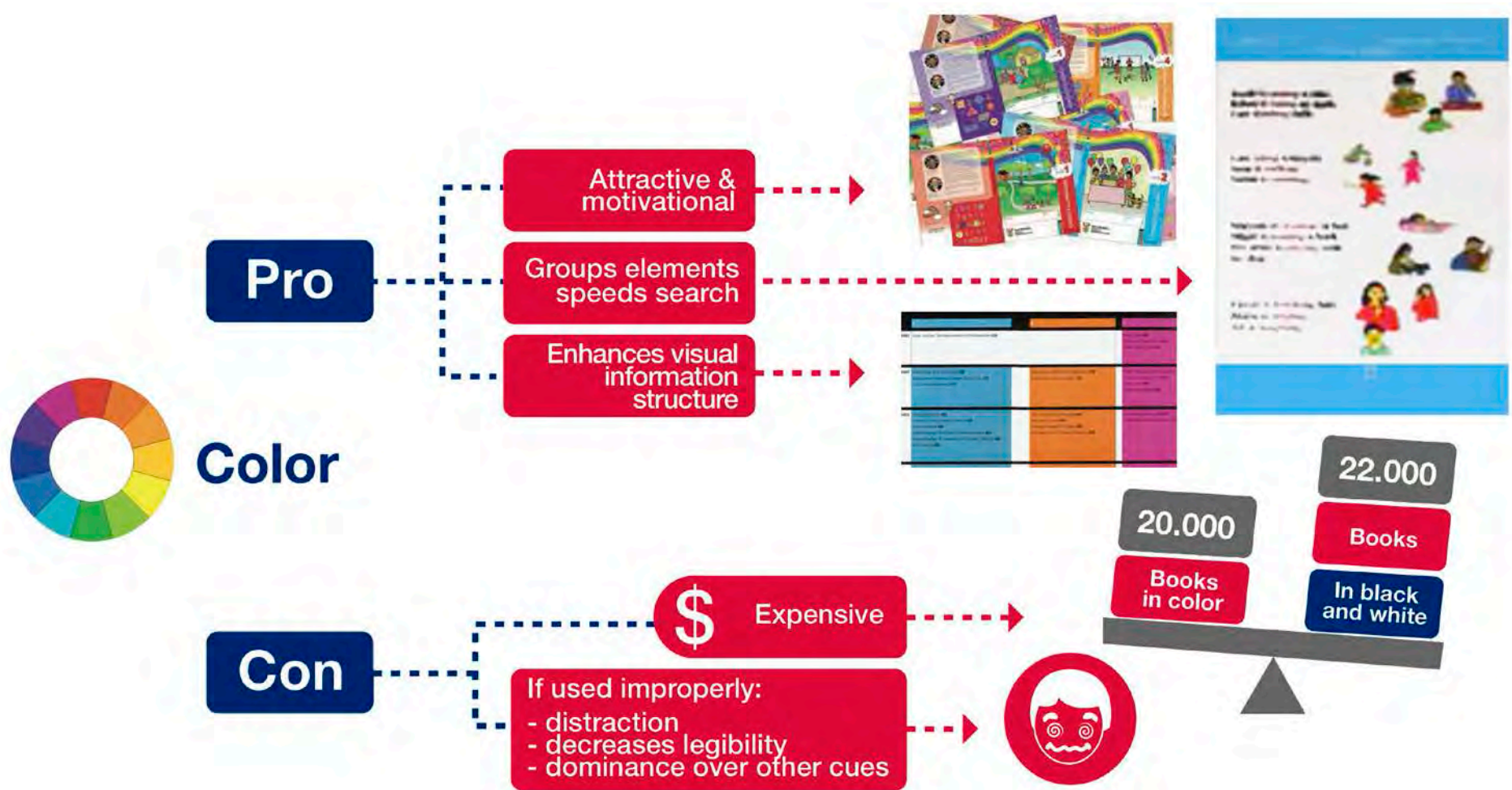
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19. Further details are not disclosed for confidentiality purposes.

20. Slight modifications can occur because of the changing currency rates between the South African rand and the U.S. dollar.

The impact of color on the learning process might be different across grades and reading levels. Thus, color use might depend on the level of the reading materials, varying from pages with a few words and accompanying illustrations (the latter being in color) to informative texts (verbs in red), to those with a high word density (using, for example, color headings to improve the visual information structure). If this positive impact could be measured and quantified, it would facilitate the balancing act between the benefit of color use and the additional costs.

**INFOGRAPHIC 1. PROS AND CONS OF USING COLOR IN READING MATERIALS**



## CHAPTER 3. TRIM SIZE AND BINDING

### 3.1. INTRODUCTION

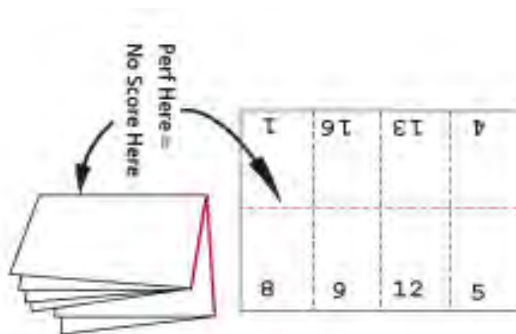
The process of producing books starts with decisions on the physical characteristics. One should consider what paper should be used, the size of the materials, the number of pages, and the most suitable method of binding for this particular book. These issues are interrelated and greatly determine the cost and durability of a book.<sup>21</sup> This chapter explains the process of folding and trimming, and how trim sizes are to be determined in relation to the type of press used. Some examples of appropriate trim sizes for a particular press are provided. Additionally, different binding options and their appropriateness with regard to cost and durability are discussed.

### 3.2. TRIMMING

After printing, the finishing process takes place. Trimming refers to cutting the paper to its final size. This is an important point to consider because it can considerably decrease your production costs.

The content is always printed on large sheets that contain multiple pages. The printed sheet is then folded 8 or 16 times to produce 16 or 32 pages (back and front). The folded section is called a signature. Figure 8 shows how a signature is folded and how the page order falls into place after folding. The paper will only be cut or “trimmed” to its final size once it is folded into a signature. The signature is cut at the top to disconnect the sheets; it is cut at the sides so the paper edges become rougher, and so that the ink to glue the signature into the spine sets better; this is called milling.

**Figure 8: Signature Folding**



To leave a margin for error, the content is always printed on a slightly larger surface. The trim size refers to the final size of the paper after excess edges have been cut off. A certain size printing press takes a specific size sheet of paper. By ensuring that the trim size is maximally adjusted to the sheet size, one minimizes the paper that is wasted when cutting it to the final size. Room to Read indicated that it has saved the most money by focusing on economical trim sizes and avoiding waste. Even half-inch reductions or extensions can save you 25 percent in paper costs (W. Pascual, personal communication, May 22, 2013).<sup>22</sup> A procuring organization may thus unconsciously specify a non-standard paper size,

21. Technical information is derived from the graphic knowledge of the blueTree Group.

22. It is important to note that some organizations and printers, for example those that are U.S. based, use inches as the unit of measurement. Moreover, the United States, Canada, and Mexico do not use the ISO A or B series paper sizes; their paper sizes are referred to as letter, legal, ledger, or tabloid, and the dimensions are provided in inches.

which is very expensive. Standard sizes are those that are fitted to press sizes, and they can significantly lower production costs.

The most economical trim size can, therefore, only be determined by the size of the press. The following are examples of appropriate trim sizes for material that is printed on a particular heatset web-offset press (L. Ehret, personal communication, June 19, 2013):

- A3: 420 x 275 mm
- A4: 275x 210 mm
- A5: 210 x 137 mm

These sizes are slightly different from the standard A3, A4, A5 sizes because they are matched to the size of the press.<sup>23</sup> It thus comes down to millimeters or inches. A common mistake is that books are trimmed to a much smaller size than the size of the sheet for that particular press, thereby wasting all the cut off paper. The selected printer will be able to indicate what trim sizes best suit their presses. It is advised to always consult the printer before determining the final trim size of the materials.

### **3.3. NUMBER OF PAGES**

The number of pages in a book determines the amount of sheets that need to be used for printing. Refer back to Figure 8, which shows how sheets can be folded into 16 or 32 pages. It is important to consider that if a publisher provides the printer with a book that contains 33 pages, one extra sheet per copy would be wasted. In some cases, the solution might be to reduce the number of pages. In other cases, having extra pages may be preferred. For example when a book has 30 pages, it is advised to make 32 pages.

Graphic considerations, therefore, determine production costs, minimizing paper waste that comes with trimming and with the number of pages.

### **3.4. BINDING**

Both the printing and the binding capacity of the printer should be taken into account. It is often the binding capacity that is the greatest limitation in developing countries for delivery of completed publications. If a printer does not have this capability, it will outsource part of the production process to a printer who does have binding capacity. This influences the turnaround times and increases the transport requirements to complete the job. This outsourcing can also lead to differences in quality and require greater administration to manage and distribute the part deliveries from the various sources (L. Ehret, personal communication, June 2013).<sup>24</sup> These issues should therefore be considered when selecting the printer.

To make a durable book, there are four different binding techniques:

#### **I. Saddle Stitching**

Printers refer to the stapling of materials as saddle stitching because it refers to the machine, the saddle, on which it is placed and stitched. Saddle stitching is a suitable binding method for reading materials of up to 96 pages. Above 96 pages, the material would “creep” around the stitches and tear. It is important for the wire used to be galvanized to prevent the staples from rusting. Saddle stitching is the cheapest binding technique of all, and it does not require a high level of graphic knowledge. However, the life expectancy of materials that are saddle stitched does not generally surpass one year.

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23. <http://www.dpandi.com/paper/> (last accessed 11-1-2013)

24. Local printers even outsource part of the printing if they do not have the machine capacity to produce such volumes within the deadline.

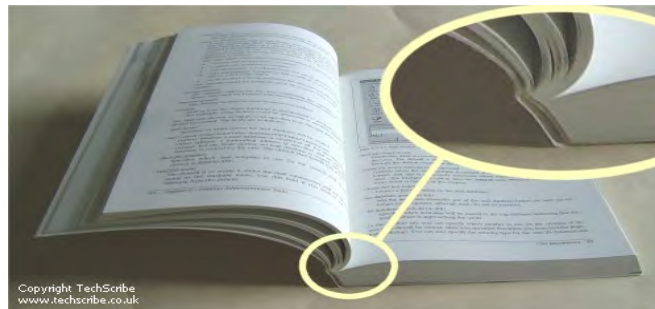
The various perfect binding techniques will be discussed next. It should be noted that perfect binding with sewed hotmelt and PUR will provide longer durability than saddle stitching; these may be the most suitable options in developing country contexts. However, on a local level, printers might not have the technology available, and they often only offer perfect binding with normal hotmelt glue. When presented with the choice between perfect binding with normal hotmelt glue or saddle stitching, saddle stitching is the preferred option as long as the number of pages (less than 96) allows it. Usually supplementary reading materials are not more than 96 pages. Section 3.5 provides an indicative cost overview of the different binding techniques.

## 2. Perfect Binding with Hotmelt (glue)

Perfect binding refers to the process of attaching the text block, consisting of multiple signatures, to the spine. As mentioned above, the signatures of a book will be milled. Afterwards the signatures will be glued together in the cover with hotmelt glue. It can have a spine of 2-600 mm and the weight of the pages can be 60-100 grams. Hotmelt glue endures a temperature of up to 60/70 degrees Celsius; above that the glue will melt. Below 8 degrees Celsius the glue will break. Currently, many books available in developing countries are bound with normal hotmelt glue, but general experience shows this type of binding to have a rather low life expectancy (6-12 months). This is because books left in cars and warehouses are often exposed to higher temperatures, causing the glue to melt and the books to fall apart.

Perfect binding with hotmelt glue is currently the most standard method of binding, apart from saddle stitching. The specifications in the printing contract often only refer to perfect binding rather than specifying whether this should be with hotmelt glue, sewed hotmelt, or PUR. The life expectancy of a book bound by normal glue is, however, too low to justify the costs.

**Figure 9: Perfect Binding with Hotmelt**



## 3. Perfect Binding with Sewed Hotmelt

With this binding technique, the signatures will be sewed together. Afterwards they are glued into the spine with hotmelt. These books can have spines of 2-600 mm and the weight of the pages can be 60-250grams. This is more expensive since sewing signatures is more labor intensive. However, this binding option provides a longer life expectancy than no-sew hotmelt, approximately 3 years in difficult circumstances. This method is not suitable when different kinds of paper are being used within one book, however, since sewing and gluing different kinds of paper does not bind well. In general, sewed hotmelt binding is recommended for heavier books with hard covers such as dictionaries.

**Figure 10: Perfect Binding with Sewed Hotmelt**



#### **4. Thread Sewing**

Books used to be thread sewn. In this process, the signatures are sewed together and the collection of signatures is then sewed into the spine. However, similar to sewed hotmelt perfect binding, the costs are too high for this to be a suitable binding method for supplementary materials in developing countries. This method is quite labor intensive, due to the requirements of different and expensive machinery, which can be difficult to operate, and the need for highly skilled employees.

#### **5. Perfect Binding with PUR (polyurethane)**

PUR perfect binding involves the same process of milling the signatures and gluing these into the spine. However, the glue used is PUR glue. PUR is the strongest glue and is available worldwide; all professional printers work with PUR binding. Once PUR glue dries, it is permanent. These books can have spines of 2-600 mm and the weight of the pages can be 60-300grams.

PUR has a longer drying period: four hours to two days depending on air humidity and paper humidity. PUR is insensitive to temperature and solvents and different kinds of paper can be combined in one book. PUR maximizes the life expectancy of a book to 3 years in difficult circumstances and is generally the preferred binding method for books that see a lot of use. Although PUR binding is slightly more costly than regular hotmelt, this is vastly outweighed by its advantages (OutputLinks Communications Group, 2003). However, many local printers have not yet automatized their binding process let alone automatized it using PUR glue. It is of great importance to support local capacity building in the ability to properly finish books and assist them in enhanced access to finishing machinery, using PUR glue. This distinguishes the printer in terms of production speed and durability so the return on investment is guaranteed. If one aims to only provide materials that last for 3 years or longer, the investment in PUR perfect binding technology is absolutely fundamental.

### **3.5. INDICATIVE COSTS OF VARIOUS BINDING TECHNIQUES**

This price overview is indicative only. However, it is important to provide a price estimate so that the impact of the binding technique on the unit costs and durability of reading materials can be considered. Assuming print runs from 20,000 copies, the following are unit costs of the various binding techniques:<sup>25</sup>

- Thread sewn with hotmelt glue                      USD 0.15

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25. Consider the currency exchange and the fact that costs differ from printer to printer.



- PUR USD 0.07
- Saddle stitch USD 0.03

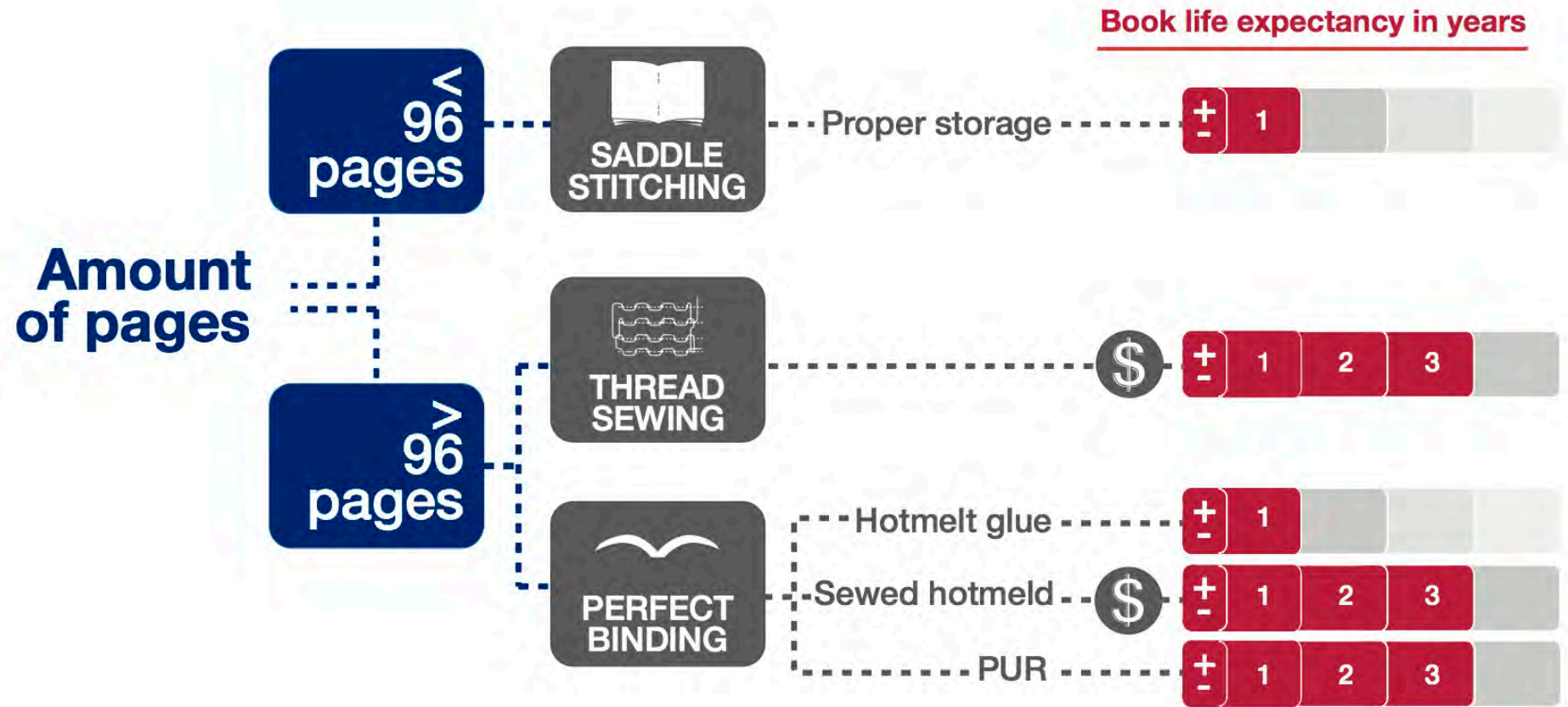
The costs for perfect binding with normal hotmelt glue are not included because, in most cases, printers who have other technology available simply do not consider it to be an option for producing durable books (E. Fivaz, personal communication, October 25, 2013). The costs are, however, a bit higher than for saddle stitching and lower than for PUR binding.

### **3.6. CONCLUSION**

The finishing process has a significant impact on production costs. Trim size and binding method in particular influence the unit price of reading materials. The most cost-effective trim size is determined in relation to the size of the press to be used. To select the most appropriate binding technique, the required life expectancy of a book should be considered, as well as the costs of the potential binding technique and the finishing capacity of the selected printer. For supplementary reading materials, which generally do not have a large number of pages, saddle stitching can be a suitable binding technique. However, PUR binding will provide a much longer life expectancy, which justifies the cost increase of USD 0.04 per copy.



INFOGRAPHIC 2. SELECTING BINDING TECHNIQUE



## CHAPTER 4. PAPER AND SUSTAINABILITY

### 4.1. INTRODUCTION

Paper accounts for a large part of the production costs of reading material, and its quality determines the overall quality of the reading materials. This chapter provides an overview of the kinds of paper that are appropriate for reading materials, the associated costs, and the impact a government’s policy on importing paper has on the strength of the local printing industry. Lastly, the chapter discusses the origin and sustainability of paper, a very important topic for the book printing industry that has not received much attention.

### 4.2. TYPES OF PAPER

There are two main types of paper: uncoated and coated. Coated paper is often used for magazines and is more expensive. Uncoated bond paper is commonly used for books and book covers. The paper used for newspapers, called newsprint, is very thin, uncoated paper. Uncoated paper is classified according to its weight in grams per square meter, for example, 70 gsm (European Paper & Packaging Industries, 2013). Traditionally, papers used for printing textbooks are "low white and opaque papers so that they are easier to read and so that the show through [opacity] of text from another side of a page would not appear" (Praphamotripong, 2010). Bond paper allows for writing in books without smudging, thus it is recommended for use in workbooks and exercise books. Tips for choosing paper include (L. Ehret, personal communication, June 19, 2013):

- Uncoated, bond paper is the most appropriate paper for learning materials.
- 70/80 gsm paper offers better opacity than 60 gsm paper; this prevents show through of the reverse side of the page.
- Covers should be printed on no less than 130 gsm, with 160 gsm offering stronger protection and durability

### 4.3. PAPER COSTS

Paper affects the durability, appearance, and cost of reading materials (Praphamotripong, 2010). Depending on the size of the order, paper becomes an increasingly significant part of the overall costs. Since the paper costs remain constant per book, its contribution to cost grows along with the size of the print run. The South African Book Development Council (SABDC) notes that for 250 copies, paper is estimated to account for 4 percent of cost, whereas for 10,000 copies it accounts for almost half of the costs (SABDC, 2006). This is because all other production costs are spread over the size of the order, whereas paper is a recurring cost for every copy. Although paper prices fluctuate heavily, this general overview is still accurate: paper remains a dominant factor in a printer's cost price—that is, the price that it costs to make a product without profit. Table 11 demonstrates this.

**Table 10: Paper Share**

Print run	250	500	750	3000	5000	10000
Paper cost as percent of total paper, printing, and binding cost	4.0%	7.3%	10.2%	34.0%	40.7%	46.6%

Therefore it is important to consider the following to ensure the best available paper price:

- A printer with well-established paper supplier relationships can guarantee availability, buying in bulk when prices are favorable, and offering economies of scale/negotiating power to obtain the

best pricing. Local printers cannot often benefit from these bulk-buying options and have little negotiation power. Without paper in stock, it can take longer to deliver the copies due to the time needed to receive the paper. It would be beneficial for local printers to increase collaboration to explore bulk buying options and collaborative negotiation with paper suppliers.

- Ordering well in advance allows the paper merchant to get the best paper price available.
- In many developing countries, access to quality paper that is locally produced is a challenge (Praphamotripong, 2010). Importing paper from overseas can have cost implications due to exchange rates, requires longer lead times for ordering and can have negative environmental implications (L. Ehret, personal communication, June 19, 2013). However, imported paper is not always more expensive. Large international mills may have more modern technology and economies of scale in production; thus, sometimes they can offer better prices. Whether importing paper is more expensive than locally is dependent on context and the import policy on paper.

As a global commodity, paper prices fluctuate significantly from day to day. A price offer today may be significantly higher or lower in 2 weeks. Some large printing contracts therefore separate production costs and paper price in order to account for a 10-percent price fluctuation on paper.

#### **4.4. IMPORT POLICY ON PAPER**

In many developing countries, local printers also face a competitive disadvantage since import duties are levied over the raw materials to produce books, including paper and ink. Finished books are, however, exempted from import duties as a consequence of governments ratifying the Florence Agreement and Nairobi Protocols. In Malawi, for example, the import duties caused a 15–20 percent increase in paper price. Considering the large proportion of cost that is paper, especially for volumes of more than 10,000 copies, this import policy makes it very difficult for local printers to compete with any printer across the border. South Africa has exempted paper from import duties, and the printing industry is flourishing; Malawi still levies import duties over paper, and local printers have suffered. Such policies can either strengthen or weaken the local business environment.

#### **4.5. SUSTAINABILITY OF PAPER**

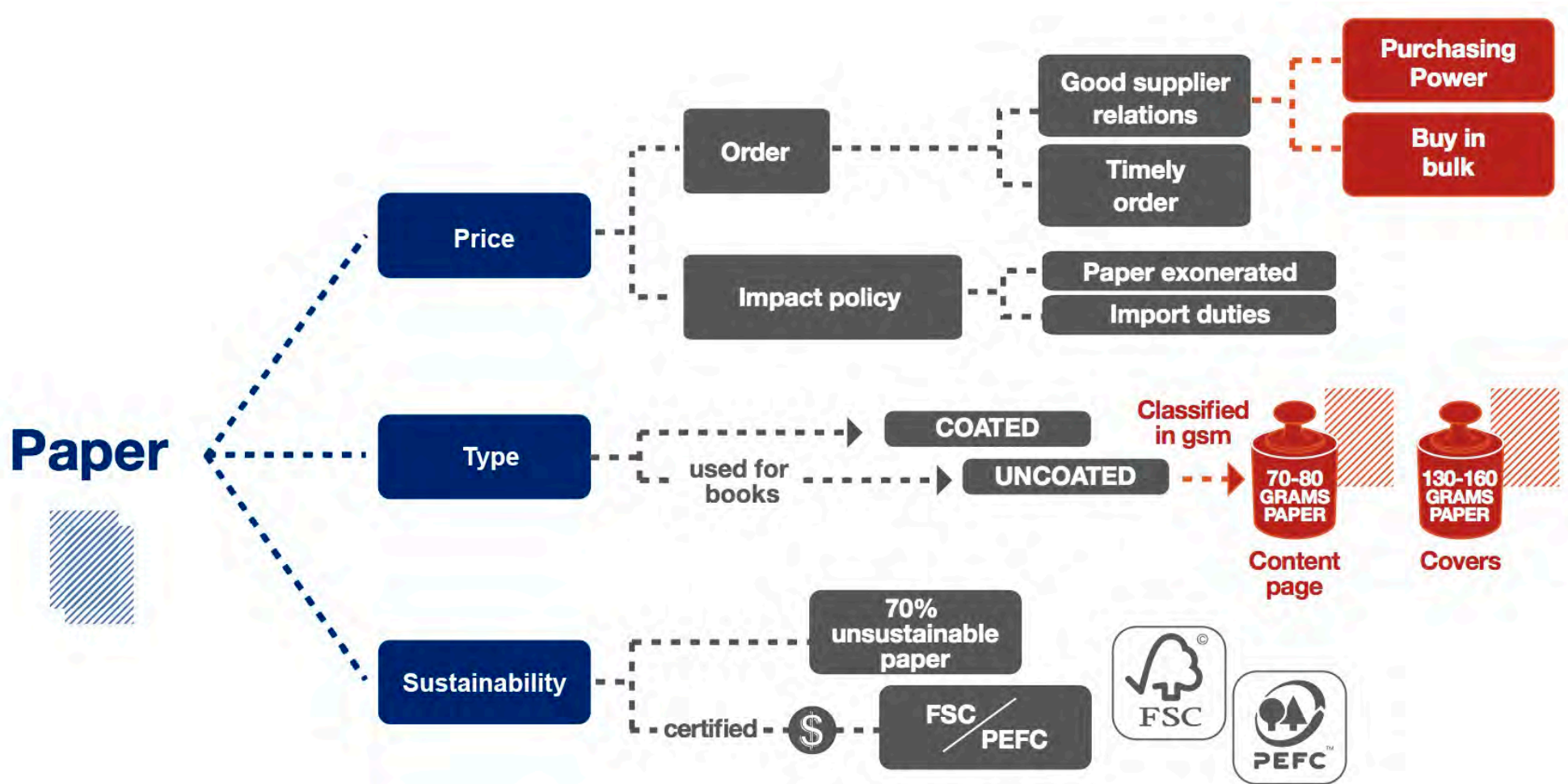
A last important consideration is the origin of the paper and its sustainability. More than 70 percent of the paper in the world is made from wood taken from forests in regions with ecologically valuable, biologically diverse habitats. Each year about 13 million hectares of the world's forests are lost due to deforestation. This results in loss of species, increased carbon emissions, land and water degradation, as well as impacts on indigenous communities dependent on the forests (Sappi presentation, 2013). Paper that is not sourced from sustainably managed forestry might be cheaper, but comes at a very high price in terms of sustainability, and creates reputational risk for the project owner. Paper that is manufactured using wood from forests with credible forest certification, such as FSC™ (Forest Stewardship Council™) and PEFC (Programme for the Endorsement of Forest Certification), provide verification that forests are managed sustainably in terms of impact on people and the environment and economic viability. Books printed by a printer who has FSC™ (Forest Stewardship Council™) and CoC (Chain of Custody) certification carry the FSC™ CoC product label, which provides independent international verification that the products can be traced back from their point of origin to responsible, well-managed forestry and controlled and recycled sources. Paper with FSC or PSC certification can be more expensive due to the costs of the certification process and proper forest management (L. Ehret, personal communication, June 20, 2013).

#### **4.6. CONCLUSION**

Uncoated, bond paper is the most appropriate type of paper to be used for educational materials. It is classified according to its gsm, which determines the durability of the paper and the level of opacity of the reading material. Paper costs become an increasingly large share of the overall production costs because they are recurrent costs. To get the best possible paper price it is important to try to buy in bulk when prices are favorable, increase negotiation power through bulk buying, and if the paper is not in stock, order it well in advance.

Local printers pay approximately 15–20 percent more for paper when host governments levy import duties over paper, even if the print work has educational purposes. This policy should be reviewed in terms of creating a more favorable business environment and enabling local industry to better service book demands. Moreover, the procurement policies of host governments and development partners with regard to the sourcing and sustainability of paper should be reviewed to ensure that the impact of book demand on deforestation and the environment is minimal.

### INFOGRAPHIC 3. CHOOSING PAPER FOR SUPPLEMENTARY READING MATERIALS



## CHAPTER 5. PRODUCTION METHODS AND SCALE IN A LOCAL AND INTERNATIONAL CONTEXT

### 5.1. INTRODUCTION

Each printing method and press is designed to most efficiently deliver specific types of printing work. Therefore, it is advised to select the preferred production method according to project scale and context. The following table briefly explains the various printing techniques in relation to volume to be printed.

### 5.2. PRINTING TECHNIQUES

**Table 11: Types of Printing** (L. Ehret, personal communication, June 19, 2013)

Number of copies	1– 1000	1000–10,000	10,000–00,000	100,000 +	1,000,000
<b>Type of printing</b>	Digital	Sheet-fed	Heatset web offset	Publication gravure	Coldset
<b>Production method</b>	Use plate-less toner based printing devices. Digital information printed via ink cartridges directly onto paper.	Ready-made sheets go directly into the press.	Intermediate, rubber blanket used to transfer printing ink to paper surface. The inked printing plate transfers ink to the blanket, which then applies ink to paper.	Use copper cylinders to print on paper.	Intermediate, rubber blanket is used to transfer printing ink to paper surface. The inked printing plate transfers ink to the blanket, which then applies ink to the paper.
<b>Characteristics</b>	<ul style="list-style-type: none"> <li>- Quick turnaround time</li> <li>- Limited paper options</li> <li>- High per unit cost</li> </ul>	<ul style="list-style-type: none"> <li>- Coated and uncoated stock</li> <li>- 28 gsm to 350 gsm</li> <li>- Ideal for covers</li> </ul>	<ul style="list-style-type: none"> <li>- Heatset utilizes drying lamps or heaters to cure or "set" the inks</li> <li>- Coated, uncoated, mechanical or newsprint</li> <li>- 40 to 200 gsm</li> </ul>	<ul style="list-style-type: none"> <li>- Set up time is longer but cylinders last longer; less maintenance so suitable for high volumes</li> <li>- Good quality on lower quality paper, coated or uncoated</li> <li>- 32 to 115 gsm</li> </ul>	<ul style="list-style-type: none"> <li>- Ink dries through absorption into paper</li> <li>- Ink can smudge so mostly for newspapers</li> <li>- Only uncoated paper</li> </ul>

In the case of large-scale book procurement, international or regional procurement is often advised. Printers with a range of presses have more flexibility and can utilize them in ways most well-suited to a particular project, resulting in greater cost and time efficiency. Modern presses are also quicker, more efficient, and deliver a higher quality product.

When local sourcing is required it is important to make the best use of available technology. However, local printers face considerable challenges accessing capital to acquire the most effective technology and training for their personnel. This accounts for lower machine capacity and underdeveloped finishing capacity. Much of the binding is still done manually, and PUR perfect binding is not available. However, if the goal is to produce books with a three-year lifespan, PUR binding is a prerequisite.

The country-level print industry has the potential to grow with targeted capacity-building efforts to improve access to technology and training. Revision of import policies on paper and other raw materials to produce books locally would provide a significant boost to the local industry. Commitment from governments and development partners to produce at least part of their books locally would create a more favorable business environment for investments by local printers. Some development partners may actually prescribe local sourcing of books, which stimulates local capacity building. Notwithstanding the challenges, there are also clear advantages to the local sourcing of print work. Whether or not local sourcing is more advantageous for the procurer again depends on the size of the order. For small- or medium-sized orders, the distribution costs and procedures might become relatively high per unit, justifying local production. The creation of such niche markets on the country level has the potential to uplift the local print industry.

### 5.3. PRINTER CRITERIA

A large, professional printer offers the full package of capabilities that determine the success of a quality, timely order. This is especially important for international procurement, where delivery delays of weeks or months occur frequently. On the local level, this should be the focus of capacity-building efforts.

Other considerations for print capability include:

- **Capacity:** The printer selected should have the capacity to deliver the full volumes required within the deadline. Further outsourcing may result in quality differences in delivered materials, additional transport requirements, and project-management challenges involving delivery and distribution.
- **Efficiency:** More modern technology provides greater production-cost efficiency, higher quality, and quicker turnaround while reducing the environmental impact by decreasing waste and energy usage.
- **Quality:** Higher quality production results in longer lasting materials. This is measured by consistent color and registration, correct collation of the sections, and durable binding. The printer should have established integrated quality controls in place to measure results throughout the production process.
- **Risk management:** In a dynamic environment, assurance is needed that the printer has considered all production risks to guarantee delivery within the timeframe required. This includes guaranteed stock supplies, production, resources, and power backup.
- **Accountability:** The printer needs to have an integrated data management system that measures, tracks, and reports on quantities produced against quantities ordered for each publication to provide auditable verification of delivery against investment.

When procuring internationally, the printer will usually be able to offer different kinds of printing methods that can be matched to the client's needs. For example, if 500,000 textbooks and 5,000 teacher guides are needed, the materials can be produced on different presses if that benefits quality and costs. The all-around capacity of a printer will ensure timely delivery of competitive prices and durable books.

### 5.4. MATCHING ORDER SIZE AND CONTEXT TO APPROPRIATE TECHNOLOGY

The size of a print order predicts the most appropriate production method. A multitude of international printers are available for the provision of medium and large print orders. However, it is important to consider smaller scale solutions. International printers are not interested in a couple of hundred copies so one should consider appropriate solution for serving small language communities.

SIL International has invented the Bloom Technology, which facilitates self-publishing for smaller communities and languages. Bloom provides simple technology to customize your version of a book, for example, in different languages with different pictures. This encourages greater access to a wide variety of self-made materials in different languages.<sup>26</sup> As an idea, Bloom is particularly powerful, considering that the demand coming from smaller language communities for different versions of books will not necessarily be of interest to bigger publishers. Bloom shows that it is possible to enable small communities to independently customize books. It is important to match this small-scale self-publishing model with a suitable production solution.

As shown in Table 12, digital printing is suitable for 1–1,000 copies, and it is the most high quality and economic printing option for an order of this size. Digital printing requires capital-intensive machinery and training, so most printers focus on either conventional or digital printing. A digital-printing hub in the capital of each country could service the book demand for small language communities.<sup>27</sup> Establishing such a hub will require the necessary capital for machinery and employee training. However, in various developing countries, including Liberia and Malawi, printers with digital print machinery already exist. But they do not function properly due to the lack of training. With some targeted capacity-building interventions, functionality can be improved and a local business can serve the niche print market that involves less than 1,000 copies.

Another innovative printing solution is that offered by the South African company, Paperight. Paperight turns any local copy shop—and there are often many of these in developing countries—into a Printer on Demand. When a copy shop registers at Paperight, Paperight makes its online library of books available to the copy shop. The user pays the copy shop and the copy shop pays Paperight; Paperight, in turn, pays the publisher. Paperight also offers a wide variety of Open Educational Resources (OERs). This facilitates printing and accessing materials of interest and educational value for local people. Since it is provided by the local copy shop and directly ordered by the end user, there are no distribution costs, procedures, or storage issues (A. Atwell, personal communication, May 6, 2013 and June 21, 2013). The challenge for this production method is that color printing is more expensive than, for example, offset printing. This method is best for the niche market in which only one or a few copies are needed at a time.

A common assumption is that since the local print capacity is not currently up to standard, one has to look elsewhere for a cost-effective supply of quality materials. Fortunately, there is a trend toward supporting local capacity development of all stakeholders in the book chain, which can help overcome the challenges and contribute to the development of a healthy investment climate and a niche market for local suppliers.

The local investments made in terms of machine capacity will be determined by the country and region's printing demand. For example, when printing in Rwanda, considering the relatively low number of students and the annual book demand, it may be best to print the very large volumes internationally. Otherwise there is overcapacity; machines that are not in use still cost money and affect the financial viability of the company. It is the creation of a local niche market of small- and medium-sized volumes that will enhance access to quality, affordable books that are produced locally. The time and costs associated with international production are not justified for production of small and medium volumes. In short, the size of your order will determine the type of printing needed and the associated distribution requirements.

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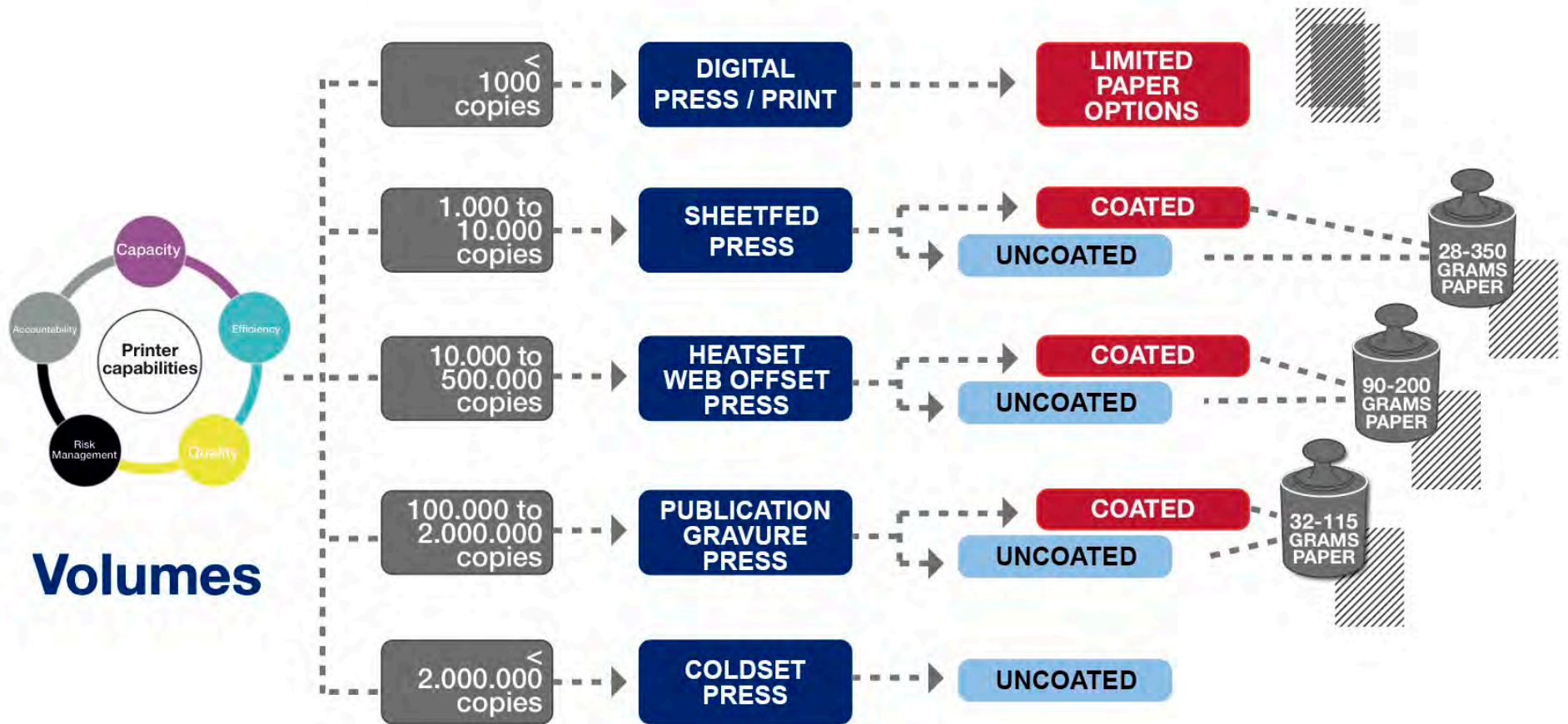
26. More information can be found on <http://bloom.palaso.org> (last accessed October 10, 2013).

27. There are local printers that have already acquired digital printing machinery (e.g., Dremags printing in Liberia). However, they need additional training to use, maintain, and repair the machinery.



The following infographic provides an example of the most suitable amount of copies for each type of printing press. It also prescribes the type and weight of paper that can be used. This information can change as technology continues to develop, but it currently provides a clear indicator of what kind of technology is most cost-effective for a particular sized printing order.

**INFOGRAPHIC 4. CHOOSING PRINTING TECHNIQUE**



## 5.5. DISTRIBUTION

Distribution is an important consideration for international and regional procurement. Although it largely falls outside the scope of this paper, a few factors for consideration are:

- Depending on the location of production and delivery, distribution will be more cost-effective by ship, truck, or train. As an illustration, the Arab Printing Press said that “a container of 20 feet will contain around 150,000 story books of 32 pages, and the average shipping cost/container to Africa, for example, is \$4,000, which costs around USD 0.03 per book. This will vary from one country to another, but this is the approximate range. The time frame is 35 days by sea freight from Lebanon.” (S. Fegali, presentation, February 21, 2013). From India or Vietnam transport costs for 150,000 books of 130 pages would be approximately USD 0.02 to USD 0.03 (B. Druck, India; Hanoi Printing Vietnam, personal communications, December 4, 2013).
- Another option for continental distribution is the railroad. This is a cost-effective and efficient method of distribution, yet rail networks in developing countries are still underdeveloped. However, since railroads facilitate all kinds of transport and trade, large investments are being made. This could be a useful method of transporting books and learning materials in the future.
- When books arrive at the harbor, airport or border, ground transportation is required. Problems can occur with books passing customs at the harbor or borders, which causes delays. It is important to specifically state the distribution responsibility of the supplier, whether this is to the border, to the local warehouse, or directly to schools. Prices for road transportation vary greatly among developing countries and depend on existing in-country infrastructure.
- A speedy option for international shipping is airfreight; this should, however, generally be avoided because of the high costs involved, as well as the large carbon footprint.

Local production, especially for small- and medium sized orders, has the following benefits:

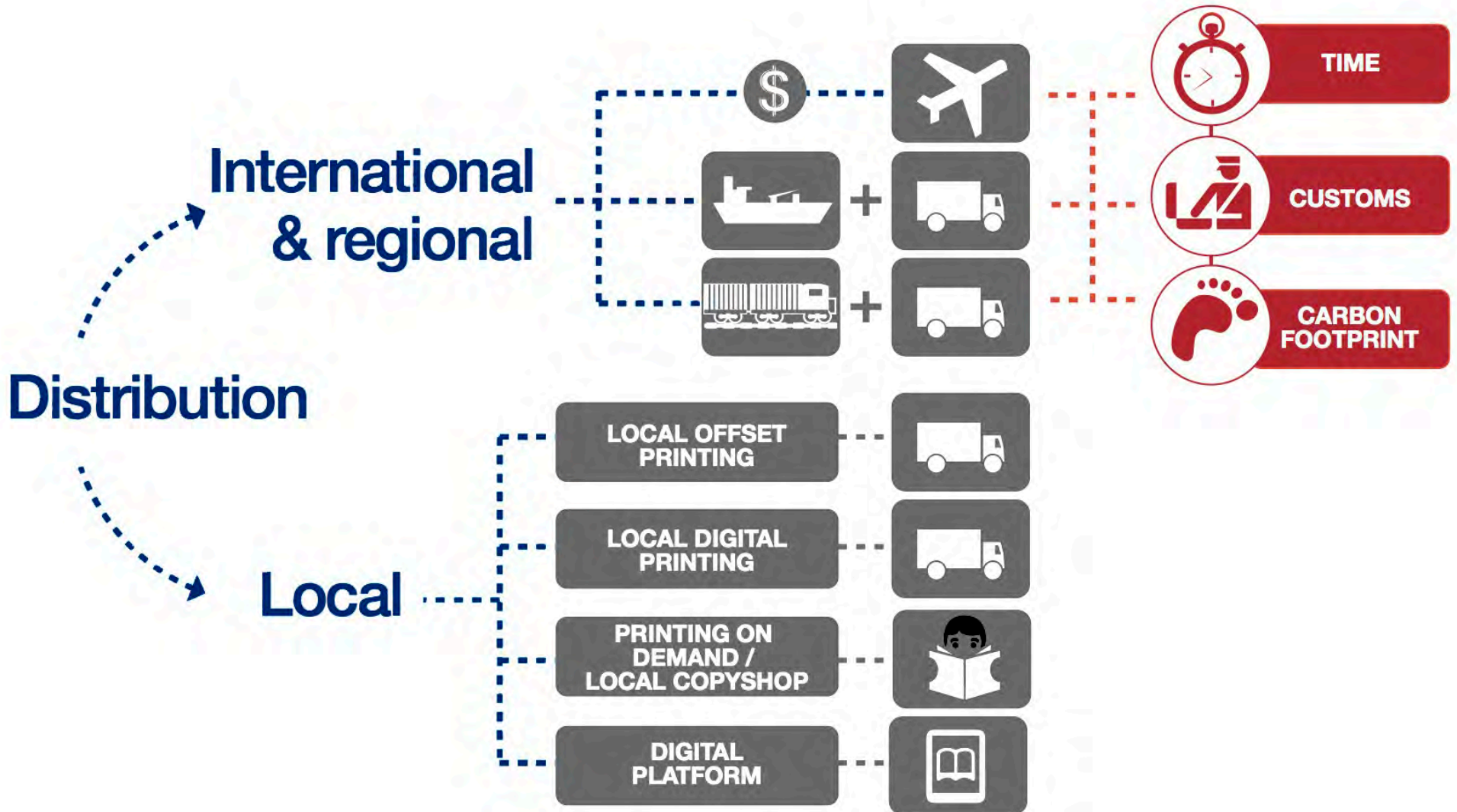
- There are only in-country distribution costs
- The local economy benefits
- Shorter turnaround time
- Reprints or top-ups can quickly be delivered

Local production becomes more cost-effective with smaller sized orders. Shipping, related additional costs, and import procedures combine to become a significant percentage of the cost per book, making international production more expensive. Consider that competitive international prices are always achieved by economies of scale, which are by default not achieved when printing in small volumes. The appropriate place and method of production is, therefore, always dependent on the order size and context.

## 5.7. CONCLUSION

The following infographic demonstrates the considerations that come with international and local production. For international production, shipment and railway provide the most cost-effective solutions. These methods still require in-country distribution by truck. Moreover, longer lead times are needed, there are challenges when passing customs, and the carbon footprint of the book industry is greater. On the local level, a conventional printer can service print orders of more than 1,000 copies, while a digital printing hub or printing on demand via local copy shop can provide alternative solutions for smaller volumes under 1,000 copies.

INFOGRAPHIC 5. DISTRIBUTION OPTIONS



## **CHAPTER 6. THE POSSIBILITIES OF A DIGITAL REPOSITORY FOR SUPPLEMENTARY READING MATERIALS**

### **6.1. INTRODUCTION**

The development of literacy skills in early grade readers in developing countries has been seriously hampered because of so-called book poverty. Children need exposure to reading materials and the time to practice and develop literacy skills. A digital library can help; however, the user community must first be defined. Determining the user community in advance is important, as there are implications for key issues such as the design of an appropriate interface. Consider the hub for providing services when deciding on the designated user community (e.g., school, library, community center) and the role it can play in reading support and user management.

### **6.2 EXISTING INITIATIVES**

More research is needed on the use or development of a digital repository with supplementary reading materials for the early grades. It is helpful to start by considering existing digital library, storybook, and Open Educational Resources initiatives. One example is the International Children's Digital Library (ICDL), designed to build a comprehensive collection of children's books that reflects a wide variety of cultures and languages around the world (ICDL, n.d.). ICDL started in 2003, and its work is based on extensive research on digital libraries. Interdisciplinary experts were consulted to tailor-make their library. ICDL reports indicate the importance of establishing the designated user community up front. This context will affect certain preferences and requirements (e.g., the required hardware and software, or attitudes towards OERs).

### **6.3. OPPORTUNITIES AND CHALLENGES**

Digitization of reading materials contributes to their preservation. In a developing country context, books are at risk of "disappearing" once they are taken out of circulation because funding for production and distribution has stopped. Through digitization, these materials will remain available (T. Welch, personal communication, June 25, 2013). In addition, it is easier to update or produce additional versions of digital reading materials compared to books. This is especially beneficial in the African context where orthographies are continually changing and developing. Users are able to create multiple versions of the materials using different dialects.

However, digital materials can pose particular challenges in a developing country context, including access to materials (the workbook/the story), devices (the printed book, laptop, kindle, or phone) and training. Other basic requirements for an online platform of supplementary reading materials include access to computers, and the associated prerequisites of electricity, storage ability, and security.<sup>28</sup>

### **6.4. SOFTWARE AND INTERFACES**

A digital platform where reading materials can be uploaded and downloaded requires software and an interface that is designed according to the designated user community's needs. ICDL, one example of the many existing open resource projects, has experience in developing and adjusting software and interfaces, conducting research, and evaluating user needs, preferences, and behavior.

The ICDL software is written on Java and relies upon Sun Microsystems' free Java 2 platform, available for Windows, Solaris, Linux and Mac OS. It is built using the Jazz toolkit for zoomable user interfaces. The software is deployed with Java Web Start technology, which enables a user to download, install, and

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28. This will not be discussed any further in this report, but a similar low-margin, high-volume approach, like the one being evaluated for printed books, can be considered.



launch the software with a single click on a web page link, once Java is installed. The software may then be launched either from the web page or a desktop icon (Druin, et al., 2001; Druin, et al., 2003).

ICDL made changes, however, because evaluation results showed that only 12 percent of its visitors were able to run the library software successfully. Running the software required a fast Internet connection, a 250 megabyte memory, and a computer with Java and Java Web Start installed. These high system requirements prevented the majority of users from accessing the digital library. Therefore, a more accessible HTML version was developed. Keeping the designated user community in mind, it will be necessary to simplify system requirements as much as possible (Druin, et al., 2001; Druin et al., 2003).

## 6.5. INTERNET REQUIREMENT

The ICDL software requires Internet to access and retrieve the reading materials. Given the poor connectivity in developing countries, opportunities for using software that does not always require Internet access should be explored. An example of software that can be used offline is Polygon. Polygon is a South African company that provides software solutions for the management of moveable assets such as library books, textbooks, and stock. It uses an offline reservation system; similar offline software could be developed for digital libraries (Polygon Software Development, 2011).

In developing countries, offline software would have the advantage of being user friendly. However, a disadvantage is that offline library services provide a static system, so continuous uploads and downloads are not possible. A solution that can balance these benefits and costs is needed.

The Freedom Toasters—interactive computers set in touchscreen content-delivery kiosks—provide a potentially interesting solution to the online/offline debate. Funded originally by the Shuttle Worth Foundation, the Freedom Toaster aims to deliver open-source software and open digital content to the masses. People in South Africa as well as other sub-Saharan African countries are limited by restricted bandwidth and the “pay-per-megabyte” structure of Internet, which means they still pay for obtaining the (otherwise free) software. Breadbin International's Freedom Toaster bridges the digital divide and facilitates maximum use of technology in education by making open-source software and a vast array of OERs available for free (Freedom Toaster, 2011).

**Figure 11: The Breadbin Freedom Toaster**



The Freedom Toaster is designed and supplied by Breadbin Interactive (Freedom Toaster, 2011). Among its clients are the University of South Africa (UNISA), the MTN ScienCentre, the Western Cape Education Department, and the Western Cape's Provincial Government.

The Freedom Toaster can be described as a digital content vending machine where users can access open-source operating systems, OERs, videos, apps, etc. and burn these to CDs, DVDs, or USB flash drives; or users can send them via Wi-Fi directly to smartphones or tablets, which can be used at home.

This is especially helpful for users with limited bandwidth, and it becomes even more valuable in consolidating content in an information-overload society. The catalogue offers a variety of open sources including instructional books, instructional support videos from teachers, storybooks, educational applications, software, and simulations (B. Simpson, personal communication, June 21, 2013).

The Freedom Toaster has a flexible design, facilitating easy customization to run on virtually any computer, and it is intended to target the needs of the designated user community. In short, the Breadbin Freedom Toaster provides an interesting opportunity to enhance access to reading materials for the early grades in a context of limited access to bandwidth and an information-overload environment.

## 6.6. USING OR DESIGNING AN APPROPRIATE INTERFACE

The requirements of the interface depend on the designated user community. If the goal is to serve young readers directly, then the interface should be child friendly and allow children to access, retrieve, and use the information according to skill level. Rather than depending on key-word searching or “point-and-click” interfaces that require typing, spelling, or reading long titles, the focus should be on visualizing the interface to facilitate the child’s selection and use of the book (Druin, et al., 2003).

Child-friendly interfaces can help children search, using category icons such as age, color of the cover, animal pictures etc. It is important to also visualize the selection and processing steps so children can understand the steps in the search process.

Designing the appropriate interface requires a balancing act of display and perception. Children’s preferences as well as their ability to read, work a mouse, click objects, and spell and compose queries should be considered. Figure 12 shows ICDL’s current interface as an example.

Figure 12: ICDL’s Interface



The format and categories of an interface should always be tailored to the preferences and skill level of the designated user community. If the interface focuses on early grade readers from developing countries, dealing with language and cultural diversity will be challenging. However, many topics are universally interesting to children.

There is a growing demand for digital libraries; more than 3 million visitors have visited the ICDL since 2002. It will be interesting to monitor the use and appraisal of digital libraries in developing countries. In these contexts, organizations and education systems may be downloading selected materials and printing large amounts of hard copies, as opposed to individuals accessing digital content on their own.

### **6.7. LANGUAGE, CULTURAL, SOCIAL, AND POLITICAL DIFFERENCES**

Learning and communicating in one's mother tongue is vital to one's cultural identity. Access to materials in the mother tongue is a prerequisite for effective development of early grade reading skills. A digital repository of reading materials could greatly enhance access to a wide variety of materials in different languages.<sup>29</sup>

The African Storybook Project aims to create and encourage the use of a digital library for early grade readers with openly licensed digital stories that can be translated and versioned for local African languages and contexts. Users can upload and download materials to share stories in various languages (SAIDE, 2011). However, the ability to control the cultural, social, and political appropriateness of available materials is limited. Therefore, guidelines on uploading materials should be considered in the selection process.

To facilitate the access and use of materials in different languages, the software, metadata, and interface may need to be translated in different languages as well. This allows the user to view the metadata and the interface text (e.g., navigation labels) in their own language. The ICDL has been focusing on this so it would be possible to consult with them on the technical details (Druin, et al., 2003). Breadbin Interactive is able to translate the interface to any language desired (B. Simpson, personal communication, June 21, 2013). Whether this is necessary, again, depends on the designated user community. If the digital platform targets organizations or education systems, providing the platform in a limited number of widely used languages may suffice.

Another point of consideration is the cultural and political interpretations of icons, symbols, illustrations, and materials provided. ICDL for example replaced their five-sided stars with seven- or eight-sided stars because of the religious significance of five-sided stars. Facial and hand representations can also have completely different meaning across cultures. The African Storybook Project is considering how to use authentic illustrations for various contexts without stereotyping certain cultures or peoples (T. Welch, personal communication, June 25, 2013). ICDL was criticized for having many Arabic materials but only one Hebrew book on their online platform, resulting in user's claiming that ICDL was taking a political stance on the Arab-Israel conflict (Hutchinson, et al., 2006). When such a digital platform would be provided by a bilateral or multilateral donor representing one or more countries, this is especially important to consider.

### **6.8. SUPPORTING CHARACTER SETS**

Software used should support Unicode, which ensures that the software can handle different character sets. For example, Russian uses Cyrillic, Farsi uses Arabic and English uses the Latin alphabet. Unicode provides a single character set with unique encoding for virtually all characters in every language (Hutchinson, et al., 2006). This is particularly important in providing access to reading materials with such lingual diversity.

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29. Some languages have not yet developed an orthography or conventional spelling system. This is a separate issue outside the scope of this report.



## 6.9. SELECTION OF MATERIALS

Thoughtful selection of the materials that will be provided on the digital platform is important. There is disagreement about the availability of appropriate, quality reading materials in mother tongues. The African publishing industry has grown and some regions such as East Africa benefit from healthy competition among indigenous publishers. Several organizations have started by developing an inventory of existing materials and considering what is suitable for use in the digital context. For example, Stories Across Africa (StAAf), a project by ACALAN and PRAESA, focuses on creating a shared African children's literature (ACALAN, n.d.). StAAf and many other initiatives could inform the selection of materials for digital repositories and possibly be useful sources of appropriate materials as well.

The ICDL relies on contributions from around the world, and established a collection development policy. According to this policy, materials should target the designated user community: children between 3 and 13 years of age, and parents and adults who work with children. The materials selected for the prototype complied with the selection criteria of the National Advisory Board of Librarians. ICDL established an international advisory committee of librarians and educators to oversee the selection process. ICDL also considers any objections against materials and recommends retention or withdrawal to the director of collection development, who makes the final decision. Generally members of the national library associations are responsible for selecting books within their own countries.

The African Storybook Project allows communities to upload their own versions of reading materials. To set a quality standard, exemplars are being developed and will be shared on the website. In general, the content of the catalogue or its use will not be controlled. However, procedures for taking down inappropriate content are being considered (T. Welch, personal communication, June 21, 2013).

Breadbin Interactive is creating user supports for managing potential information overload that might hamper effective selection of materials. Specifically, Breadbin Interactive is improving tagging possibilities, which enables better targeted searches with relevant terms. Additionally, a rating system was designed for teachers to view material assessments before selection. The material is filtered through three levels of education specialists hired from the teaching community, including high school and junior school content curators, phase specialists, and subject specialists who are still teaching (B. Simpson, personal communications and presentation, June 21-22, 2013).

In sum, there are different approaches to digital repositories and selection of materials. Some initiatives start by creating an inventory of available and appropriate materials that might be offered digitally. Others opt for the public to freely upload materials, and offer general examples as a guide for the kind of materials desired. To screen the appropriateness of materials, some initiatives relying on public uploads of materials established an advisory committee that takes the lead in collecting materials from host countries. To prevent users from being inconvenienced by information overload and a complex selection procedure, Breadbin Interactive is developing rating systems that incorporate peer review and recommendations. The key to selecting appropriate materials is to work with as many host-country stakeholders as possible. USAID should adopt an approach that best serves the needs of their designated user communities.

## 6.10. COPYRIGHT

Copyright is important for establishing a digital platform for reading materials. Some materials will be freely available, but many quality works appropriate for early reading will be copyrighted. Publishers have expanded their reach to remote communities through initiatives such as Paperight, where materials can be offered via a local copy shop. Paperight also provides access to Open Educational Resources (OERs) in its digital library (A. Atwell, personal communication, October 15, 2013). OERs are free teaching and learning materials and present an opportunity for a low-margin, high-volume approach in enhancing access to supplementary reading materials. The intellectual property license permits free use and can

even permit re-purposing by others.<sup>30</sup> The Breadbin Freedom Toaster also offers OERs on its digital library. Access to these OERs facilitates free access to information for the content and in terms of free physical access to the materials.

Creative Commons is the most well-known licensing framework for OERs. Creative Commons provide the legal framework for the copyright holder to specify the permitted use of the materials. Creative Commons provides a standardized way of describing the permission that the copyright holders give for others to use their work, facilitating free access to all kinds of materials. (Commonwealth of Learning, 2011).

Pratham Books uses a Creative Commons platform where freely available items can be specified (Creative Commons, n.d.). Pratham currently offers 159 free books on the children's library site <http://prathambooks.org> (M. Chaudry, personal communication, June 26, 2013; John, 2013).<sup>31</sup>

The ICDL offers both copyrighted and freely available materials. It does not allow downloading, copying, or printing of any materials. ICDL has negotiated the rights to include books in their collection with the copyright holder. The materials are either contributed by the copyright holder or a contractual agreement has been made with the copyright holder (ICDL, n.d.). If USAID is considering the facilitation of uploading, downloading and reviewing materials, this might influence the willingness of organizations to enter contractual obligations with copyright holders. Through maximum use of OERs and Creative Commons on such a digital library, combined with a contextualized solution for online and offline retrieval, one can significantly increase access to freely available supplementary reading materials.

### **6.11. COLLABORATING ON OR ESTABLISHING AN INDEPENDENT DIGITAL PLATFORM**

There are numerous online reading platform initiatives including the African Storybook Project, ICDL, and the Breadbin Freedom Toaster. Other initiatives working with online repositories of educational materials include TNO's Learn2Read and Paperight.

The process of establishing a digital library may involve the following stages, based on ICDL's experience (Hutchinson, et al., 2006). The first stage centered on ease of searching and reading materials, which led to technical questions of which search engine to use, how to catalogue materials appropriately, and the necessary hardware and software requirements. In the second stage, ICDL developed a simpler HTML version, to solve the issue of many users not being able to run the library software. In the third stage, metadata for books in the library was translated to native languages so users could view the metadata in their chosen language (NISO Press, 2004).<sup>32</sup> In the last and current stage, ICDL is focusing on the translating the interface to different languages and making the interface more culturally appropriate. ICDL has over two decades of experience in developing and redesigning a digital children's library. If ICDL and other initiatives are willing to share knowledge and best practices, USAID could build on this body of knowledge and focus on tailor-making a digital platform that suits its designated user communities.

TNO is developing a program for Burkina Faso called Learn2Read in partnership with local organizations and the government. The program seeks to develop interactive digital materials that allow self-learning of literacy skills by children, supporting independent literacy acquisition (H. Stubbe-Alberts and J. de Boer, personal communications, June 19, 2013).

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30. <http://www.oercommons.org/contribute/> (last accessed 10-10-2013)

31. The African Storybook Project, the Breadbin Freedom Toaster and Paperight use open educational resources. As noted by T. Welch, open sources are free to be translated whereas for copyrighted materials permission is required. Pratham Books noted an increase of exposure in their books when offering them via ScribD, a website linked to Creative Commons.

32. Metadata are data about data content.

Paperight enhances access to OERs that become available for print in any local copy shop that has aligned itself with Paperight. The content offered varies from exam papers to books from the Gutenberg project to the Youngster series, which are short books by celebrities and leaders. The availability of early grade reading materials is still rather small (A. Atwell, personal communication, June 21, 2013).

### **6.12. CONCLUSION**

A digital platform has advantages that merit exploration as a potential tool to advance the mission of improving reading skills of 100 million children in the primary grades. Both similar and unique challenges of hard copy and digital book provision have to be taken into consideration when establishing and designing a digital platform. First, it is important to establish the designated user community. The targeted audience prescribes prerequisites including software characteristics and the type of interface needed. Lack of access to internet does not necessarily hamper the regular access and use of a digital platform, for example through solutions such as the Breadbin Freedom Toaster. The selection of materials is another important matter to consider, given the large cultural, political and language differences that exist across communities and borders. The use of OERs should be maximized, and the best ways to engage copyright holders to allow their materials to be accessed through digital platforms should be considered. The lessons learned from other organizations working with digital platforms can contribute to the efficient launch of a digital platform for supplementary reading materials, and collaboration with existing digital platforms could be an interesting option to consider.

## CHAPTER 7. FINAL CONCLUSIONS

This paper reviews existing research and the experiences of individuals and organizations in the field to make recommendations for selecting and developing supplementary reading materials for early grade students in developing countries. It provides preliminary guidelines for appropriate visual formats and designs for improving reading skills, and highlights other important considerations. Chapter 8 discusses recommendations for further research.

Main findings include:

- Little research exists on the effects of the visual format and design of reading materials. Further, linguistic diversity, different characteristics of scripts, and differing country contexts complicate the development of uniform standards.
- Sans-serif fonts such as Andika, Myriad Pro, ZNuscript, Arial, Cordia New, Helvetica and Levenim MT should be used to develop supplementary reading materials. Andika is a free font, explicitly designed with the beginning reader in mind, and is therefore highly recommended.
- Depending on the grade level, font sizes should be a minimum of 24–26 points (English/Latin Script) or 32 points (Thai/Arabic Script). Studies have shown that increased font size is particularly important for 5- to 7-year-olds, and that an increase in letter size can improve reading speed by as much as 9 percent.
- Word and letter spacing affects how people process typographic cues; the spacing after titles, between pictures, and between lines can facilitate better comprehension of a story. Although guidelines offer an overall indication of the appropriate spacing to create an effective learning curve, specific standards depend highly on the specific script used.
- In terms of text alignment, unjustified text is recommended for early grade reading.
- Use of color attracts readers, especially young ones; it can motivate them to pick up a book and improve object recognition. But, it should be used consistently and should not be over-used to avoid causing confusion or distraction.
- The cost of using color is highly dependent on the printer's capacity. But, this study found that full-color book production can cost 10 percent more than black and white.
- Graphic considerations in finishing, trimming and binding determine costs. Always consult the printer before determining these features. The specifications of the print contract often indicate the general size of the book; however exact trim size is determined after consulting with the selected printer. Many local printers do not have the capacity to use PUR binding technology, which is a must for a three-year life expectancy of reading materials. Support through commitment to local sourcing or financial investments in technology and training is recommended for the development of local printers' capacity in finishing and binding books.
- Printers in developing countries often lack proper binding capacity. Saddle stitching is a suitable binding method for supplementary materials because it is the most economical technique for materials of less than 96 pages. Perfect binding with PUR is more expensive, but it is the most economical and durable option for materials of more than 96 pages.
- Uncoated, bond paper is the most appropriate paper for educational materials. Paper with 70/80 grams per square meter has less opacity and is more durable than a lower weight paper. Covers need to be of no less than 130 gsm.

- Paper costs rise as a share of a book's overall production costs with increases in the number of pages. For the best paper price, try to buy in bulk; consider the printer's paper supplier relations and ability to hold stock or order in a timely fashion; and review the necessity and cost implications of importing.
- Consider whether the paper used is sourced from sustainably managed forestry and the impact of book demand on deforestation and loss of ecologically valuable and biologically diverse habitat.
- Printing methods should be chosen in relation to the scale of the order.
- International procurement is recommended for high volume orders. Large, international printers have access to all kinds of printing presses, including those that produce huge orders cost-effectively. However, international distribution costs have to be considered in the total unit price per book.
- Host governments and development partners increasingly require local production. If local capacity is sufficient, this avoids international transport, provides local economic benefits, shortens turnaround time, and speeds delivery. Medium volumes can be produced through local offset printing, and less than 1,000 copies of smaller volumes can best be provided through a central digital hub or even the local copy shop.
- As local production grows, it is increasingly important to hold discussions with host governments about import duties on paper and ink and the impact on the local printing industry and capacity development.
- Digital storage and retrieval of reading materials can reduce development costs and duplication of effort, and has great potential for preserving texts, facilitating in-country and cross-country access, and creating versions in multiple languages. Challenges include access to materials, equipment and training; software and hardware requirements; and linguistic, cultural, social, and political diversity.

**Table 12: Producing Supplementary Reading Materials: Do's, Don'ts and Alternatives**

Early Grade Reading	Do	Alternative	Don't
<b>Font type</b>	Use a sans-serif font		Do not use a serif font
	Use Andika if there are few to no special characters needed	Use Arial, Cordia New, ZNuscript or Myriad Pro if you need an extensive range of special characters	
	Use Andika if you are able to download the font but have limited funds	Use Arial or Cordia New if you do not have Internet access	Do not use Helvetica, Levenim MT, ZNuscript or Myriad Pro if you cannot afford to buy fonts
	Use Andika when designing materials for beginning readers, especially because 'a' and 'g' letters are easy to distinguish in this font type	Use Arial, Cordia New, or Myriad Pro if you are not using Andika	Be aware of the fact that the 'a' and 'g' of the ZNuscript is very similar and could be confusing to beginning readers
<b>Font size</b>	Use the largest recommended font size when learners have to read the materials independently and/or take home to read	Use a slightly smaller font size when the teacher has to read the materials to the learner	Do not use a font size smaller than 24–26 points (English/Latin Script) or 32 points (Thai/Arabic Script). This will depend on grade level. Refer to Table 2 for more specific guidelines
<b>Spacing</b>	Make use of proportional spacing between different parts of the text. If standard spacing is double spacing between individual lines, then there should be 4 line spaces between paragraphs and 6 line spaces between headings/titles and the first paragraph/line of text		Do not use single line spacing

	<b>Between words:</b> Three letter spaces between words and slightly expanded spacing between the letters of each word. Standard spacing: the spacing used in normal Courier text: 1.16 times the width of the lowercase x	Can use standard spacing between the letters of each word	Do not expand the spacing between the letters of each word by more than 10% (More than 1.28 times the width of lowercase x of the Courier font)
	<b>Number of lines per page:</b> Depending on the grade, there should be between 4 to 10 lines per page. Refer to Table 4 for more exact guidelines		Do not increase the density of lines per page too substantially over the course of the year
	<b>Alignment:</b> Use left-aligned text for Latin Scripts and right-aligned text for Arabic scripts		Do not justify text
<b>Color</b>	Whether or not to provide colored materials is within the discretion of the provider and depends on budget and purpose	To be more cost-efficient, provide materials with only colored illustrations and black text or provide materials with a colored cover only	Do not use too many colors and do not use them inconsistently to avoid confusion and distraction
	If the budget allows it, provide colorful early grade readers that attract children		
<b>Trim size, binding and design</b>	Always determine the exact trim sizes with the printer; include this in contract		Do not set an exact trim size without consulting the printer and considering the press used

	Determine the number of pages according to the number of pages that fit one sheet		
<b>Binding</b>	If you want materials to last 3 years: always use PUR binding	Otherwise saddle stitch materials under 96 pages  Perfect binding with hotmelt glue is frequently provided but life expectancy varies between 6-12 months	Do not saddle stitch materials of over 96 pages
			Do not perfect bind with normal hotmelt glue when PUR is available
<b>Paper</b>	Use uncoated, bond paper with 70-80 gsm paper for content and minimum 130 gsm for covers	Consider and review the impact of policies on import duties for paper on the competitiveness of local suppliers and the unit price offered	Do not provide materials with less than 70 gsm because it will affect durability and opacity



	Strive for the best price through bulk buying to increase your negotiation power and buy when prices are favorable		Do not postpone print orders because late paper orders affect the paper price; a large proportion of the production costs
<b>Production methods and scale</b>	Always strive for economies of scale. Match the size of your order to the type of press and select a printer on that basis	When sourcing should be done locally, minimize elevated prices through striving for economies of scale, cost savings in design (trim size, binding, number of pages) and support for local printers to invest in technology and training	Do not neglect to consider distribution and storage costs and procedures when procuring internationally
	Support local capacity development and access to machinery and training. Produce small and medium volumes in-country		Do not provide only general specifications in the contract (e.g., stating only perfect binding rather than perfect binding with PUR, or stating general size but not that exact trim size should be determined upon consultation of the printer).

## CHAPTER 8. RECOMMENDATIONS

It is hoped that the recommendations of this report will contribute to development of supplementary reading materials that are appropriate for developing country contexts.

The visual format and design of materials affect the acquisition of reading skills. Yet, the best practices for font, spacing, and color provided in this report are based on preliminary field findings and the little research that exists. Therefore, targeted research is recommended for collecting empirical evidence on best practices; specifically in the context of improving skills of children in the early grades in developing countries. It is also important to collect detailed information from a variety of international print suppliers and distributors to determine the turning point of economic advantage for international versus local production.

The report provides suggestions for maximizing cost-efficiency and quality. However, these goals cannot always be met when working in a developing country context. Contracts might prescribe local sourcing for print and publishing work, yet local suppliers do not yet have the required capacity. Suggestions for further research are as follows:

- **Chapter 1:** Conduct research on the impact of font type, font size, and letter and word spacing on early grade readers, and look at how the influence of these factors diminishes as learners' progress through the grades. Such a study could also analyze how the different purposes of supplementary materials (e.g., independent or home reading materials, read-aloud materials, and other materials only used by the teacher) influence design of the materials. Since language and culture are at the core of this issue, research should be conducted in multiple developing countries; results from one country or region may not be generalizable to other countries or regions with vastly different demographics.
- **Chapter 2:** Initiate research on the impact of color on the development of literacy skills in a developing country to refute or confirm preliminary findings. In particular, evidence is needed on the impact of color on illustrations alone because most text is printed in black. Research could also be conducted on the impact of color on the reading ability of children in a print rich environment as compared to children who have been less exposed to colored print. The research should try to capture the extent to which color improves literacy skills, for example, as compared to the use of other, less expensive typographic cues. It could also compare the impact of materials with only a colored cover to materials that have colored illustrations in cover and content. A field test might be conducted with two trial groups, one that consistently works with black and white materials and the other with colorful materials, to measure the improvements in reading per group. Another option might test children's retention and comprehension when reading black and white materials versus colored materials, controlling for pre-existing reading ability and other factors.
- **Chapter 3:** More research is needed on government and development partners' policies with regard to book procurement, specifically the determination of specifications on the print contract and the level of graphic knowledge amongst procurement specialists. Procurement efficiency and cost savings can be increased by having a print specialist at an organization's disposal. UNICEF has print specialists who managed to cut printing prices in Liberia in half. These print specialists work in many other countries where UNICEF is active.
- **Chapter 4:** The procurement policies of development partners and host government with regard to the use of sustainable paper should be reviewed in terms of environmental

responsibility and the impacts of the global book industry on deforestation and loss of habitat. These topics could be explored through continued research or a workshop.

- **Chapter 5:** A case study is proposed to examine when economies of scale benefits no longer outweigh additional distribution costs and procedures. This would entail evaluating prices and delivery times from multiple countries and different printers. To ensure that smaller language communities can also benefit, it is important to consider appropriate production solutions for small volumes, and tap into local technology that might already be available.
- **Chapter 6:** The issue of digital storage and retrieval of supplementary reading materials merits further research and consultation. It is important to examine various existing digital book repositories and to consider collaboration possibilities.
  - One approach would involve partnering with educational and industry experts to create an inventory of what materials already exist and what is appropriate for specific contexts. What best suits the project's goals – for example, using an existing platform and tailoring it, or establishing an independent digital repository for supplementary reading materials? What are the copyright issues? Given the wide variety of initiatives and range of opportunities, it is recommended that a workshop be held to explore next steps.
  - Some questions in digital platform design include: Who is the designated user community? What are the hardware and software requirements of the specific context? What are the project goals and the targeted users' preferences and abilities? What are the language, cultural, social and political differences that need to be taken into account?

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