Designing Next e-Book Reading Experience: Multi Device e-Book

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ABSTRACT: *The key question of this paper is what will come as the next e-book after the present ebook, which is merely a digitalized version of the paper book? This paper extracts three elements of book, and categorizes three generations of books by news analyzing. This paper suggests a new e-book model that can be realized with the advance of media technology, from the viewpoint of three elements of books. In particular, the Multi-Device e-Book prototype was made and simulated. This simulation suggests novel reading experience the new e-book will bring.*

Keywords: e-book, Ubiquitous Systems, Interactive Multimedia, Communication, Experience, Reading

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1. Introduction

E-book is publication manufactured and stored in digital form. The National Information Standards Organization (NISO, 2005) defines e-books as "*digital documents, licensed or not, where searchable text is prevalent, and which can been seen in analogy to a print book (monograph). The use of e-books is in many cases dependent on a dedicated device and/or a special reader or viewing software*". [1] Ebook is highly valued for its portability and economical efficiency. It also differentiates from paper books in that it can feature multimedia contents.

The release of the Kindle in 2007 and iPad in 2010 on the market has contributed in stabilizing the ebook platform. There are over one million publications sold in e-book form on Amazon; Apple offers iBook Store and iBook Author, an e-book creating tool. According to the survey by the Association of American Publishers (AAP) and the Book Industry Study Group (BISG), the total share of e-books in the trade market has rocketed upward from 0.6 percent in 2008 to 6.4 percent in 2010.

Until now e-books were merely transformation of paper books into digital form. However the development of media and technology has enabled a new form of e-books that manifests the distinct characteristics and possibilities of the digital format. The video '*The Future of the Book*' presented by IDEO[2] in 2011 predicted the advent of e-books that contain: platform to feed up-to-date news, reading environment sharing social libraries, and multimedia and game elements. What will the New Media Technology change and expand/extend in books? Will this expansion/extension of elements in books enable the development of a new form of e-book?

To explore the answers for the questions above, the book is analyzed from three different view points – contents, interface, and communication. Then books with other media technology are searched for categorized three generations of books, and a new e-

book model is suggested accordingly. The object of this paper is to build a prototype of Multi-Device e-Book, which is one of the suggested e-book models. This paper observes a new type of reading experience through multi-Device e-Book and lists characteristics of it. The production and assessment of the new e-book will propose a direction for future e-book and reading experience, and provide grounds for suggestion of new Multi-Device e-Book production system design.

2. Previous Work about E-book

First of all, there are few studies of books as media, including e-books. Marshall-McLuhan said '*Any understanding of social and cultural change is impossible without a knowledge of the way media work as environments* [3]'. Marshall-McLuhan is a famous as study of books as media aspects. His study was confined to paper book, which contrasts to new media - TV or the Internet. However, many studies focused on the story about the book, not form as media when they treat books [4].

Previous works include the definition and social impact of e-books, and the combination of books and multimedia. Magda Vassiliou and Jennifer Rowley [5] have defined and cleared the characteristics of ebooks from gathered references and Robert Darton [6] pointed out the changes e-books will bring to the publication market and the possible problem of monopoly.

Addtionally, Selçuk Özdemir [7] researched on educational effects of multimedia elements in books and Ava Vasile [8] suggested the possibility of new communication through transmedia literature with the example of FanFan2.

Researches on e-books have only covered the subsequent industrial phenomena of existing e-books. This paper will differentiate from previous research by looking into the future to suggest a new possibility for e-books.

On the other hand, Glenn Ward Scott [9] studied the progress of newspaper from a mediamorphosis point of view. In his research on newspaper subscription and increased reader participation of enewspapers he pointed out that the emergence of Internet lead the transformation of newspapers. Also he explained "*All this leads toward a model of journalism practice where professionals and amateurs communicated more directly*". The change of the paper version of newspaper under the influence of new media can guess the book has a same process. It also implies that e-book will have the same change with next new media.

3. Three Elements of Book

In this section, the meaning and examples of the three elements of books are explained. UNESCO, Oxford, and Webster's definition of books were used to extract the following three elements: Contents that tell the story, Interface to meet the readers, and Communication involved throughout the process. (Figure 1)

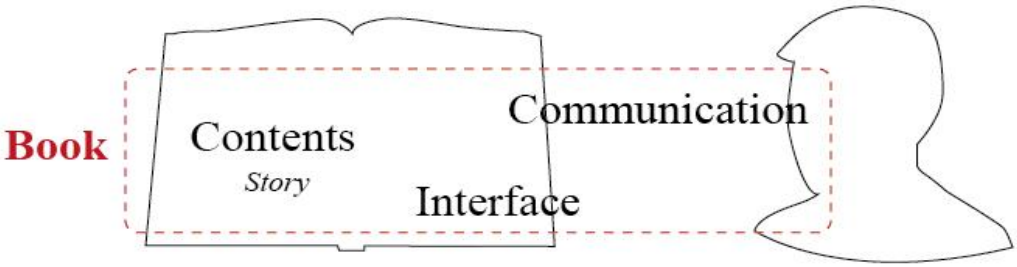

Figure 1. Three Elements of Book

3.1 Contents

Content is the element that tells the story. It doesn't mean the story, but it means intermediate as deliver the story. In books this is realized through text, drawings, photos, and with the development of technology, videos and 3D elements. Outside of books supplementary information is given with independent software or webpage forms.

3.2 Interface

Interface is the boundary or intercepting point of two different systems. In books interface is determined by the layout and hardware of books. Interface inside books is shown by the method chosen to deliver the contents to Readers, and includes scroll, codex, hypertext, etc. Outside of books interface is a tangible media that includes stones, papyrus of ancient times to

paper, tape, CD, DVD, and in the recent digital environment, Tablet PCs, etc.

3.3 Communication

Communication is divided into real-time and interaction inside books and reader-reader, reader-writer, and reader-world outside of books. These elements and supporting examples are shown in Table 1.

Book	Contents	Element	Text, image, picture, sound, movie, 3D…
		Form	Software, Webpage
	Interface	Layout	Scroll, Codex, Hypertext
		Hardware	Stone, Papyrus, Paper, Tape, CD, DVD, Tablet PC…
	Communication	Inside	Real-time, Interaction
		Outside	Reader – Reader, Reader – Writer, Reader - World

Table 1. Three Elements of Book and Example

4. Categorized There Generations of Books

Traditional books have evolved with the development of storage device and platform technologies. Roger Fider [10] asserted, "*Older, more established media do not die with the introduction of new media. They instead continue to evolve and adapt to co-exist with new technologies*". For example as CDs are added to hardware of books as new storage device, sound and moving images were used as contents to tell the books' stories.

It chronological compares how to adopt a book for the emergence of new media by Roger Fiddler's mediamorphosis theory. The development of media technology can be divided into the development of storage media and the evolution of the platform. Major storage media technologies are Philips' invention of cassette tape (in 1963), VHS (in 1974), Floppy (in 1976), Compact Disk (in 1981), DVD (in 1996), Wi-fi (in 2001) and Cloud Storage (in 2011). Meanwhile, Major platform technologies are Photography (in 1823), ENIAC (in 1946), Motorola's mobile phone (in 1973) IBM PC (in 1981), World Wide Web (in 1991), Rocket e-Book (in 1998), iPhone and Kindle (in 2007), iPad (in 2010) and Smart TV (in 2011).

The cases of books with other media technologies were gathered at newspapers' articles. For this, all articles of Korean four newspapers digital DB from 1920 to 1999 are searched with '*book*' and new media technology keywords. Then Meaningful news is selected. In 1975, Children's book with cassette tape was first Impart in newspaper. After that there are many articles of the book with cassette tapes or records as a result of disseminate cassette and records. The Photo book with VTR tapes was first released in 1983; many '*book with listening*' change from tapes to CD from 1990s. In 1993, many books were made with CD-ROMs; Screen-Book service that downloaded and read in PC was released in 1995. Rocket e-Book (in 1998), Soft-book and every-book (in 1999) released late 1990s, and Apple's iBooks serviced officially in 2010. (Figure 2).

This figure shows that media technology affects the expansion of the book approximately 10-year cycle. In early 1963 the advent of the cassette tape led to the news about the children textbook with cassette tape, approximately 10 years later, in 1975. The paper book with cassette tapes in the late 1970s, add sound as a content of the book. Meanwhile, the development of the VHS in 1974 goes to star's photo book with VHS in 1983 approximately 10-year cycle. This combination is for added moving image into paper book. CDs invented in 1981 led to popularity of CD-ROM books in 1993. The book with CDs can be an interactive communication media. These changes that a combination of books and new media from the 1970s to the 1990s expand the book's elements - sound, moving image, interaction.

And it also expands the book's area. On the other hand, the invention of PC in 1981 led to Screen-book service that download and read in PC in 1995, appearance of Rocket e-book which is first e-book led to Amazon's Kindle and Apple's iPad (Tablet PC) in 2007. From here, the traditional concepts of the book as "*press*" changes to the book, which is comprised in the new media. (Figure 3)

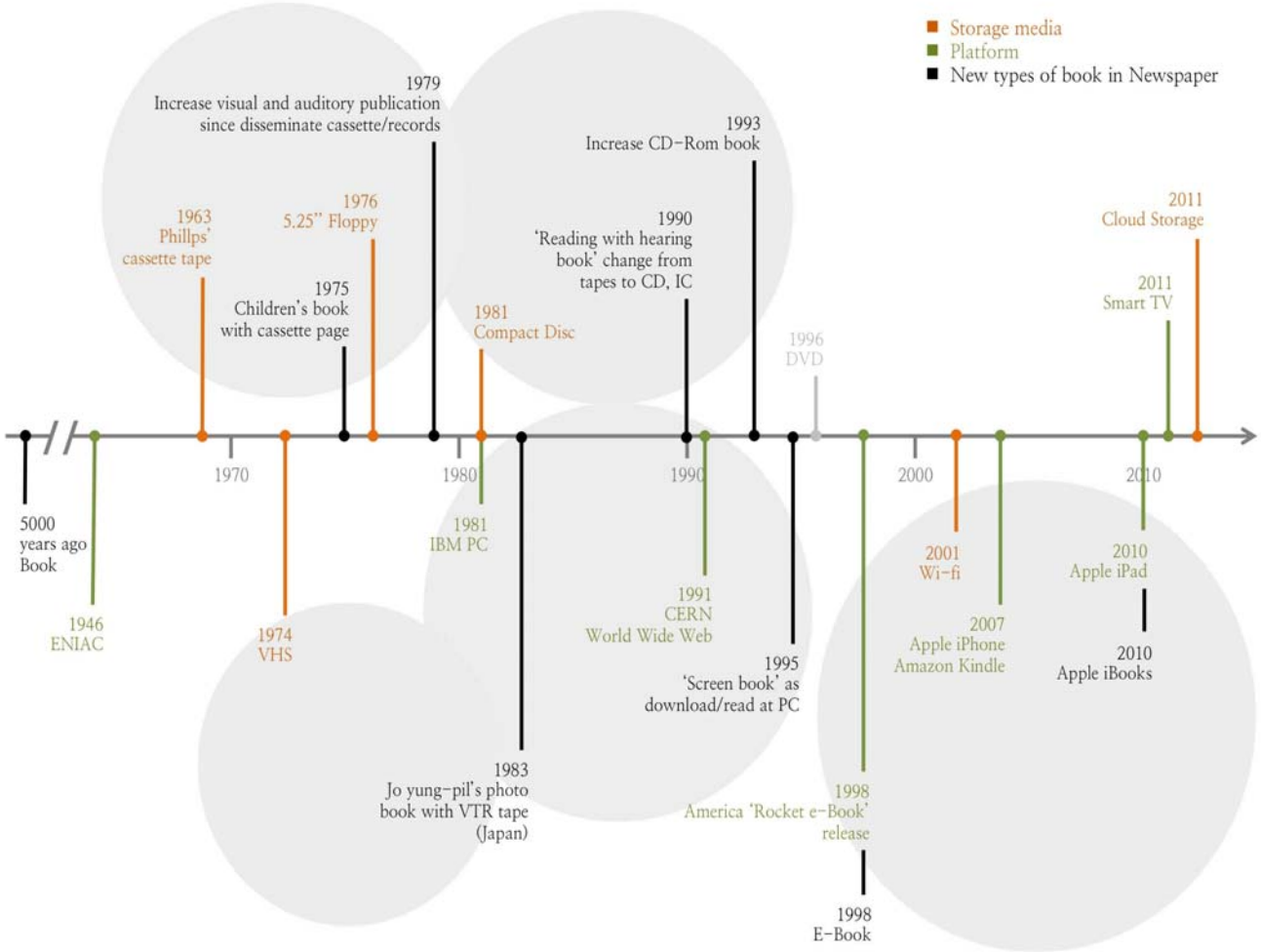

Figure 2. Chronological Chart with Media Technology and New Types of Books

This is the result of overcome the limitations of paper book as contents, interface, communication aspect and breakthrough in the market for sale. 10-year cycle is about the time for establishing standards of technology and for price stability of a playback device. Elements based on this book, the development of media technology expand the books elements, and thereby categorized three generations of books; Book 1.0 as conventional book, Book 1.5 as multimedia book , and Book 2.0 as e-book. The extended elements and requirements of books are shown in Table 2.

As Marshall McLuhan indicated in The Gutenberg Galaxy [11], the spread of Gutenberg printing largely influenced books from the shape of them to the communication itself. Book 1.0, which is the most conventional type of books, is printed out in paper and completed in codex form. This type was kept for almost 500 years before the development and supply of new storage devices in the 1900s. Book 1.5 includes contents that cannot be printed on paper such as audio and video by providing tape, CD, DVD, Blue-ray and other extra media with the paper form.

In the 21st century, the advanced smart technology brought the advent of tablet PCs and other smart devices. E-books were finally separated from the notion of printing and real-time communication and expression was made possible without the aid of extra media.

5. New Types of E-Book

The development of Media Technology will extend the three elements of Contents, Interface, and Communication. The extension

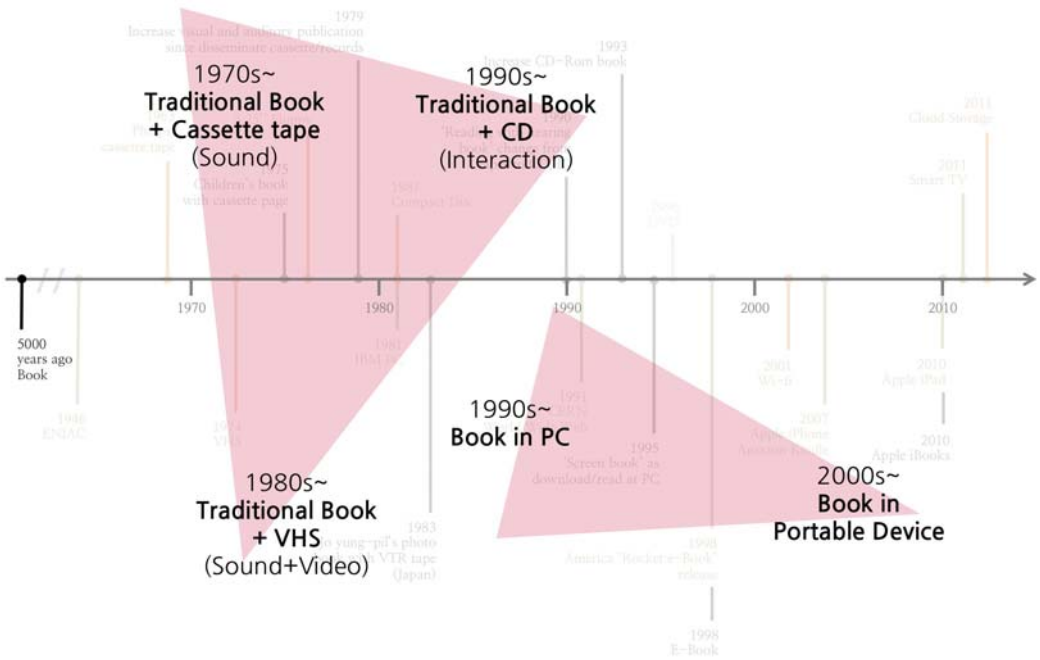

Figure 3. The Changing Trends of the Age-specific Books

of each element will allow the development of new e-book models that provide different form of reading experience. Here three different models are suggested: Haptic e-book, Multi-Device e-Book, and Open writing open world e-book.

5.1 Haptic e-Book (contents aspect)

Books substitute the sensory system with representations of various elements. Reading experience that materialize the descripted physical sensation of the subject will be made possible through advancement of display technology and maximization of reality of expression.

5.2 Multi-Device e-Book (interface aspect)

Until now one story was completed in a single hardware, or the story was experienced differently by changing the hardware. Multi-Device e-Book is a story is that continued simultaneously in more than one hardware device. This allows a new experience regarding the reader and story interface.

Age of the book	*Content aspect*	*Interface aspect*	*Communication aspect*	*Development of Media technology*
Book 1.0 : *Conventional book*	Text, Image, Picture	Codex Paper	Reader-Reader	Gutenberg Press (1450s)
Book 1.5 : *Multimedia book*	Sound, movie, 3D Software, Webpage	Hypertext Tape, CD, DVD	Interaction Reader-Writer Reader-World	Development of storage technology (1900s)
Book 2.0 : *e-book*		Tablet PC, Smart Device	Real-time	Development of Smart Technology (2000s)

Table 2. Age Of the Book with Media Technology

5.3 Open Writing Open World e-Book (communication aspect)

In the conventional book the reader experiences the story created by the writer in an environment separated by the world. With

Figure 4. Multi-Device e-Book System Structure

Open writing open world e-Book the boundaries between the reader, writer, and the world will vanish. The reader and writer will make the story together and there will be a new movement to communicate with the world through that story.

6. Designing Multi-Device E-Book

In this paper, a design prototype of Multi-Device e-Book model is suggested and its potential is tested through simulation. As you saw earlier, the emergence of new media technologies have had an impact of the expansion of the categories of books. Smart device and cloud storage service which released in 2010 can affect new types of e-book after 5~10 years. Since Multi-Device e-Book can be with these services, we focus on this type of e-book and make a prototype for observe the result of the new kind of reading experience.

In the traditional book a story was concluded in a single independent hardware. Now with the development of the media, it is

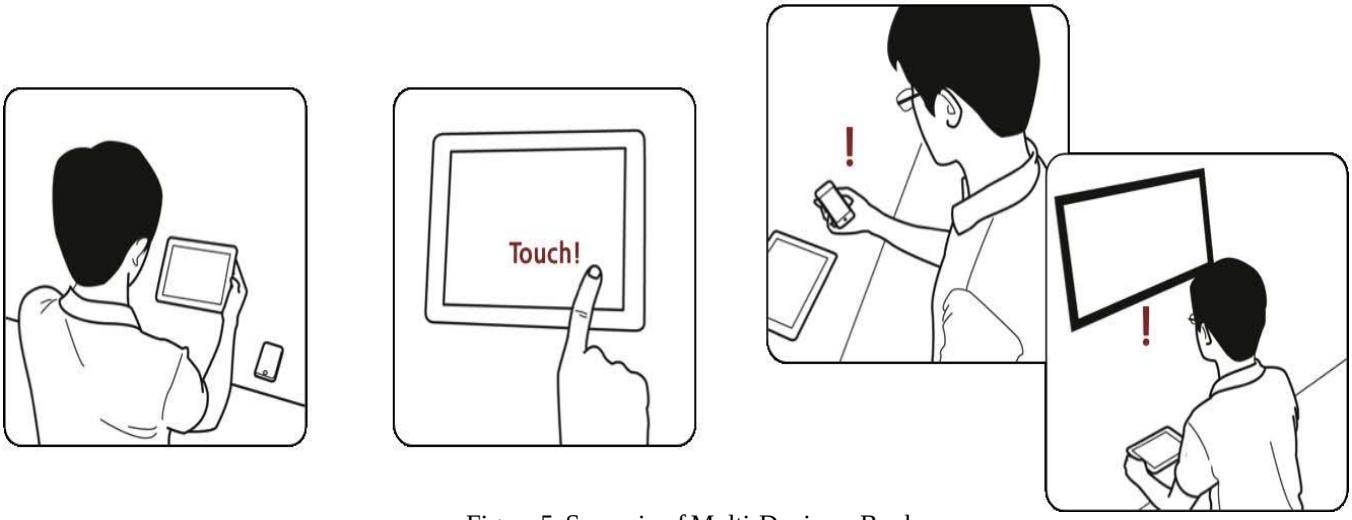

Figure 5. Scenario of Multi-Device e-Book

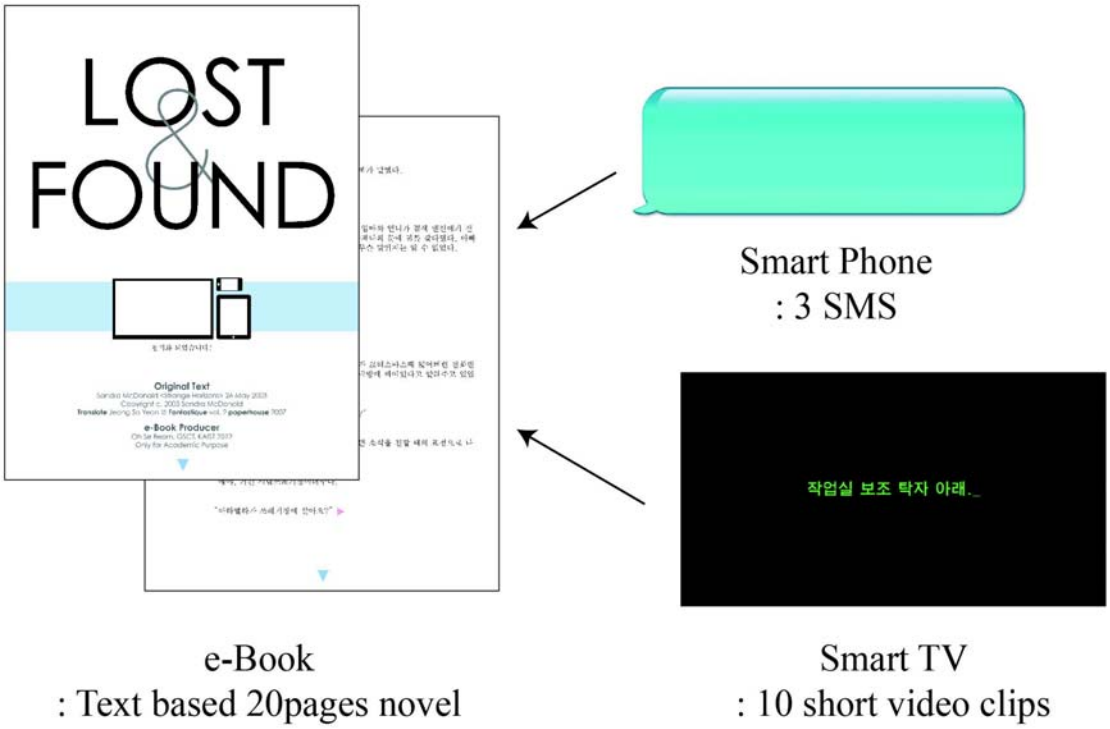

Figure 6. Media application of "*LOST AND FOUND*" (Multi Device e-Book Version)

possible to experience a story starting from a book and carry on to a computer, likewise from a tablet PC to a mobile phone, and so on. Also the arrival of the Cloud Service in 2011 has allowed multiple devices to connect and share information and status with each other. If this technology is utilized in e-books, a new generation of story design using diverse smart devices such as mobile phones, tablet PCs, smart TVs, etc. will be possible.

6.1 System

Multi-Device e-Book goes through a step of downloading the story on a Smart Device and sharing with other devices. As the Reader goes through the book the progress in the story is synchronized concurrently. In formerly designed Story points, synchronized devices show sub-stories or related information. Reader can choose to either read the book from one device or experience a more full story with other connected devices. (Figure 4).

6.2 Scenario

Reader reads the book in Cl oud Environment. The Reader does not perceive this, but Smart Devices are connected to each other. In certain Story points the synchronized devices are sent signals, and corresponding related stories are shown. For example a phone call may be made to the Reader from a subject in the story, or a new flash about an incident in the story will pop up on television. This kind of reading experience not only allows Readers to be more absorbed in the story, but also lets them feel the story in a spatial way. This kind of story that '*converses*' with the Reader through various smart devices provides an entirely different experience from conventional e-books that were just a digitalized version of paper books. (Figure 5).

7. Prototype

The prototype was made focusing on the moment of connection from Tablet PC to mobile phone, and Table PC to Smart TV, and the story effects occurring at that time. When the characteristics of the devices (mobile phone - phone call, SMS, web search / TV - news, video play) are combined with the story of the book to come alive in the real world, the full effect of the experience will be maximized.

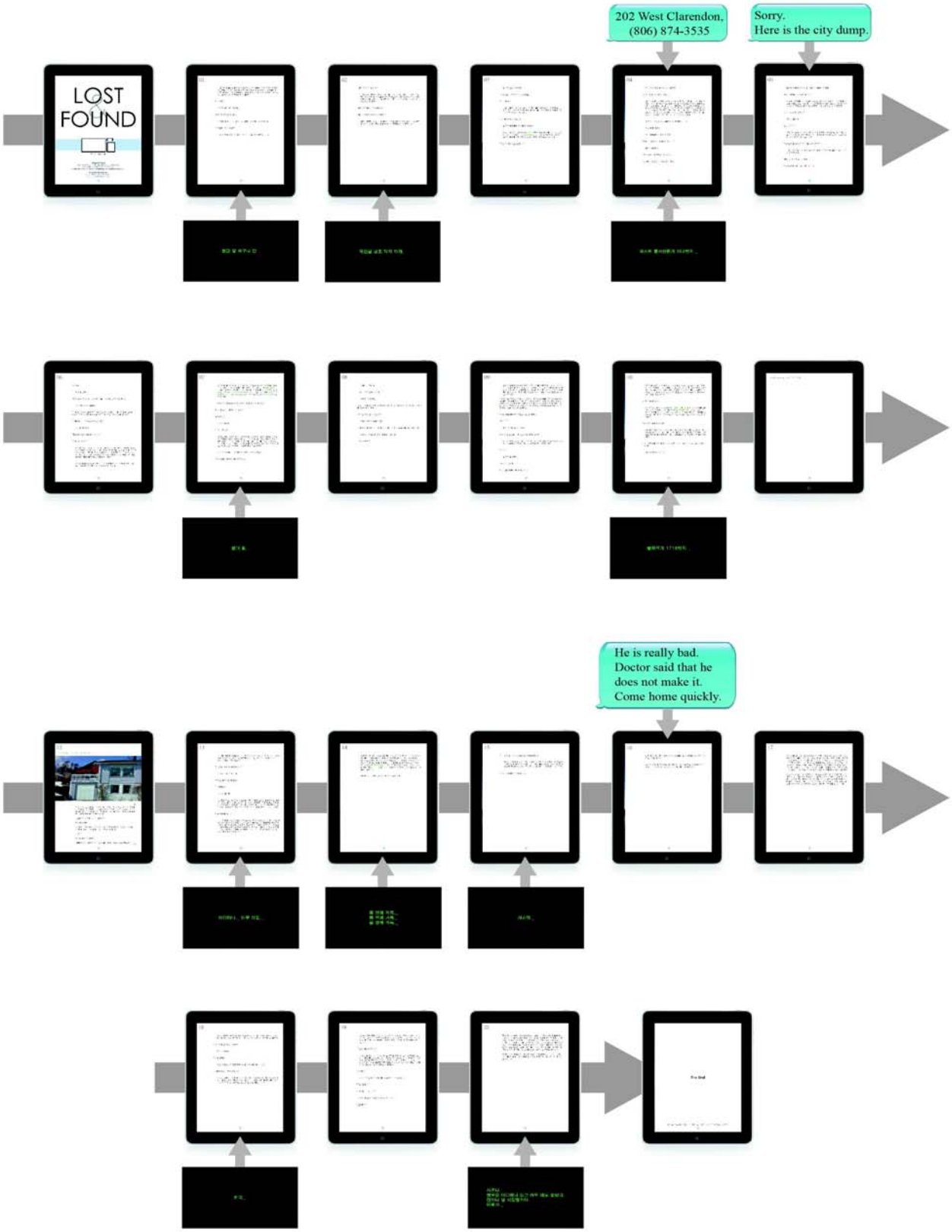

Figure 7. System Flow of "*LOST AND FOUND*" (Multi Device e-Book Version)

Figure 8. Simulation

7.1 Story

Sandra McDonald's <Lost and Found> was used as the text for e-book in this prototype. It was chosen because it involves a certain amount of TV and mobile phone in the story, thus making it easier to prepare the videos and effects to be used with the story. The prototype excludes any other type of media or expressive techniques and focuses on story telling through text, so that it maximize the effect of text-to-multi-device transition. Two different versions were made: Book 2.0 which reads the whole story in the tablet PC, and Book 3.0 which also partially applies TV, and mobile phone throughout the story.

7.2 Design

Currently there is no available platform that can create multi-screen contents that integrate table PCs, smart phones, and smart TVs, making it necessary for the researcher to control the multi-device manually in the simulation environment. Therefore in this research InDesign Digital Publishing was chosen to provide the digital books in the simulation environment in the same quality as e-books used in reality.

In Design Digital Publishing shows the contents in tablet PCs in the form of e-books using Adobe Content Viewer, taking away the need to formally publish e-books. Also it provides functions such as inserting hyperlinks, slide shows, multimedia, and web contents and adding high quality page-turning effects.

The prototype includes 21 pages of text-based story, Google map to explore the area of the setting, ten different 3-second smart TV videos, and two smartphone messages. (Figure 6, Figure 7).

7.3 Simulation

The final goal of the Multi-Device e-Book design is to create an environment that can provide a full experience of a story in this kind of system. A prototype room with Smart devices will be set up for Readers and Contents Creators to experience and compare

the traditional e-book and Multi-Device e- Book. (Figure 8).

7.4 Simulation Result

After simulation of prototype, there is an interview session with questions about the reading experience of Multi-Device e-Book, not the story of it. Subjects said multi device reading experience gives them a new feeling that you'd like to participate as a part of the story. And such reading feels like fresh, new one. Some subjects were embarrassed when the other screen which they didn't notice is used for reading. And this inconsistency makes difficult to understand the story. Furthermore, there is a negative answer about repetitive behaviors make lower nobility. On the other hand, some subjects had a pleasure of expect about which story comes from and where it comes. The expectation was like a trailer of the movie.

Many subjects told us the numbers of repeat is very important in this reading experience. They recommend us more delicate adjustment of the repeat and connection option for the web search. It makes more fun and active reading experience. Most of them like the moment when they get the SMS from the hero of the book. So maximize the interaction with smart phone is recommended.

7.5 Result and Modify

We obtain a modify lists of Multi-Device e-Book for future work through simulation result and interview answer. First, special platform design for Multi-Device e-Book is needed. This platform support cloud or wi-fi system for connects other smart devices. It has multi screen area for each page for the purpose of designing each moments of the story. Subjects also gave their feedback to us. If there is an option for choose the multi device mode or not, reader will read with an open mind. Lastly, multi device effect's frequency controller as an adviser should be offered because too much multi device effect makes lower nobility and interrupt reading experience. With these modifies, Multi-Device e- Book can be much immersed in the story line, and maximized its effectiveness.

8. Conclusion and Future Work

This paper extracted three different elements of Contents, Interface, and Communication from books, and examined the possibility of development of each element. And three generations of books are categorized by genealogical analysis that how a book takes other media through generations. Also three e-book models that provide new reading experience were suggested and of them the Multi-Device e- Book was prototyped and simulated. The new e-book is expected to allow a more active and spatial reading experience than conventional e-books, and thus result in greater immersion and enjoyment. As the paper was being written, the Multi-Device e-Book was built and simulation is in plan. The search to find a better way to identify and communicate the experience and possibilities of the new form of e-book continues. The aim of this research is not trying to build the prototype to near perfection but suggesting new possibilities of e-books through it.

This study narrows down to focus on the Multi-Device e-Book among various possible models of next generation e-books. Because the research is designed around the communicational effects of the Multi- Device e-Book, it is necessary to investigate the technological aspects of making the e-books. However in future research, simulation and assessment of other types of models will also be made using the same methodology. Additionally, using the results of the prototype making process as a basis, technological guidelines for the platform design of Digital Publishing making tools for e-books will be set up. This research on future models of e-books with new reading experiences will encourage different points-of-view on future e-books.

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References

[1] NISO. (2005). Information Services & Use: Metrics & Statistics for Libraries and Information Providers: Data Dictionary, National Information Standards Organization.

[2] IDEO. (2012). Future of the Book for IDEO 2010 , http://www.ideo.com/work/future-of-the-book, Retrieved by 31 May 2012.

[3] Marshall McLuhan. (1967). The Medium is Massage, Gingko Press.

[4] Kang Min Ji. (2007). Interface of Book and Writing Space, Seoul National University Department of Communication.

[5] Magda Vassiliou, Jennifer Rowley. (2008). Progressing the definition of "*e-book*", *Library Hi Tech*, 26 (3) 355-368.

[6] Robert Darnton. (2009). The Case for Books: Past, Present, and Future, 1st ed,. PublicAffairs.

[7] Selçuk Özdemir. (2010). Supporting printed books with multimedia: A new way to use mobile technology for learning, *In*: Proceeding of British Journal of Educational Technology.

[8] Ana Vasile. (2011). Feedback: FanFan2 and the transmedia literature, Transmedialab. http://www.transmedialab.org/en/storytelling-transmedia-2/feedback-fanfan2-and-the-transmedialiterature/, Retrieved by 31 May 2012.

[9] Glenn Ward Scott. (2006). Mapping Mediamorphosis: How print newspaper circulation influences features of audience participation at online news sites, The University of North Carolina at Chapel Hill.

[10] Rouger Fidler. (1997). Mediamorphosis: Understanding New Media, 1st ed., Sage Publications, p. 23.

[11] Marshall McLuhan. (1962). The Gutenberg galaxy: the making of typographic man, University of Toronto Press.