

Paper Catalog and Digital Catalog - Reading Behaviors of College Students in Taiwan

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Abstract. This study focused on undergraduates with varying reading habits and investigated their behavioral differences as well as the structural relationships between their attitude toward reading paper and digital catalogs, their digital usage behavior, and their paper and on-screen reading literacy. Fifty undergraduate students from Northern Taiwan comprised the sample population and were interviewed in depth. Comparative analysis was conducted on the behaviors between reading paper and digital catalogs. The results show that paper catalogs emphasized (a) richness of content messages, (b) viewing comfort of graphics editing, (c) convenience of storage, (d) connectivity of data search, and (e) influence of applied operations, whereas digital catalogs focused on (a) interactivity of media exchange, (b) immediacy of feedback sharing, (c) authenticity of audio–video transmission, (d) interoperability of service platform, and (e) potential of diverse internationality. Based on these qualities, the reading behaviors of undergraduate students who read using paper and digital catalogs were investigated and compared to determine the influence of paper and on-screen reading on the students. Finally, strategic recommendations for promoting digital catalogs are proposed through inductive analysis.

Keywords: Paper catalog · Digital catalog · Reading behavior

1 Introduction

In the digital age, the widespread applications and public knowledge of computers and the introduction of mobile reading technologies along with iPad and iPhone devices in 2010 have gradually expanded the use of tablet computers and smart phones. Digitization has become an integral part of peoples' lives. People traditionally acquire and accumulate knowledge by reading printed materials. As technologies progress, reading

behaviors have rapidly changed from linear paper reading to nonlinear on-screen reading.

Catalogs frequently assist leaders in transmitting, reading, and comprehending messages and ultimately completing purchase behaviors. Catalog contents exhibit the functions of displaying corporate image, manifesting product attraction, and enhancing emotional associations, which are means of conveying commercial messages. Because the on-screen reading industry and relevant technologies have seen rapid development, catalogs no longer convey strictly visual knowledge but adopt digital multisensory stimulations through surface representation. Contrary to traditional paper catalogs, digital catalogs provide readers with a brand-new audience experience, which has revolutionized paper reading patterns and integrated graphics, audio, and video in nonlinear reading patterns, stimulating readers' interests through innovative, charming presentations. This has led to a revolutionary age since the advent of printed mass media and has transformed advertiser marketing, media pricing, and consumer behaviors. However, the effects of these revolutionary features and whether they meet reader expectations thereof remain unclear.

The purpose of this study is to determine participants' level of acceptance of reading catalogs presented in various media formats, their usual text reading habits and behaviors for various media formats, and their opinions on text presented in various media formats.

Based on the research purpose, the specific objectives are described as follows:

- Investigate differences in the reading behaviors of undergraduate students who read using digital or printed text formats.
- Investigate the selection motive and usage condition of undergraduate's students who read using digital or printed text formats.
- Investigate the roles of digital and printed text formats in the reading activities of undergraduate's students.

2 Literature Review

2.1 Reading Properties Associated with Paper Catalogs and Digital Catalogs

Previously, businesses were required to publish numerous planar catalogs for marketing products. However, products are often phased out or upgraded before all the catalogs have been distributed because of fierce market competition. This is no longer the case in the digital age because digital business has become a market expansion channel through the emergence of the Internet. In addition, this change has facilitated the development of paper catalogs into digital catalogs. Online reading has emerged because of the increase digital information, constant development of digital technology, and ever-changing digital content and media technologies. These facets complete the Internet at present and have prompted the diverse applications of on-screen reading, digital catalogs, digital magazines, digital picture books, and multimedia books. As the national economy and per capita income rise, the formation and development of the

logistics system prompt a market of approximately NT\$4–5 billion on catalogs per year. Since the Internet emerged, digital business has become a channel for seeking marketing opportunities and has promoted the development of catalogs. The Internet has become a crucial channel for business marketing, and the World Wide Web has been deemed to become a focal point of prospective lifestyles and mainstream commercial exchange [1]. Digital catalogs are free from stock problems and can be revised and viewed online at any time. This application has gradually received increasing attention from business operators. An increasing number of companies has committed to developing digital catalogs and has gradually replaced costly planar printed versions. The emergence of digital publishing has diversified potential electronic book developments. Digital contents can be stored, and readers can upload or download and read preferential online content on their computers or personal readers. This provides a brand-new and convenient approach to reading [2]. Therefore, prospective developments of paper and digital materials and readers' preferential reading properties are worth investigating.

2.2 Textual Presentation and Reading Behaviors

Reading is a complex cognitive process influenced by individuals' perceptual skills, decoding abilities, experience, language background, and reasoning abilities. Reading can be separated into two components, which are word identification and verbal comprehension [3]. Reading behavior refers to the conditions of readers in reading activities and their level of preference and is typically limited to analyses on reading frequencies and breadth [4]. Gary Hartzell considered that reading comfort is a crucial factor that encourages reading activities. A study showed that reading digital materials is 30% slower than reading printed hardcopies and asserted that on-screen reading comfort plays a pivotal role in the potential replacement of paper reading [5]. Wang et al. adopted an interview survey method to analyze the reading behaviors of people who read using paper and digital materials and found that the results were mostly independent of the content, time, and location. However, regarding reading frequencies, most readers preferred paper reading [6]. HarperCollins Publishers, Hachette Livre, Scholastic and MCT Consulting and Training have stated that people prefer reading digital materials in crowded subways and paper materials at home. On-screen reading is no longer characterized by generation-based division but rather scenario-based division. New reading patterns provided publishers with restructuring opportunities, which are expected to take place over the Internet. These opportunities include new marketing methods for digital business, network marketing, and social community manipulation [7].

Rosenbaum (1999) adopted Taylor's Information Use Environment concept and Giddens' Structuration theory and proposed the digital information environment theoretical framework to determine how readers use information and communication technology as well as digital information to influence situational and information behaviors [8]. Schcolink (2001) investigated on-screen reading strategies and determined that readers presented positive attitudes toward digital readers. Digital books provide mostly either real-time information or leisure and entertainment contents.

The most common reading strategy or behavior is paging. Most leisure and entertainment materials adopt linear navigation methods and favor image display and paging methods instead of scrolling methods. Navigation methods are more common than study-based reading [9]. These results suggest that situational behaviors substantially influence personal information behaviors. Figure 1 shows that paper and digital information environments consist of users and providers. Providers comprise various sources, such as Websites, newspapers, catalogs, and libraries. Crucial behaviors must be considered during the interactive process between users and providers, namely retrieving, sharing, communicating, interacting, presenting, managing, and storing.

2.3 Prospects of Paper- and Digital-Based Reading

The publishing industry has changed drastically in the past two decades. The State of the News Media 2013, published by the Pew Research Center, indicated that the number of digital media readers increased by 7.2% between 2011 and 2012, when relevant advertising revenue increased by 16.6%. Therefore, the development of digital publishing in Taiwan, where the penetration of the World Wide Web has reached 74.18%, is anticipated to duplicate that of the United States [8]. In the Taiwan Digital Publishing Forum, Shih mentioned that the additional increase in the on-screen reading population is anticipated following the introduction of 4G services. The largest reading material provider in Taiwan, books, formally announced that they would be entering the on-screen reading market in 2015 [10]. Carr considered that digital-based reading is expected to occupy a certain market share, but a complete replacement of paper-based reading is unlikely. Thus, reading is expected to assume numerous forms. Consumers can select among digital-based reading, audio reading, and multimedia reading. Each of these options presents a unique reading format and therefore has no risk of being replaced [11].

3 Research Methods

Surveys and interviews are the most commonly adopted methods in studies on reading behaviors and both have their merits. However, because of the unique properties of this study, to prevent misunderstanding by participants as well as to obtain specific results on reading behaviors and relevant influences, an objective in-depth interview method was adopted. Moreover, this study focused on readers who read both paper and digital catalogs to collect their opinions on reading behaviors associated with digital and printed text formats. The samples selected comprised the Dechnology new-aesthetics (paper) catalog and the corresponding Dechnology Website (digital catalog). The participants were 50 undergraduate students from a design institute in Northern Taiwan with experience in reading both paper and digital catalogs. The study was divided into three implementation stages. At the first stage, a relevant literature review was conducted and the 50 undergraduates were interviewed to determine their reading behaviors. At the second stage, the 50 undergraduate participants were tested and interviewed using the paper catalog. At the third stage, the same participants were

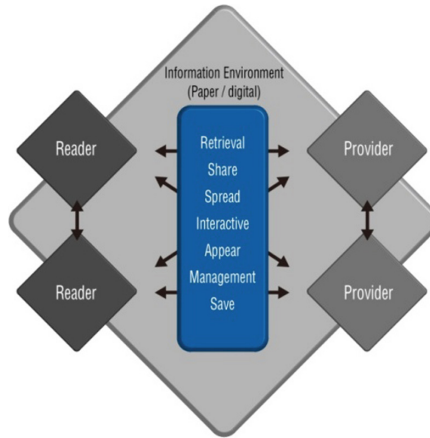


Fig. 1. User-provider interaction in an information environment (Revised in this Study)

tested and interviewed using the digital catalog in 2weeks’ time to determine the behavioral differences and structural relationships between their attitude toward reading paper and digital catalogs, their digital usage behavior, and their paper and on-screen reading literacy.

4 Research Results and Discussion

4.1 The Industrial Technology Research Institute Dechnology Project on Readers’ Textual Interpretation of Paper and Digital Catalogs

Dechnology refers to the integration of design and technology to achieve a new technology that is aesthetic and innovative. Since 2009, the Department of Industrial Technology, Ministry of Economic Affairs has initiated the Dechnology project, which focuses on technological aesthetics and integrates the eight legal entities comprising the Industrial Technology Research Institute (ITRI), the Institute for Information Industry, the Taiwan Textile Research Institute, the Food Industry Research and Development Institute, the Development Center for Biotechnology, the Metal Industries Research and Development Centre, the Automotive Research and Testing Center, and the Ship and Ocean Industries Research and Development Center to jointly implement the Dechnology project. The research and development (R&D) value derived from the joint efforts of the technology and design industries is expected to increase the technological competency of Taiwan, thereby instilling technology-design aesthetics, living experience, and design energy into the lives of the general public. This project was initiated to adapt to innovative global industries and market change in which prospects and manufacturing of technology are not priorities. The creation of emotional products through the technological commercialization process has become the key to dominating markets. Thus, the Department of Industrial Technology, Ministry of Economic Affairs promoted the Dechnology project, introduced technology into design work, and enabled innovative

technological applications. The ITRI released the Dechnology catalog (paper) and Website (digital catalog) to introduce potential products and commercial opportunities (Figs. 2 and 3).



Fig. 2. Dechnology catalog (paper)

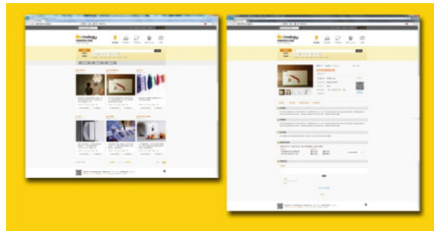


Fig. 3. Dechnology website (digital catalog)

4.2 Textual Analysis on the Information Environment

According to the provider–user interaction in the information environment proposed by Chen, the textual analysis of the paper and online Dechnology catalogs are shown as follows:

The analysis revealed that the paper catalog displayed functions such as communicating messages and can be conveniently stored. However, the continuous cost of printing traditional paper catalogs and limited paper quantities affected the number of readers. Therefore, the paper catalog exhibited inadequacy in retrieving, sharing, interacting, and managing properties (Tables 1 and 2).

The analysis showed that using Rich Site Summary as a medium can substantially increase the portability of an electronic catalog. Furthermore, the medium enables quick and comfortable viewing on various devices. A service-oriented framework was adopted to provide various concepts by incorporating multiple sources. In addition, the Internet was used to clearly introduce various product specifications and content information for convenient access. Messages can be actively transmitted to readers automatically from the server side. Information is integrated in high security through interactive communication channels to complete matching processes.






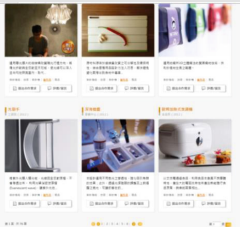
Table 1. Textual analysis of the information environment of the paper dechnology catalog

Item	Content	Feature
Retrieving	Only 22 pages long; table of contents not provided for retrieval.	X
Sharing	Must be printed to share.	X
Communi-cating	Designated message transmission or quick response (QR) code connections.	O
Interacting	Introduces strictly 41 innovative goodies; no interactive functions.	X
Presenting	Comprises Chinese–English bilingual presentation, designer, technical departments, and product identification pictures.	O
Managing	Printed distributions are free of subsequent management problems.	X
Storing	The catalog measures 18 × 14.5 (cm) for convenient storage.	O

4.3 Differences in the Reading Behaviors of Undergraduate Students Who Read Using Paper Catalog or Digital Catalogs

Stage 1: Sample description The interview participants’ experience in reading both paper and digital catalogs were first confirmed. Among the 50 undergraduate students, 34 were male and 16 were female, yielding a male-to-female ratio of approximately 7:3. This study focused on participants who read at least one digital catalog per month; therefore, the slightly higher male population can be explained by their comparatively higher familiarity with technological products. Consequently, more male students than female students read the digital catalog. The participants mostly used desktop or laptop computers for reading digital materials (58%), followed by other devices such as cell phones (34%) and tablet computers (8%). The percentage of owning tablet computers was below the overall average of 90%, indicating that tablet computers remained comparatively expensive and were uncommon among students. The contents, ranked from highest to lowest preference, were lifestyles and hobbies (31.3%), fashion and entertainment (29.5%), and crammers’ companions (16.8%). The male participants preferred reading materials on lifestyle and hobbies, whereas the female participants favored those on fashion and entertainment. After the participants’ reading devices and material contents were identified, their reading attitudes, digital-based usage behavior, and critical paper and digital catalog functions toward reading paper and digital

Table 2. Textual analysis of the information environment of the dechnology web site (digital catalog).

Item	Content	Text	Feature
Retrieving	The digital catalog features a navigation page for data retrieval		O
Sharing	Messages from the digital catalog can be shared with friends on Facebook, Twitter, or Google+		O
Communicating	The digital catalog can be browsed on other digital readers by using the QR Code		O
Interacting	The digital catalog provides a platform for manufacturers to submit business partnership proposals and product reviews		O
Presenting	In addition to Chinese–English bilingual descriptions and designer and technical departmental information, multi perspective product pictures are provided		O
Managing	The knowledge bank of the digital catalog is constantly updated; product listing and correction managements can be instantly performed		O
Storing	The digital catalog can be added to My Favorites or downloaded and saved on digital readers for offline viewing		O

catalogs as well as their level of satisfaction with the digital catalog platform were analyzed.

Stage 2: Reading attitude and behaviors of undergraduate students who read using paper catalogs The results showed that 16%, 64%, and 20% of the participants completed reading the paper catalog in less than 10 min, between 12 and 20 min, and between 20 and 30 min, respectively. No users expended more than 30 min reading the catalog, suggesting that the participants could not read excess information because of the length of the catalog.

“The contents of the Dechnology catalog (paper) were extremely attractive and showcased 41 innovative products that inspire design and creative thinking processes. However, further product information would be of great help for relevant learning.”

“[The catalog] demonstrates a global perspective. Not a lot of catalogs present Chinese–English bilingual contents. Product design concepts are well detailed but lack additional product images. The products are shown in single pictures without actual sample operating diagrams. The operating methods or correlation between internal and external structures are sometimes unclear.”

“The catalog features appropriate dimensions, a handy design and portability, high-quality printed texture, well-executed layout, sound viewing comfort, and contemporary appearance. The only drawback is that most of the images were synthetically simulated. Structural diagrams would aid in the interpretation of product operation methods and structures.”

“Such refined catalogs are rarely seen. In addition to learning from them, I would like to keep them as part of my collection.”

“The title is attractive.[I] would have wished for more elaborate content information as the introduction was concise but insufficient. The QR code is too small. The Website cannot be successfully connected to using a cell phone.”

Regarding paper catalog-based reading behaviors, the undergraduate participants mostly emphasized on the following contents: (a) richness of content message (instructional aspects; attractive contents increase readers’ willingness to learn); (b) viewing comfort of graphics editing (graphic layout also influences readers’ willingness to read); (c) convenience of storage (dimensions and paper selections, appearance design, and texture quality leave marked impressions in readers); (d) connectivity of data search (in addition to existing content data, the importance of extended reading is emphasized); and (e) influence of applied operations (readers voluntarily participate and select the messages of interest).

Stage 3: Reading attitude and behaviors of undergraduate students who read using digital catalog The digital catalog was tested by the same participants in 2 weeks’ time after Stage 2. Observations were made during the test, and the participants were interviewed. The results showed that 2%, 42%, 50%, and 6% of the participants completed reading the digital catalog in less than 15 min, between 16 and 30 min, between 31 and 60 min, and more than 60 min, respectively. Only less than 10% of the users completed reading the catalog within 15 min, suggesting that the participants did not skim through the digital catalog but rather developed an interest in the material.

“The Website features a clean navigation layout in which a title list accelerated search processes. In addition, the Website contains rich product themes and has a product search function that accelerates processes for finding relevant product information. However, multilevel buttons tend to cause confusion during user operation, which is considerably inconvenient.”

“Interactive structures strengthen connections between users and designers and consist of professional design matching capability and mechanisms. However, the instant feedback feature was weak and lacked adequate management.”

“[The Website] contains numerous pictures that present various angles and structures of the products and elaborate on product operation and usability. However, most of the products are in development stages, and most of the pictures were illustrated using 3D-simulated diagrams. As digital media continue to develop, 360° or virtual reality product presentation options can be added.”

“The online platform presents increased information contents, technology descriptions, and design concepts but lacks the English translation function and thus lacks global development potential. In addition, providing external connections to designers (teams), technological terms, and technical legal entities substantially expands and completes the spectrum of database information.”

“The products consist of numerous items. Data variety should be enhanced. Products lacked adequate classification and were difficult to search for.”

In addition to the five reading behaviors that were similar to those toward reading the paper catalog, the undergraduate students reported several crucial items regarding the digital catalog: (a) interactivity of media exchange (readers can often express opinions or exchange experiences online through interaction with others), (b) immediacy of feedback sharing (information can be shared with friends through built-in social functions; this provides tagging functions in on-screen reading), (c) authenticity of audio–video transmission (in addition to image and text product descriptions, multimedia or virtual reality dynamic presentations can be incorporated), (d) interoperability of service platforms (provide external connection services by connecting to other cloud computing services to complete the spectrum of viewing services), and (e) potential of diverse internationality (provide multilingual options and potential global perspectives and control information services and application opportunities).

5 Conclusion

How do readers decide between paper and on-screen reading on identical catalog content? This study showed that the selection was determined according to the properties of the text contents. Readers select the digital catalog when they want a quick overview or to acquire in-depth information of the contents. The diverse properties of the media provider increased relevant links and enhance accessible information. To seek convenient data or portability features, readers select paper catalogs. The paper catalog in this study featured a QR code that integrates cloud services in traditional paper-based publicity and marketing models, which strengthens the marketing advantage through complementary effects. Therefore, the potential development of a new media carrier among the traditional counterparts remains to be observed.

The undergraduate participants interviewed in this study preferred an on-screen reading environment. This was primarily due to the rapid and convenient properties of technological instruments and the richness of the text contents (including relevant contents and topics). For the undergraduate online users, the digital catalog provided diverse reading channels and material options, increased content richness, and facilitated immediate interactions. The present advantageous influence of the on-screen reading interface enabled the undergraduate participants to access data sources and

employ diversified text processing methods instead of merely accessing information during the reading process. The World Wide Web is changing the information behaviors and reading habits of people. This study provided ITRI recommendations for enhancing the Dechnology Website (digital catalog) design:

- Presentation of audio–video technology (construct an interactive space for new media to increase technological presentation)
- Strategy on the core construct (guided search–retrieval operations; present orderly messages)
- Integration of the business platform(diversified corporate Website links; provide comprehensive services)
- Service on information tagging (readers can browse tagged content, which strengthens functional data retrieval)
- Aesthetics of the Windows environment (administrators may manage the display interface and provide a professional experience)

The ITRI has promoted an information-based catalog construct, which profits from selling existing content to readers, to provide service to innovative technological R&D institutions, industrial designers, and readers. The digital catalog emphasized the property of the contents and the development and operation of knowledge properties. Therefore, this technology and the applications thereof must be emphasized to revolutionize reading conventions.

References

1. Chen, S.C.: A Research on the behavior of catalogue Consumers—based on a catalogue company. Graduate School of Management Institute, Asian University (2005)
2. Tseng, M.L.: Non-book—eBook. *Soochow Univ. Libr. Newslett.* **14**, 1–30 (2002)
3. Lin, Y.C.: The Effect of Integrating Picture Books into Reading Instruction on Children’s Reading Motivation and Word Recognition Ability. Graduate School of Speech and Hearing Disorders and Sciences, National Taipei University of Nursing and Health Science (2011)
4. Huang, H.C.: A Study of the relationship between reading behavior and writing attitude. Graduate School of Education, National Pingtung University of Education (2012)
5. Lin, C.M.: A survey on e-reading habits and behaviors of elementary school students in taiwan. *National Central Libr. Bull.* **100**(2), 30–59 (2011)
6. Wang, C.Y., Liu, S.Y., Chen, P.T., Yang, C.C.: The reader reading motivation: reading behavior and market share. *J. Graph. Commun. Technol.* **4**, 47–64 (1998)
7. Chou, Y.L.: Reading era: digital publishing trend of social networking site. *Learn. Dev.* **703**, 48–55 (2014)
8. Lin, S.J.: An exploratory study on e-reading behaviors of academic faculty. *J. Libr. Inf. Stud.* **1**(1), 75–92 (2003)
9. Schcolnik, M.: A Study of Reading with Dedicated E-Readers. Graduate School of Computer and Information Sciences, Nova Southeastern University (2001)
10. Pew Research Center for the People & the Press. In changing news landscape, even television is vulnerable (2012)
11. Nicholas, C.: *The Shallows: What the Internet Is Doing to Our Brains.* W W Norton & Co Inc., New York (2010)