Designing Template-based Page Generator: A Case of Mobile Pad

Tse-Ming Tsai[1,2], Shih-Chun Chou[1], Bo-Fu Liu[1], Yuting Lin[1], Seng-Cho T. Chou[2]

[1]The Innovative DigiTech-Enabled Applications & Services Institute, Institute of Information Industry
Taipei, Taiwan

[2]Department of Information Management, National Taiwan University
Taipei, Taiwan

{eric; benchou; bofuliu; ytlin}@iii.org.tw; chou@ntu.edu.tw

Abstract—The importance of web application and advanced technology has attracted increasing attention as among the concerns of individuals such as designers, traditional media publishers, ad agencies, and companies of all sizes in order to create, distribute, monetize, and optimize engaging content and publications for mobile pad. Pages that are often used for collecting and disseminating information are natural bases in publications. The current study presents a methodology that uses factoring and synthesis to process aesthetic knowledge involved in pages for designing template-based page generator. Grounded on this research, content producers/distributors possess flexible creation and modification of computer-generated pages for streamlining creative content formation processes.

Keywords-content management; mobile applicatopn; page component; publication; template

I. INTRODUCTION

Awareness and ownership of mobile pad (also well known as tablet PC) are growing, spurred by marketing campaigns from Apple, Amazon, Barnes & Noble or Research In Motion recently as well as press coverage and word-of-mouth buzz. According to Forrester's newest report in March 2012, US consumer tablet sales in 2016 expect to reach 60.3 million unit sales. And 112.5 million US adults will own a tablet in 2016, which will equal 34.3% of US adults [1].

In order to seize these widespread business opportunities, individuals such as designers, traditional media publishers, ad agencies, and companies of all sizes want to create, distribute, monetize, and optimize engaging content and publications for tablet devices [2]. However, the specification of mobile pad is totally different from personal computer or even paper. How to assist traditional designers utilize the characteristic of mobile pad to concept creative layout? How to help digital publishers create innovative digital content for mobile pad? How to bridge the communication gap of digital publishing between programmer and editor in a fastest and economic way? Therefore, in this research, our objective is to present a methodology for designing a template-based page generator to overcome innovative editing problems. Grounded on our research, a product-innovation and creative content platform can be prototyped by the corresponding modules and processes.

In this research, page refers to a leaf or a sheet in publications (e.g. books, magazines, newspapers, journals,

catalogs, etc.), which are typically published for mobile pad devices. Pages that are often used for collecting and disseminating information are natural bases in publications [3]. These publications provide immersive reading experiences through engaging content in mobile applications (hereinafter referred to as "publication Apps").

The remainder of the paper is organized as follows. Sections II and III define various concepts associated with page management, including a page, template and meta-template. Section IV describes the factoring and synthesis of pages. Section V presents the methodology for designing template-based mobile page generator. The last section concludes the paper and illustrates the future work.

II. CHARACTERISTICS OF PAGES

A page in publication Apps can be decomposed into six parts including heading, description, background, menu, intension and extension. The heading part refers to the highlight title which summarizes the articles within a page. Most of the highlight titles are usually outlined in a sentence, such as topic, headline or subtitle. The description part is composed of numerous paragraphs which describes the details of the highlight titles. We can regard caption or footnote or article as a description part. The background part contains figures to help explain the article or beautify the margin. The menu part indicates the functions which prompt readers to do specific tasks such as jumping to a particular page, setting the font size or searching keywords within a whole publication App. The intension part is defined as the input data from device sensor. Take multi-touch sensor as an instance, reader needs two fingers to stretch the image to zoom in, and vice versa. Besides, when reader rotates his/her mobile device, the accelerator and gyroscope can detect the speed and direction to make the illustration upside-down. The content which is changed by device sensor data is called intension parts. The extension part refers to web content that must be connected to the Internet to fetch the updated data. A noted example is the updated tweets from social network websites. The last three parts including menu, intension and extension are specific characteristics in publication Apps in order to provide vivid reading experiences in this post-PC world.

Each part in a page is aggregated by pieces of *components* which may be divided from static to dynamic [4][5]. For static components, their display effects are stable. We regard text as a static component that every single word is fixed and firmed. In other words, the display effects of

dynamic components are changed by input values such as time, location data, device holding direction, etc. We regard web content as a dynamic component that the web content area could be connected to the server to get the newest response, i.e. the display essence from the web content component is changeable. Therefore, we summarize seven components which are commonly used in publication Apps, shown as below component spectrum.
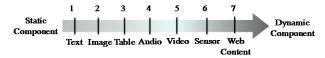

Figure 1.   Page component spectrum from static to dynamic.

Based on the components, the structure of a page may be analyzed by its purpose. Different purposes of pages may construct different characteristics and components. In Fig. 2, for instance, the pages within magazine App can be concluded to cover page, interior page, and advertisement page. Firstly, in regard to cover page we often see the heading and the background parts with text and image components. Secondly, the interior page usually contains the focal subject that is elaborately designed with multiple components. A publication App usually consists of numerous interior pages. Lastly, the advertisement page is often arranged for the advertisers. Common components of the advertisement page are image and web content (website link).

Figure 2.   Different purpose of a page.
(adapted from WIRED magazine App: WIRED App Guide, 19.13 free)

III.   LEVELS OF ABSTRACTION

In addition to grouping related attributes into generator, pages can also be generalized at three different levels: page instance, page template and meta-template.

- Page instance: a page instance in publication Apps could be defined as a screen shot of the mobile device. In every digital publication App, multiple pages comprise a complete book or magazine. In this research, we use "page" and "page instance" interchangeably.
- Page template: the skeleton of a page, in which attribute values are removed and may be substituted by other proper ones. The example in Fig. 3 shows

the relationship between a page and its template. A template may contain text, image and other components.
- Meta-template: a further abstraction of templates by replacing their components with associated types. For instance, the image and text component of the page templates shown in Fig. 3 can be generalized into a meta-template of *Components* because image component can be substituted for jpg, png, and gif format attributes. Also text component can be substituted for different wording or different font attributes. A meta-template can generate multiple templates. A template can generate multiple pages.
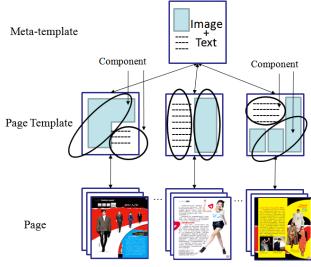

Figure 3.   Meta-template, template, page and their relationship.
(partially adapted from Bella magazine App: free edition)

IV.   FACTORING AND SYNTHESIS OF PAGES

Based on different levels of abstraction, pages can be manipulated and managed through a factoring and synthesis process [6], as shown in Fig. 4. Factoring is a process of aggregation and generalization. It builds templates and meta-templates from existing pages. Synthesis is a process of specialization and instantiation. It constructs pages from meta-template and templates.

The first step in factoring is page analysis that extracts components to build a template. Attribute value in pages are removed from components to separate template and their affiliated data (F1). The templates are then generalized into meta-template (F2).

The synthesis process constructs pages from meta-templates and templates. When a page is needed, the user chooses a proper meta-template to build a template by defining attribute values of components (S1). Once the template is built, the system retrieves data from source material database and maps data into the template based on specification of the template. A page is constructed (S2).
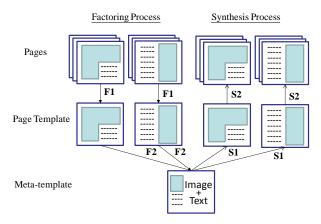
Figure 4. Factoring and synthesis of pages.

V. METHODOLOGY FOR DESIGNING TEMPLATE-BASED DIGITAL PUBLISHING SYSTEM

The processes of factoring and synthesis suggest a method for designing template-based mobile page generator. The method includes two major stages: design and application (see Fig. 5). The design stage is the process of factoring that includes page analysis, component design, meta-template design and database design. Once the meta-template and database are available, the page generator can be applied to construct pages by the synthesis process. This section presents major modules of the method.
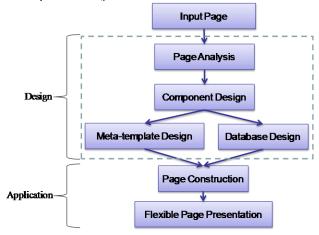

Figure 5. Methodology for development.

A. Page Analysis

The objective of page analysis is to find the attribute values of major characteristics for designing the page generator. Pages are analyzed to identify their parts (including heading, description, background, menu, intension and extension) and corresponding attribute values. The process of identifying characteristic parts in the page is recursive.

The second step focuses on recognizing associated attribute values of a part. For instance, the description part is

composed with associated attribute values such as string, number, jpg and mp4.

B. Component Design

After defining all attributes, it is necessary to find their relationships. The most important processes of this module are factoring all the attribute values and grouping some similar attributes. In other words, this module collects attributes into clusters with a homogenous structure. If the values are jpg, png, and gif format attributes, these attributes are aggregated to image component. If the values are tap, flip, pinch, stretch and gesture attributes, these attributes are aggregated to sensor component. The *components* may be divided from static to dynamic for seven components.

C. Meta-template Design

The purpose of meta-template design is to simplify and automate the process of page generation. The components in Fig. 1 can be combined together within a page for 127 possibilities, as in (1).

$$C_1^7 + C_2^7 + C_3^7 + C_4^7 + C_5^7 + C_6^7 + C_7^7 = 127 \qquad (1)$$

Note that the possibilities means the sum of the meta-templates which refers to that the different combination within a page is 127 categories. To go into detail, one of the seven components is a kind of meta-template deriving 7 possibilities of the meta-template. Moreover, randomly choosing two of the seven components will composite 21 possibilities of the meta-template. For this similar inference, once the page generator chooses all of the seven components within a page, the number of meta-template is 1.

D. Database Design

To maximize the flexibility in page construction, data must be decomposed and stored at the elementary level. To accomplish this goal, source material data are indexed and tagged. Besides the seven components can be combined to meta-template, the components can be mapped to the source material database. Take the image component for example, there are several other formats or extra picture files to fill in the image component. All the page generator needs to do is assuring the index or tag in database is correctly link to the components in order to replace the relative attribute values of the components.

E. Page Construction

The major function of the application phase is to construct pages from meta-templates. To allow end users to create their own pages easily, it is necessary to automate the application process. Through this module, editor can choose one of the meta-templates. This meta-template is similar to what he/her wants to convey. Then editor has flexible creation and modification of computer-generated pages for streamlining creative content formation processes.

VI. Conclusion and Future Work

The current study presents a methodology for designing template-based page generator. The method is based on the concept of factoring and synthesis to simplify content management. It includes two major phases: one is to derive meta-templates and design material databases from existing pages; the other is to apply meta-template to create new page for publication Apps.

The contribution of the current study is two-fold. First, the methodology can alleviate the difficulty in flexible arrangement of page components, especially when creative presentation is necessary. It integrates several concepts and methods (such as factoring, synthesis, aggregation and generalization) into the design process to provide flexible necessary for individuals such as designers, traditional media publishers, ad agencies, and companies of all sizes that want to create their innovative pages easily. Second, the method allows a page skeleton and its associated attribute data to be managed separately. This helps the construction of template-based page generator to better use existing data in material database. The editor may specify different templates and fill them with data in the current material database. It also provides a greater possibility for reusing page layout and other presentation modules.

In addition to managerial implication, this research provides profound impact in this AppEconomy era. The app economy began to percolate in 2007 — the year that Apple introduced the iPhone and Facebook turned its website into a platform for other programs designed for its rapidly growing audience. Individuals such as designers, traditional media publishers, ad agencies, and companies of all sizes that want to create, distribute, monetize, and optimize engaging content and publications for tablet devices desire an easiest tool to flexibly manage the source material (of literature and art) for publication Apps. Not only the traditional designers can utilize the characteristic of mobile pad to layout pages, but also the digital publishers can quickly create another new issue of innovative pages based on previous edition. Furthermore, publishers who are aiming at distinguished digital publishing need to develop native publication Apps that results in the communication gap with programmer. The current study provides a method for editors to sketch a blueprint or a solid configuration with definite expression toward aesthetic knowledge. The sketch speeds up the communication between editors and programmers.

This work is the beginning of a line of research focused on flexible page management in creative content platforms. In the future work, this method can be implemented into an automated system integrating with other systems to expand system capabilities and evaluation of system productivity and user satisfaction. Moreover, leaving a space for innovation should also be taken into consideration since it has been proved that the most successful webpage designs are not template-based but the ones that rely on presenting the content in a way that meets the business owner objectives and attracts the attention of the end-user.

Acknowledgment

References

[1] Sarah Rotman Epps, "Forecast Update: Amazon Expands Tablets' Addressable Market", Forrester Blogs, http://blogs.forrester.com/sarah_rotman_epps/12-03-06-forecast_update_amazon_expands_tablets_addressable_market. Retrieved Mar 13, 2012.

[2] Bob Bringhurst, "Design Decisions for Digital Publishing Apps", InDesign Docs, http://blogs.adobe.com/indesigndocs/. Retrieved Mar 13, 2012.

[3] C.W. Holsapple, A.B. Whinston, Decision Support Systems: A Knowledge-Based Approach, West Publishing, St. Paul, MN, 1996.

[4] Chia-Hui Chang, Mohammed Kayed, Moheb Ramzy Girgis, Khaled F. Shaalan, "A Survey of Web Information Extraction Systems", IEEE Transactions on Knowledge and Data Engineering, vol. 18(10), 2006, pp. 1411-1428.

[5] P. Fraternali, and P. Paolini, A conceptual model and a tool environment for developing more scalable, dynamic, and customizable Web applications, in: Proc. Int. Conf. EDBT98, Valencia Spain, March 1998.

[6] Jen-Her Wu, Her-Sen Doonga, Ching-Chang Leeb, Tse-Chih Hsiac, and Ting-Peng Liang, "A methodology for designing form-based decision support systems", Decision Support Systems, vol. 36(3), 2004, pp. 313–335.