A study on the interactive interface of mind-mapping apps based on user experience

Yi-Chun Cheng *, Pei-Jung Cheng **

** Graduate School of Industrial Design, Taipei, Taiwan, aaa024008@gmail.com*
*** Department of Media Design, Tatung University, Taipei, Taiwan, prcheng @ttu.edu.tw*

The paper aims to explore designers' needs while they are using the mind-mapping apps on an iPad. For this purpose, we first conducted a focus group to make sure of the elements that will be applied to the paper prototyping process. Then 10 student designers who have experience on using an iPad carried out the usability test with a paper prototype. Besides, a retrospective interview was held for each designer after the paper prototyping process. The study found that the influence from those designers' user experience on making an appropriate interface paper prototype of mind-mapping App includes icon selections and interface layouts. In terms of 'icon selections', designers tend to grab some familiar icons with what in a system or an application software they have experienced, and in terms of 'interface layouts', designers tend to set icons with where the position in a graph software they have experienced. The study also found that the intuitional gestures during usability test include tapping and dragging by index finger. Designers use tapping to select the icons and use dragging to edit the element they've selected and scroll the screen. In addition, we suggest that the future study can use a real device and design a new application to increase the reliability of study.

Keyword: Mind-mapping apps, Interface design, User experience, Interaction.

1. Introduction

Yen and Cheng [1] suggest that designers take the following action steps to generate creative concepts during design work: (1) write down ideas; (2) read over the keywords that they have written down; (3) go over the information they have found; (4) decide on concepts; (5) search for relevant information; and (6) integrate all the information obtained. They argue that design thinking definitely is one of the necessary design processes for designers. During design work, designers will often use auxiliary tools or software. Mind-mapping software commonly used for derivational concepts or the recording of ideas are among those tools. Mind-mapping is a thinking aid proposed by Buzan [2] from the UK that uses integrated diagrams to help users perform idea conceptualization and that can also be used as a tool to express concepts and discuss projects. Mind-mapping is widely used among many groups, with designers representing one of these groups. As a result of the development of smart platforms, mind-mapping software programs also migrated from PCs to the new platforms; however, their methods of operation went through several changes during the process of conversion. These changes caused the appearance of numerous operational problems that interrupt the thinking process during use by designers, indicating that further study is needed for mind-mapping apps to achieve high intuitive or operational efficiency. Therefore, the motivation for this study was to explore the operation of mind-mapping apps when used by designers in order to further assess their user interfaces, and to then use the results as a reference for future studies of interface design.

In considering the above issues, the main purpose of the study is to explore the interface icon preferences of designers used in mind-mapping apps, as well as to understand their intuitive way of operation. The study sought to achieve the following objectives: (1) to understand the operating styles and preferences of designers when using mind-mapping apps; (2) to integrate the necessary operational icons and methods for a designer-oriented mind-mapping app.

2. Research Method

The structure, steps, and research items of the study are shown in the diagram below:

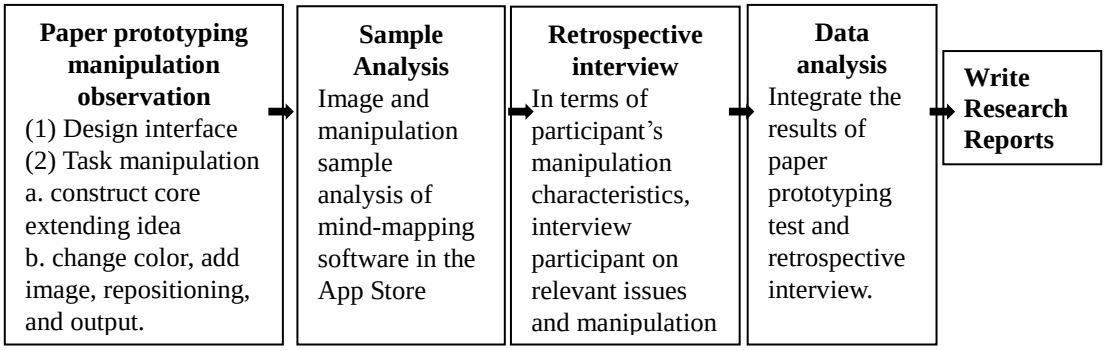


Figure 1. Research structure diagram

2.1 Sample analysis

In the Apple App Store, the types of apps are divided into a total of 23 categories, with 54 different "Productivity" type variations listed under the Mind-Mapping App category. In the App Store, each category has its own ranking, with the top 200 apps listed in the ranks. The rankings are prioritized based on Best Sell, and are divided into Paid and Free rankings. Mind-mapping apps within Taiwan's "Productivity" category listed under the Paid rankings [3] include: iThoughtsHD (ranked 94), MindHD (ranked 120), and Grafio (ranked 185). Apps listed under the Free rankings (ranking statistics since November 22, 2012) include: Idea sketch (ranked 78), Mindjet (ranked 86), Mindmeister (ranked 110), SimpleMind+ (ranked 134), iMindmapHD (ranked 163), and Total recall (ranked 173). Therefore, the study analyzed the above-mentioned mind-mapping apps in detail, collected operating methods and icons, eliminated icons with high homogeneity, and finally categorized the selected icons and functions as paper prototyping test elements.

2.2 Paper prototyping task testing

Snyder [4] proposed that paper prototyping is one way to test the practicality of websites or application software. The use of paper prototyping to test tasks serves the following functions: (1) to understand the concept that users used to select an icon or object; (2) to understand the process of user interface operation; (3) to understand whether the content of the information is suitable for the user; (4) to understand whether the layout typesetting is contrary to user expectations; (5) to understand whether the interface features meet user needs. Paper prototyping can also be used to explore the user experience. Travis [5] pointed out that paper prototyping allows designers to understand a user's software experience and requirements in advance during design work preparation, which can then be translated into an appropriate interface design. Therefore, the present study used

the paper prototyping testing method to identify operating icons, functions, and layouts commonly used in mind-mapping apps as a reference for assessing mind-mapping apps in the future.

2.2.1. Participant

The participants of the present study were designers. Therefore, the paper prototyping test used a sampling determination by inviting ten designers with experience in iOS-based products (such as the iPhone and iPad) to participate in paper prototyping task testing, without any preconditions regarding gender or age.

2.2.2. Observations

When it comes to icon recognition rates on smart platforms, various factors, such as screen size, color, and resolution, can affect research objectivity [6]. Surveys conducted by IHS [7] regarding the tablet PC market showed that from the 3rd quarter of 2011 to the 3rd quarter of 2012, the product with the highest market share was the iPad, as shown in Figure 2. Although Samsung's share of the tablet PC market did gradually increase in 2012, the study found relevant literature [8] indicating that the smart platforms adopted by most designers still use systems that are iOS-based, and these iOS-based systems have significantly more interface activity and error rates than Android-based systems. Research by Chen and Chen [9] further pointed out that most users have had more intuitive interactive experiences operating iOS-based systems. Therefore, the iOS based system, iPad, was taken as the research tool in this test of the study.

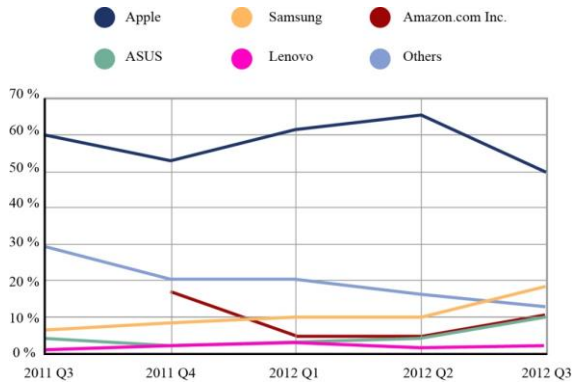


Figure 2. Tablet PC market share line chart (IHS, 2012) (Redrawn in this study, 2012)

The study mainly focused on the designer group for user interface research on mind-mapping apps, and thus used the user-centric design rules proposed by Travis [5]: (1) continuously focus on users and their manipulating actions; 2) observe user behavior; (3) carry out relevant interactive design. The study used the above-mentioned rules for task observation and analysis. The manipulating methods of mind-mapping apps can be roughly divided into the following actions: long press, click, drag, and double-click. These actions are common manipulating actions in smart platforms. Therefore, the study allowed participants to decide their own manipulating actions to experiment with. However, in order to eliminate the effect of color, the icons obtained from the sample analysis are rendered in black and white, and participants were asked to design their own preferred interfaces for task manipulation, with tasks mainly divided into two parts: (1) draw the mind-map center core and construct a two-dimensional decisional direction; (2) in either of the two dimensions, changes of shape, position, and color, as well as additions of built-in icons, can be made to the originally drawn shape and saved to output. In addition, during

the interface design process, if no appropriate icon is available, participants can draw their own. The participant's entire manipulating process is completely recorded by camera during task observation.

2.2.3. Retrospective interviews

Retrospective interviews were conducted on participants to ask them questions on problems that came up during task manipulation by having the participant recall and explain the details of their manipulation. In addition, the study conducted an extended questioning on the characteristics of participants' manipulation and the content of their responses to get a more in-depth interview result.

3. Result and Discussion

3.1. Sample analysis and paper prototyping result

The aforementioned mind-mapping app has a total of 112 types of operating icons. After eliminating icons with higher degree of homogeneity and those that were the result of focus group screening, the remaining 57 types of icons were given to participants as reference during interface design. Results from participants' paper prototyping manipulation showed that participants are not constrained by the effect of manipulating tasks. During interface design, they will include manipulation icons with functions outside the task in the interface, indicating that the interface design of participants are not influenced by the manipulating task but are focused on various functions of the mind-mapping app. After sorting through the icons used by each participant, the study finds that manipulation icons, such as Previous-Step, Next-Step, Upload-Photo, Add Build-in Icon, Delete, Change-Color, E-Mail, and Edit-Text, reached consistency (Table 1).

Table 1. Consistency icons

Previous Step	Next Step	External Photo	Build-in Icon	Delete	Change Color	E-Mail	Edit Text
							

In addition, Snyder [4] mentioned that the layout of a paper prototype can show user expectations for software operation. Therefore, the study arranged the results of the paper prototyping layout accordingly in the following: The mind-mapping app interfaces (Table 2) designed by the participants show that interface icons are positioned at the edge of the screen. The study, based on these layout positions, divided the manipulation icons into four major layout types of positioned-bottom, positioned-top, positioned-left, and evenly-positioned-around-four-sides. All participants' designed interfaces use classification and menu functions to save screen space.

3.2. Sample analysis and paper prototyping result

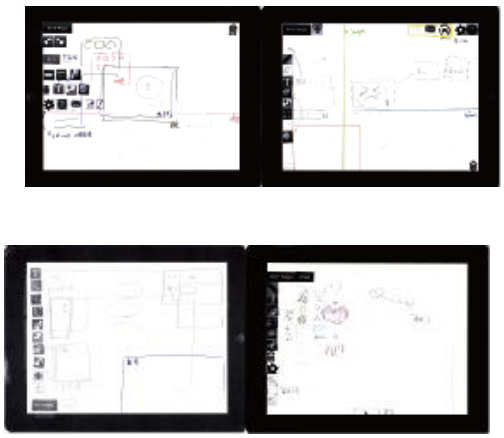
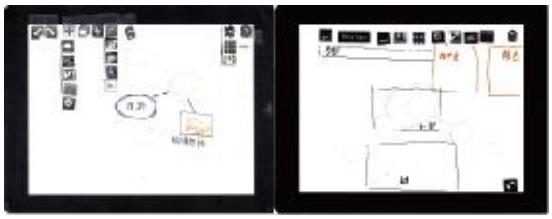
The participants' manipulating actions showed that they prefer to use the index finger to manipulate. When executing a particular function (such as zooming), however, the thumb is added to the manipulation, with task manipulation mainly carried out by point and tab action except for actions such as "repositioning" and "element scaling." When "repositioning," participants used point, tab, and drag to manipulate; when "element scaling," participants manipulated by dragging toward the bottom left to accomplish the action.

3.3. Retrospective interview results

After the completion of the paper prototyping test, the study carried out retrospective interviews on problems that arose during the task observation process. The interview was conducted based mainly on the paper

prototyping functions mentioned by Snyder [4]. The content of the interview mainly included layout typesetting, manipulation schema concepts, and task manipulation processes. It was recorded using audio recording, and was tidied up using text. Interview results can mainly be divided into manipulation icons, layout, interface manipulation process, and usage psychology. In selecting manipulation icons, the participants selected more similar icons for interface design from the regularly used system or software icons. In terms of layout typesetting, the designers were influenced by commonly used graphics design software programs, such as Photoshop, Illustrator, and 3D's MAX. In addition, apps commonly used by participants also affected manipulation icon typesetting. In terms of the manipulation process, in addition to manipulation methods installed on the iPad, participants indicated that the regularly used graphics design software manipulation processes also affected their methods of manipulation. In terms of usage psychology, participants were mainly affected by the impact of manipulation space. Participants indicated after the interview that the iPad interface is not suited for too many icons because of limited room for maneuvering. Paper prototyping also showed that participants indented all functional classifications to save screen space.

Table 2. participants' paper prototype layouts

Layout of manipulation icons positioned- left	Layout of manipulation icons evenly-positioned-around-four-sides
	
Layout of manipulation icons positioned-top	Layout of manipulation icons positioned-bottom
	

3.4. General discussions

The analyzed results can be divided into the following three parts:

(1) Icon selection aspect:

After task observation, participants selected more similar icons for interface design depending on their system or software user experience. Therefore, the study carried out the following analysis on actions with high consistency: manipulation icons such as "Uploading External Image," "Change Color," "Delete," and "E-Mail"

can use direct observation of icons themselves to sense their meaning. Manipulation icons such as “Build-in Image,” “Edit Text,” “Previous-step,” and “Next-step” are related to participants’ regularly used software.

(2) Manipulation action aspect:

participants’ manipulation actions show that the user experience of all kinds of software and systems will affect the manipulation processes and action. For example, when conducting element zooming, participants apply downward and to-the-right dragging action, which is a commonly seen manipulating action in graphics design software. Saffer [10] mentioned that most users will intuitively use the index finger for touch-type manipulation, but rotation and horizontal repositioning may be carried out using two hands or other fingers simultaneously. The task observation in this study showed that participants will also use the index finger to perform most manipulations, along with the thumb for manipulations with more specific functions. Thus, it can be seen in Smart Platform manipulation that index finger is the main manipulating finger, with the thumb as the main assisting finger. For “repositioning” action, the primary factor that impacts participants is system platform operating experience. For “repositioning” action in task observation, participants manipulate using point, tab, and drag. This manipulation method is a commonly seen mode of operation in smart systems. Therefore, system platform user experience is also one of the key points in determining manipulating actions by the participants.

(3) Interface layout aspect:

Based on participants’ interview results, the main factor affecting participants’ interface preference is “software usage experience”. In "Positioned-left layout" and "Even layout", the main factor affecting participants’ interface preference is the photo editing software installed on the PC platform. According to interviews of participants, the main factor affecting participants’ icon layout of “Positioned-left layout” participants comes from the use of graphic design software such as Photoshop and Illustrator, with the “Even layout” being 3D graphics software, such as 3D's MAX. In terms of “Positioned-bottom layout” and “Positioned-top layout”, the main factor that impacting participants’ interface preferences comes from user experience of various apps. All these show that participants will use the user experience of their regularly used software or apps to carry out interface design. The content of the interview shows that screen simplicity is one of the important design points in mind-mapping apps.

4. Conclusions

According to the above-mentioned analysis and retrospective interviews of users, the following points can be summarized: (1) participants will depend on system or software user experience to select icons with closer similarities for interface design; (2) designers prefer interfaces with more simplicity; (3) participants will intuitively use the index finger for touch-type manipulation, with thumb as assistant; (4) regularly used graphics design software will have an effect on designers' interface layout and manipulation actions. In addition, the study only observed the process of participants manipulating a paper prototype, not the actual Tablet PC machine. Therefore, future mind-mapping app design and task testing should be carried out using actual machines to increase research reliability.

5. References

[1] J. Yen and P.J. Cheng(2009), *Roles of Referring-Sketching Action for the Design Ideation*, Bulletin of Japanese Society for the Science of Design, Vol. 56, No.1, pp. 65-72, 2009

[2] Definition of Mind Mapping, wiki: http://zh.wikipedia.org/wiki/, 2013/01/13 Retrieval.

[3] Mind-mapping App Ranking, wiki: http://store.apple.com/tw, 2012/11/22 Retrieval.

[4] Carolyn Snyder(2001), *Paper prototyping*[Online PDF], Available at < http://www.snyderconsulting.net/us-paper.pdf> [Accessed 16 January 2013]

[5] David Travis (2009), *The Fable of the USER-CENTRED DESIGNER* [Online PDF], Available at < http://www.userfocus.co.uk/pdf/fable.pdf > [Accessed 16 January 2013]

[6] Chi-Wu Huang (2007), *Assessment of Image Recognition Rate and Satisfaction Level on Smartphone*, National Science Council supported Project Research Report.

[7] IHS(2012), *Larger Display Sets iPad Mini Apart from Other 7-Inch Tablet Competitors*, Product design &supply chain, Chicago

[8] Yi-Chun Cheng, Pei-Jung Cheng (2012), *Study of Interface Prompts on Smart phones using Mind Mapping APP*, Collected Papers from the 17th Chinese Institute of Design Symposium, pp. 697-702.

[9] Chen-Zhi Jing, Jian-Xiong Chen (2011), *Smartphone Interface Usability Assessment, Industrial Design*, vol.39, page 52-57.

[10] Dan Saffer, (2008), *Interactive Gestrues: Designing Gestural interfaces*, O'Reilly Media, Sebastopol
.