

# Design Framework for Multimodal Reading Experience in Cross-Platform Computing Devices – Focus on a Digital Bible

Minjeong KANG, Juhyun EUNE

*Seoul National University*

*With the emergence of cloud computing, a diverse range of content can be read across platforms. Here, we extend our previous research (Kang and Eune 2011), where we proposed three aspects to reinforce seamless reading across different platforms: coherence, immersion, and multimodality. The reading process is classified as pre-reading, during the reading, and post-reading, where each step requires different goals, functions, and types of reading. An appropriate platform among smart phones, Tablet PCs, and PCs is chosen to play a main role at each step. In this research, we verify the design framework of our previous study by analyzing a digital Bible, ‘Youversion’, across platforms. In a comparison of the digital Bible and a digital newspaper, which was the case from the previous research, we find common characteristics of multimodal reading in each platform. This research contributes to finding a brand new content market for the cloud eco-system while offering a way to enjoy the content with an enhanced sense of immersion when analog and digital content types are brought together in a cross-platform environment.*

**Keywords:** *Reading; Cross-platform; Multimodality; Coherence; Cloud Computing*

## 1. Introduction

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As cloud computing has been studied since 2007 (Wikipedia) and a range of devices have emerged, researchers are paying attention to the services and content in this area in relation to what has become known as the multiscreen. Cloud computing is defined in *Wikipedia* as ‘the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the Internet)’. For example, iCloud, announced by Apple Inc. in June of 2011, is a cloud service that allows users to enjoy content on any device once they purchase the content from iTunes. As transferring content among devices becomes easier, interest in the consistency of experiences across various platforms has been growing. As a result, research on the cross-platform design has gained in importance.

In this paper, we aim to verify a design guide to reinforce seamless cross-platform reading experiences by extending previous research (Kang and Eune, 2011). Our approach consists of three dimensions: coherence among platforms, immersion into the content, and multimodality to enhance the reading experience. In the literature review, we study reading attitudes and processes, cross-platform consistency, and multimodality as it pertains to digital reading. In a case study, we analyze three platforms of the digital Bible ‘Youversion’ and apply the design framework we proposed in our earlier research. From an analysis of a new case considering the findings of the previous research, we extract the common features of multimodal reading.

## 2. Research Background

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We create two hypotheses in this study. First, if the content conforms to the properties of a platform, users will have a positive attitude because the content matches the user’s mental model of the platform. Second, multimodality will help users to read content on a digital device because it benefits users in three aspects: usability, comprehension, and participation.

### 2.1 Reading Attitude, Process, and Immersion

A positive attitude and high motivation for reading are known well as crucial factors for successful reading (Sperling and Head, 2002). One’s attitude toward reading consists of three factors: an emotional factor which represents the good and/or bad aspects of reading, a cognitive factor regarding the belief about the value of reading, and a behavior factor for predicting future reading behavior in light of past reading behavior (Chung, 2006). When the reading attitude leads to reading action, an intention triggers the action (Fishbein and Ajzen, 1975).

The reading process consists of three steps. In the first step, people predict the story. In the second step, people continue to monitor and visualize if what they predicted will actually transpire. In the last step, people summarize and write their opinions in their language and share the opinions with others (Mulcahy, 2006). Each step requires different goals and functions. To reinforce the experience of each step of reading, immersion in reading will be enhanced if an appropriate platform plays the main role in each step.

People spend more time reading text now that digital devices are more prevalent. However, as the reading media have changed, the ways in which these media are read have also changed. They now include web surfing, finding keywords, scanning text, and various forms

of nonlinear reading (Carr, 2010). According to Mungen (2008), there are two types of immersion in hypertext fiction reading: phenomenological immersion from our imagination of a fictional world and technological immersion from a technologically enhanced environment that we typically experience while playing computer games. Thus, we argue that digital reading consists of analog reading, which denotes phenomenological immersion, and multimodality, which represents technological reading (Figure 1).

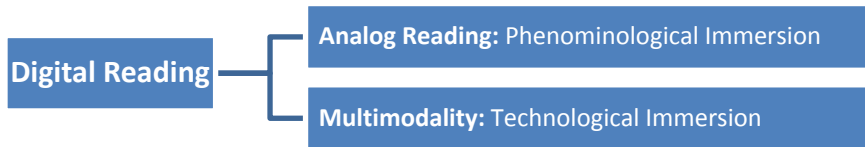


Figure 1

## 2.2 Cross-platform Consistency

The difference between platforms can be caused by the fact that the inputs and outputs to each platform are different. It was argued in Richter et al. (2006) that:

*If the task that the user executes on each device is the same, then it seems best to ensure consistency. In many cases, however, the tasks may not be the same. The horizontal, or inter-usability, concept addresses these issues by suggesting that applications maintain continuity by making the differences between interfaces as clear as possible.*

Thus, cross-platform consistency indicates coherence, which does not simply mean standardization. When a task is done through independent A, B, C, and D platforms, the cooperation between tasks in platforms A-D provides a unified experience. Thus, for cross-platform standardization, each device should be locally optimized such that the properties are conformed. Also, all of the devices should provide the same quality of user experience (UX) overall (Kim 2010). Four levels of UX standardization are shown in Table 1, and these are used in the case study later.

<b>Level 1</b>	Style	Layout, Color, Icon, Font
<b>Level 2</b>	Interaction	Structure, Flow, Input/Output, Rule
<b>Level 3</b>	Experience	Needs, Goal, Contents
<b>Level 4</b>	Eco-system	Sync, Shift, Share

Table 1

## 2.3 Characteristics of Platforms

Users have different mental models about platforms; hence, the preferred contents of each platform are different (Kang and Eune, 2011). A mental model is defined as a simple mental image of the structure of the things that allow users to predict the results of their interaction (McDaniel, 2003).

In light of the results of a survey by Nielsen (2010) in general, reading on a mobile phone is not preferred. However, communication applications such as SMS and Facebook and personal applications such as a diary on a mobile phone are highly ranked. This implies that users are willing to read if the texts are related to communication and personal concerns.

Figure 2 shows that the iPad is the most preferred platform for reading newspapers, magazines and books, suggesting that the iPad is the most suitable device for deep reading to replace printed books. On the other hand, it has been reported that the e-reader, which mimics the experience of a printed book, is the least preferred method of reading

(Murphy, 2010). Therefore, the e-reader cannot overcome printed books and other digital devices in terms of the immersion and functionality that people expect from digital devices. Joe Wikert, vice president of Wiley, Inc., said that:

*The first TV shows were basically radio programs on the television — until someone realized that TV was a whole new medium. Ebooks should not just be print books delivered electronically. We need to take advantage of the medium and create something dynamic to enhance the experience. I want links and behind the scenes extras and narration and videos and conversation (theharperstudio.com).*

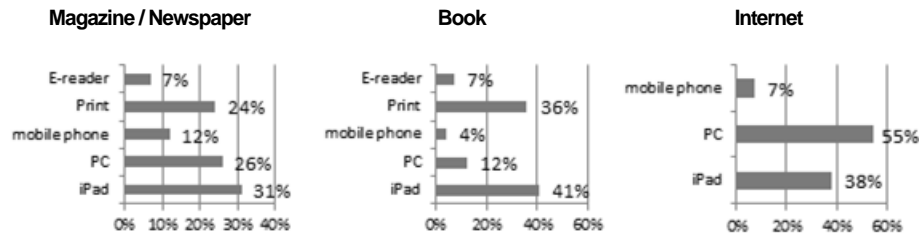


Figure 2

(Cooper Murphy, 2010)

Reading through a PC monitor causes more stress and clicking and scrolling distract reading. Visiting a linked site also disturbs the reader when they are trying to concentrate on the contents (Mangen 2008). This type reading on a PC represents scanning to find the desired information quickly and skimming to grasp the overall contents immediately. Also, people tend to engage in multitasking while reading on a PC (Kang & Eune, 2011).

## 2.4 Multimodality of Digital Reading

Dale (1969) argued that modalities have a significant impact on effective learning styles. He claimed that the learning phenomenon is achieved at the highest level both by what we say and do and that all other sayings, reading, and hearing while seeing activities alone are less effective than these modalities. Heath (2000) and Bearne (2003) stated that 'the screen' and multimodal texts need to develop new ways of communication. Walsh (2005) defined that 'multimodal texts are those that have more than one 'mode', implying that meaning is communicated through the synchronization of modes. That is, they may incorporate spoken or written language, still or moving images; they may be produced on paper or on an electronic screen and may incorporate sound.

The case of the mobile-phone book shows the benefits of digital reading. In Japan, mobile-phone novels have emerged despite the fact that the screen of a mobile phone is quite small for reading. The mobile-phone book has some advantages, such as privacy when reading. It also provides an opportunity for less well-known writers to publish their books. These mobile-phone books are popular even for people who do not enjoy reading traditional printed books. Light subjects, short sentences, and interactivity are the factors that lead to the success of a mobile book. The bestselling mobile book, "Deep Love," by the writer Yoshi, was made into a movie, a TV show, and a "manga" production (Japanese-style comic book). It was also published in a printed book with 2.6 million copies sold. Another mobile book by Yoshi includes interactive features such as movies and sound, which are sent to the readers. Multimodal texts provide users with a better understanding of his novel. The readers also give feedback via their phones. The multimodal functions of a mobile phone also invite users to participate in writing a novel. This phenomenon suggests that if the subject, form, and the style of reading are a suitable match for the properties of mobile phone, a positive attitude about reading can lead to immersion. Recently, DFKI, a German research center, announced what they termed 'text 2.0' for tablet PCs. It uses eye-tracking technology, which is an innovation in reading. This technology has the capability of

watching the reader's reading so as to react based on where they are looking and where they stop when reading. The technology enables readers to eliminate non-essential information when they are skimming, helps the readers to pick up exactly where they left off, and shows images based on what they are reading while presenting relevant reference materials. This type of multimodal reading can be a useful way to provide not only convenience but also a better comprehension of the context to provoke continuous interest.

We insist that multimodality helps users read on digital devices in three ways: usability, comprehension, and participation (Figure 3). Users have a positive reading attitude because multimodal functions provide convenience. Multimodal texts enhance the comprehension of the content because multi-sensors receive more information. Multimodality provides an easy way to participate in sharing, reviewing, and creating content.

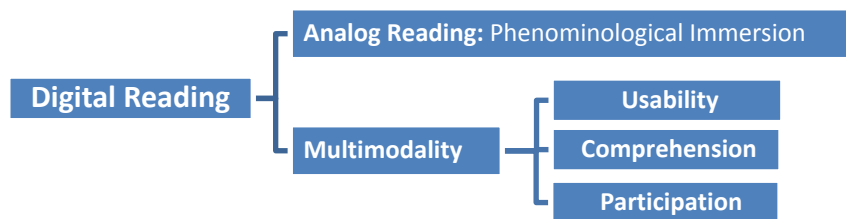


Figure 3

## 2.5. Review of the Previous Research

In previous research, we analyzed the digital versions of the Chosun newspaper (Figure 4), one of the representative newspapers in Korea. Content in a newspaper is sensitive such that readers want to read up-to-date news. However, deep immersion is not always necessary, as when reading a novel. In the literature, people didn't show strong preferences to read a newspaper in terms of platform because it differs depending on the lifestyle and degree of the interest in the news by the readers. The Chosun newspaper displays articles differently in each platform, taking an advantage of each platform's characteristics. On a smart phone, text is concise and thus suitable for short-term attention while people are moving. The space between paragraphs is large enough to breathe, making it easy to read on a small screen and thus allowing people to identify the main ideas of articles simply by skimming them. On the iPad, there is no scrolling or multimodal text, and unnecessary navigations are hidden so that people can focus on reading. The PC version has diverse functions and a complex layout and structure, providing a review section at the ends of articles. All of the menus and related article links are displayed on one page because people tend to multitask on a PC.



Figure 4  
(Kang & Eune, 2011)

We surveyed 52 people in their 20s and 30s in 2011. We asked them about what content types they prefer on each platform. Multiple choices were allowed. We learned that people prefer a smart phone for reading communication-related texts. A tablet PC is preferred to read long and linear text such as a Novel. They did not express a strong preference for a PC. Figure 5 shows the results of the survey.

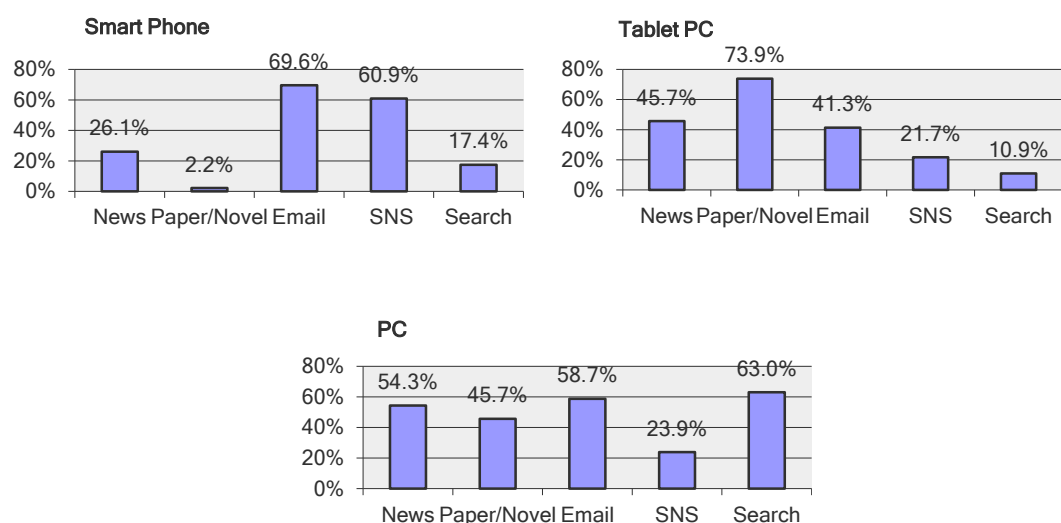


Figure 5

(Kang &amp; Eune, 2011)

We also asked people about their preferred multimodal functions when they read a digital book on each platform. We provided seven options from which they could choose. These were Search, Bookmark, SNS, Note, Scrap, Review, and Image & Sound effects. We focused on the top 5 from the results (Table 2).

The bookmark was commonly regarded as the most preferred function. However, the second most preferred functions were different for each platform. On a smart phone, the next preferred function is searching. SNS is ranked in the top 5 only for the smart phone. This implies that during cross-platform reading, a smart phone is mainly used for 'before reading' in order to find and save the content quickly to read later. On a tablet PC, note-taking and scrap-paper writing are the next preferred functions, both of which are needed 'during reading'. That means that a tablet PC is chosen for slow reading. On a PC, note-taking, bookmarking, and searching did not show much of a difference, and reviewing was mostly preferred on a PC from among the three platforms. A PC is mainly used for shallow reading while multitasking and for feedback which requires complicated work 'after reading'. The survey results show that each platform plays a different role because the preferred functions in each platform for reading are different.

<i>Platform</i>	<i>Priority of Functions</i>
Smart Phone	Bookmarking (60%) > Searching (31%) > Note-taking (26%), Scrap-paper writing (26%) > SNS (20%)
Tablet PC	Bookmarking (62%) > Note-taking (44%) > Scrap-paper writing (42%) > Searching (22%) > Reviewing (20%)
PC	Note-taking (51%) > Bookmarking (48%) > Searching (44%) > Reviewing (33%) > Scrap-paper writing (31%)

Table 2

(Kang &amp; Eune, 2011)

Based on that study, we came up with the design framework (Figure 6) for cross-platform reading, which consists with three aspects: coherence among platforms; immersion from a platform-oriented design; and multimodality to support usability, comprehension, and

participation. We will verify the design framework by conducting a new case study. The results of the case study will show the viability of the design framework.

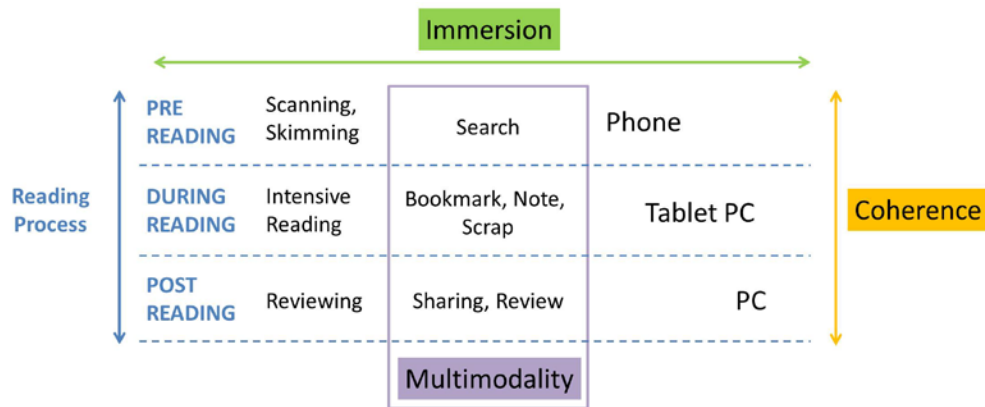


Figure 6  
(Kang & Eune, 2011)

### 3. Case Study

Contrary to a newspaper, as one of the oldest and best-selling books, the Bible is a book in which readers are often immersed deeply, as if they are reading a novel. The goals of reading the Bible are not only to understand the story but also to share what other people think and experience. There are many books that pursue these goals, such as self-help books. The digital Bible known as Youversion achieves such a goal with multimodal functions. The results of the case study of Youversion can be applied to similar books.

‘Lifechurch.TV’, founded in 1996, has created a digital Bible for mobile phones, the iPad, and PCs. As mentioned above, its name is ‘Youversion’. More than 30 million people have downloaded it thus far. It provides more than 150 Bible versions, including an audio Bible, and many features in the digital Bible, such as search, bookmarking, note-taking, live events and a reading plan in order to help people understand the Bible precisely and read it regularly. In the analysis of ‘Youversion’, we investigate the relationships between platforms and reading such that we could verify the design framework that we proposed in the previous study.

#### 3.1 Analysis of the Case

From this study, we noted if each platform of Youversion shows a different goal aside from reading the Bible. Each platform plays a main role, meaning that it leads to one experience to form a measure of coherence across platforms. In addition, a design conforming to each platform helps people to become immersed. The multimodal functions support usability, comprehension, and participation in digital reading.



Figure 7

As shown in Figure 7, the first page of the mobile-phone version of Youversion displays a menu of functions that supports reading instead of displaying the texts of the Bible itself. The search function is regarded as an important function in the mobile phone version, as the function appears first on the main page. Moreover, search options are provided only in the mobile phone version. This suggests that the Bible on a mobile phone is mainly aimed to be used for searching for and finding specific sought-after text.

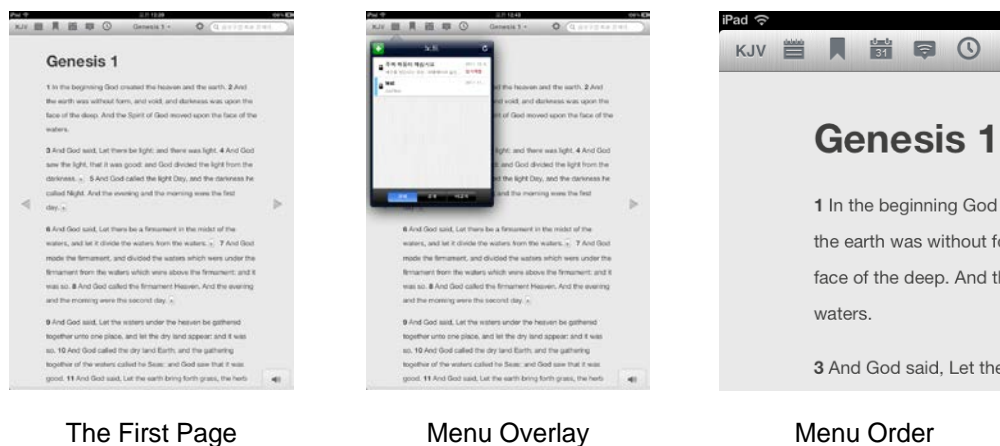


Figure 8

The multimodality of the iPad version of Youversion facilitates phenomenological immersion. The iPad version displays the page on which users left off last time as the first page. As shown in Figure 8, it appears similar to the printed book version of the Bible when it minimizes the menu bar on the screen and uses a muted color to avoid visual interruption in order to keep the focus on reading. When selecting any function in the menu, there is no page change and the menu comes out as an overlay popup so that the flow of reading is not cut off. The menu is displayed in the order of Versions, Notes, Bookmarks and Plan. The order of the menu implies that the iPad version focuses on slow reading, interpreting the Bible precisely through diverse versions and allowing the reader to record their thoughts in writing as they read the Bible.

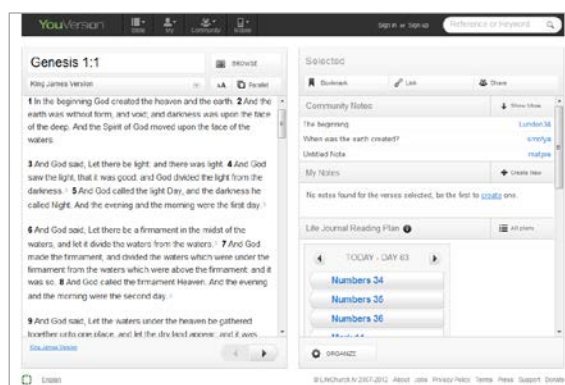


Figure 9

The PC version is divided into two sides, one with the Bible and the other with what are termed functions (Figure 9). These functions correspond to the Bible on the left side but positioned on the right side to support the reading. This method is designed to support multitasking, as users can grasp all of the related functions at a glance. Therefore, the PC version is more focused on complicated activities such as writing, sharing and managing than it is on deep reading.



The functions of Youversion are maintained across the three platforms despite the fact that the importance of the features of each platform is different. Table 3 summarizes the style, interaction, and experience of Youversion on the three different platforms.




	<i>iPhone</i>	<i>iPad</i>	<i>PC</i>	
				
<b>STYLE - Layout, Color, Icon, Font</b>				
<i>Layout</i>	Text: Functions= 5:1	Text: Functions= 10:1	Text: Functions = 1:1	Not consistent
<i>Graphic</i>	Colored, large icons →Active use of icons	Muted, Small icons →Moderate use of icons	Icons with texts →Accessorial use of icons	Not consistent
	Visual dependent	No visual interruption	Assistive visual	
<i>Color</i>	-Black & White -BG color option: B/W	-Grey(muted) -BG color option: B/W	-White, Gray & Black -BG color option: N/A	Not consistent
	For readability on a small screen	To avoid visual interruptions	To prioritize the importance of functions	
<i>Font</i>	Type/Size: adjustable	Type/Size: adjustable	Size: adjustable	Partly consistent
<b>INTERACTION - Structure, Flow, Input/Output, Rule</b>				
<i>First page</i>	Main menu (home)	Body text (no home)	Body text & functions (home)	Not consistent
<i>Menu Location</i>	Top: Main functions Bottom: Sub-functions	Top: Most functions Bottom: Nothing or voice	Top: Main functions Bottom: Action button	Not consistent
<i>Menu Priority</i>	Search>Bible>Plan>Bookmark>Note>Live>Help	Bible>Versions>Note>Bookmark>Plan>Live>hi story	Bible>my (my activity)>community (share)>mobile (platforms)	Not consistent
<i>Page Control</i>	Scroll: same page Flip: chapters	Scroll: same page Flip: chapters	Scroll: same page, chapters Flip: chapters	Partly Consistent
<i>Page Transition</i>	Flip over Bottom to top	No page change Popup overlay	Page changes	Not consistent
<b>EXPERIENCE - Needs, Goal, Contents</b>				
<i>Modality</i>	Text, Audio	Text, Audio	Text, Audio	Consistent
<i>Activities (On a sentence)</i>	A button appears → note, share, copy, bookmark, highlight color (Icon button)	A button appears → note, share, copy, bookmark (text button)	Community note & My note updated on the left column	Partly Consistent
<i>Share path</i>	Twitter, Facebook, Email, SMS	Twitter, Facebook, Email	Twitter, Facebook	Not consistent
<i>Main Goal</i>	Search, Plan	Reading, Note	Sharing, Note	Not consistent
<b>ECO-SYSTEM - Sync, Shift, Share</b>				
<i>Sync</i>	Note, Bookmark, Plan	Note, Bookmark, Plan	Note, Bookmark, Plan	Consistent
<i>Share</i>	Note, Plan, Live event	Note, Plan, Live event	Note, Plan, Live event	Consistent

Table 3

Coherence among the platforms and the diverse multimodal functions in Youversion contribute to help readers read the Bible smoothly on each platform. Basically, we find that consistency among the platforms is maintained unless a collision occurs between mental models of the platforms. In such a case, Youversion conforms to the platform's properties so that it does not interrupt the flow of reading. We also find that Youversion, as a digital book, expands the reading experience through multimodal functions that have the characteristics of web 2.0 or web 3.0, including Cloud Computing, such as personalization, participation, sharing, and openness. These characteristics of digital reading help active reading.

**Personalization:** Youversion supports more than 150 languages, various English versions, and multimodal versions of scripts such that readers can compare and interpret the texts

precisely. Bookmarks on a platform are synchronized with those of other platforms automatically.

**Participation:** Active reading can be achieved by the ‘plan’ menu, where users can track the progress of reading, and by the ‘live’ menu, where users can create and participate in church events through Youversion.

**Sharing:** SNS tools and notes to share verses and user’s thoughts help users to understand the content better and expand their perspectives.

**Openness:** Through the ‘live’ menu, any event from any church in the world is open to the public so that people can participate in reading the verses, listening to sermons, taking notes, and requesting prayers.

This case represents the three benefits of digital multimodal reading: usability, comprehension, and participation, as mentioned above. We matched the benefits with the multimodal functions in Table 4.

<i>Usability</i>	<i>Comprehension</i>	<i>Participation</i>
<ul style="list-style-type: none"> <li>• The convenient functions reinforce a positive attitude</li> </ul>	<ul style="list-style-type: none"> <li>• The multimodal text supports the understanding of the content</li> </ul>	<ul style="list-style-type: none"> <li>• Multimodality encourages users to read, share and create content actively.</li> </ul>
<ul style="list-style-type: none"> <li>• Searching, Note-taking, Bookmarking, Highlighting, Syncing with devices</li> </ul>	<ul style="list-style-type: none"> <li>• Versions, Audio, Community notes</li> </ul>	<ul style="list-style-type: none"> <li>• Plans, Share, Live</li> </ul>

Table 4

We confirm the design framework to reinforce cross-platform reading from the perspective of coherence, immersion, and multimodality through two case studies involving the Chosun newspaper and Youversion.

**Coherence:** Coherence among the platforms leads to seamless reading, as cooperation between the platforms is accomplished by each playing their own role. A smart phone helps people to search for information about the contents anytime and anywhere, which is necessary at the preview level. People then focus on reading the content on a tablet PC. After reading, people write a review about the content and share their opinion through a blogs or on a social site on a PC. Although the contents of the newspaper and the Bible are different, each platform commonly plays different role. Reading through different platforms forms one experience.

**Immersion:** Conforming to the properties of a platform improves the reading attitude, leading to immersion. In the case study, we find the properties of the platforms that help people to read. Figure 5 presents the elements of the platforms.

**Multimodality:** The multimodality of digital reading supports usability, comprehension, and participation in reading, which expands the reading experience. The key functions of each platform of Youversion are also matched to the survey results. We compared two types of content, the digital newspaper from the previous case study and a digital Bible, which have opposite characteristics. The main characteristics of each platform were concluded to be one of the benefits of multimodality in common (**Error! Reference source not found.**).

	<i>Digital Newspaper (Chosun newspaper)</i>	<i>Digital Bible (Youversion)</i>	<i>Benefits of Multimodality</i>
<i>Features of contents</i>	<ul style="list-style-type: none"> <li>• Short story (nonlinear)</li> <li>• Up-to-date contents</li> <li>• Shallow Immersion</li> </ul>	<ul style="list-style-type: none"> <li>• Long story (linear)</li> <li>• Old texts</li> <li>• Deep Immersion</li> </ul>	

	<i>Digital Newspaper (Chosun newspaper)</i>	<i>Digital Bible (Youversion)</i>	<i>Benefits of Multimodality</i>
<i>Smart phone</i>	<ul style="list-style-type: none"> <li>List type layout to enable users to find interesting articles quickly using their thumb.</li> <li>Short sentences &amp; paragraphs to help users read on a small screen while moving</li> </ul>	<ul style="list-style-type: none"> <li>Colored large icons to allow easy selections</li> <li>Easy access to the search function</li> <li>Strong color contrast to enhance readability</li> </ul>	<b>Usability</b>
	<b>Easy to identify the main idea</b>	<b>Easy to find verses</b>	
<i>Tablet PC</i>	Multimodal information (texts, photo, video) to make people understand the articles	<ul style="list-style-type: none"> <li>No visual interruption to focus on texts.</li> <li>Versions &amp; Community notes to help users understand the content better.</li> </ul>	<b>Comprehension</b>
	<b>Technological Immersion</b>	<b>Phenomenological Immersion</b>	
<i>PC</i>	Diverse functions such as SNS, reviews, and related news to react to an article.	<ul style="list-style-type: none"> <li>Community note, bookmark, and share functions corresponding to the body text to make people multitask.</li> </ul>	<b>Participation</b>
	<b>Immediate feedback</b>	<b>Multitasking</b>	

Table 5

In general, the findings of the analysis of the Bible were similar as regards the results of the previous survey and the case study. Based on the previous research and the new case study, the characteristics of reading on each platform are summarized in Table 6.

	<i>Smart phone</i>	<i>Tablet PC</i>	<i>PC</i>
<i>Properties of reading</i>	<ul style="list-style-type: none"> <li>Short sentences</li> <li>Light subjects</li> <li>Fast update</li> </ul>	<ul style="list-style-type: none"> <li>Linear reading</li> <li>Serious subjects</li> <li>High level of concentration</li> </ul>	<ul style="list-style-type: none"> <li>Multitasking</li> <li>Diverse text types</li> </ul>
<i>Ways of reading</i>	<ul style="list-style-type: none"> <li>Scanning</li> <li>Skimming</li> </ul>	<ul style="list-style-type: none"> <li>Intensive reading</li> <li>Slow reading</li> </ul>	<ul style="list-style-type: none"> <li>Extensive reading</li> <li>Scanning</li> <li>Skimming</li> </ul>
<i>Style</i>	<ul style="list-style-type: none"> <li>Color contrast for readability</li> <li>Short sentences &amp; paragraphs</li> </ul>	<ul style="list-style-type: none"> <li>Muted tone for concentration</li> <li>Similar to paper book</li> </ul>	<ul style="list-style-type: none"> <li>Diverse tones based on the functions</li> <li>Put everything in one page</li> </ul>
<i>Interaction</i>	<ul style="list-style-type: none"> <li>Exposing key menus</li> <li>Hierarchical Transitions</li> <li>Horizontal, vertical moves</li> <li>Bookmarking &gt; Searching&gt; Note-taking</li> </ul>	<ul style="list-style-type: none"> <li>Hiding distracting elements</li> <li>Minimizing the menu bar</li> <li>Overlay of menus</li> <li>Horizontal and vertical moves</li> <li>Bookmarking&gt;Note-taking, Scrap-paper writing</li> </ul>	<ul style="list-style-type: none"> <li>Exposing every function</li> <li>Menu→change page</li> <li>Body related→ same page</li> <li>Vertical moves</li> <li>Notes, Bookmarking, Searching &gt; Reviewing</li> </ul>
<i>Experience</i>	Search-oriented	Reading-oriented	Review-oriented
<i>Eco-system</i>	<ul style="list-style-type: none"> <li>Pre-reading (predicting)</li> </ul>	<ul style="list-style-type: none"> <li>During reading (monitoring)</li> </ul>	<ul style="list-style-type: none"> <li>Post-reading (creating)</li> </ul>
<i>Benefits of multimodality</i>	Usability	Comprehension	Participation

Table 6

## 4. Conclusion

This paper contributes to the immersion of digital books for cross-platform reading and for creating cloud content. We verified the design framework for the seamless cross-platform reading with the concepts of coherence, immersion, and multimodality through a case study of Youversion.

Via a literature survey, we learned that digital reading consists of analog reading and multimodality, leading to three advantages for reading: usability, comprehension, and participation. We found that texts conforming to the properties of a certain platform improve the reading attitude of the reader. Therefore, we investigated the relationships between different platforms and reading by studying the properties of three platforms: a smart phone, a tablet PC, and a desktop PC.

In the case study, we analyzed the digital Bible known as Youversion based on style, interaction, experience, and its eco-system. Unlike a newspaper, which is neutrally read on any platform, the Bible is linear and traditionally sharable; hence, a digital Bible is designed to support not only reading but also interactive functions. We confirm that Youversion reflects the design framework as suggested in previous research. Through two different cases, we extracted the design elements and learned that each platform focuses on reading steps whose goals are different.

In summary, coherence among platforms helps with seamless reading, implying that the platforms cooperate to achieve the main goal of the reading process, specifically pre-reading, during the reading, and post-reading, as each type plays a main role in the process. A design complying with the nature of each platform improves the reading attitude such that it enhances the level of immersion when reading. The functions accompanying multimodality which expand the reading experience on each platform enable users to continue reading.

As future research, it would be interesting to produce a concrete design guide based on the design framework and then apply the framework to the actual design of cross-platform reading applications.

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