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Scenario-Based Design Methods for Developing a Breast Cancer Health Care Information Website

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Abstract. This study uses scenario-based design (SBD) method to develop support tools that can facilitate brainstorming ideas for breast cancer health care (BCHC) information website. It engaged in experiment with nine designers using support tools to develop 42 concept sketches and divided 5 types of solution scenarios into; Guideline, Menu, GUI, Scenario and Game. SBD method is converted into the cyclical process of "information analysis to concept synthesis to design evaluation" using a post-experiment interview. Although SBD can integrate pre-design work, support tools can effectively stimulate the speed for brainstorming design concept and consider multifaceted user needs. Furthermore, support tools can empower designers quickly develop feasible BCHC information design solutions to the problems encountered by Taiwanese women.

Keywords: Scenario-based Design, Breast Cancer Health Care Information, Website Design, Concept Design.

Introduction

Patients' medical consumption and health information environment have changed dramatically since the rise of internet (Caron, Berton, & Beydon, 2007). Robinson, Patrick, Eng & Gustafson (1998) have defined "interactive health communication" as "the interaction of an individual-consumer, patient, caregiver as well as professional-with or through and electronic device or communication technology to access or transmit health information or to receive guidance and support on a health-related issue". The advantage of health information website is providing integrated information during comprehensive health education process, to detail description of treatment information at each period that easy to update knowledge and provide clinical cases (Clayman, Boberg, & Makoul, 2008). Thus, designers must understand users how to seek BCHC information, to utilize information providing and support tools from BCHC website when a user-centered health information website is designed. Hence, how to offer correct, easy understanding information to affect users' medical seeking behavior then decision making on their medical choice.

Literature Review

Online breast cancer health care information

Breast cancer is a common disease among women (Sutton & Patkar, 2009; Schmidt et al., 2015) and is the most frequent cancer of women in both developed and developing worlds (World Health Organization [WHO], 2012). However, more women are surviving this cancer due to the improved treatment and detection of symptoms at an early stage (Burgess et al., 2005). According to the Health Information National Trends Survey, online health information resources offer prevention and treatment options and decision making for patients (Hesse et al., 2005). The traditional face-to-face communication method is insufficiencies such as dept and breadth information needs, comprehension of professional language, controlling over consultation times, promotional content and responses questions to public etc. Internet information of breast cancer has become an important source and assist patients to enquiry doctors' appropriate questions while in consultation (Shaw et al., 2007). Research by the Pew Research Center's Internet & American Life Project and the California HealthCare Foundation (2009) indicated that 61% of adults had searched for health information online. Ghaddar, Valerio, Garcia and Mlis (2012) expressed that 81% of adolescent had accessed health information online and 59% had sought health information related to a family member's health online. Sabee, Bylund, Weber and Sonet (2012) also pointed out that patients had various goals for discussing internet research with their health care provider as follows; seeking opinion or advice, verifying information, managing impression, learning and testing. The health information had been reported and provided by internet and media thereby breaking down the barriers of time and space, but it had also immersed people in complicated health information. Readers must often consider information source while seeking information online, such as the author who writes behind the text (Rouet & Puustinen, 2009).

WHO (2004) emphasized that a majority (69%) of all breast cancer deaths occur in developing countries. This study considers Taiwanese women as the Breast Cancer Health Care (BCHC) end-users. The provision of trustworthy information, easy browsing and website interaction process of Taiwanese women were filtered principles for medical websites (Lin, Tseng, & Lee, 2010). Hence, effective BCHC information websites could facilitate promoting BCHC information, thus achieving easy of use. Usability has been shown to be a key factor when the services organization using internet (Flavian, Guinaliu, & Gurrea, 2006) and poor interface functionality has been seen as a potential cause for web usability breakdown (Nielsen, 1999). Zhang and Dran (2000) indicated to achieve satisfaction, users may spend more time at website, revisit website and recommend website to others. Javenpaa and Todd (1997) indicated users' situation would be considered and gave more service then to offer perfect experience except technology promotion when website in designing.

In fact, advantages and disadvantages of online health information exist. For example, the availability of online information may aid in making decisions that are more definitive and increase the participation of patients in their treatment; thus, patients can make more comprehensive preparations in advance of professional care and consultation (Berland et al., 2001). However, because

internet cannot be regulated, information provided is of uneven quality (John, 2005). Consequently, the content of health information websites should conform to the standards for evaluating good health information websites (Eysenbach, Yihune, Lampe, Cross, & Brickey, 2000) by embracing guidelines for health information and usability considerations (Winker et al., 2000). The constitute elements of communication online health information included; to satisfy patients' questions, to display respectfully patient's interesting information and patient's ability (Bastian, 2008). Breast cancer has three periods of measurement indicators; prevention, treatment and follow-up and currently has different health information for each periods (Lin, Tseng, & Lee, 2011), therefore, the design of BCHC information websites should consider and satisfy different periods of users' needs to acquire correct information for using and understanding easily.

The design process of website

Website design analysis, design, construction and evaluation have received considerable attention from researchers and designers. Newman and Landay (2000) studied actual website design practices and observed that during design process and designers use multiple websites for reference which could help them focus on different aspects of design, furthermore graphic design, web development, presentation, word-processing software, pen and paper are all important tools used in design process. Sketch is seen as an important and indispensable part in conceptual of design phase (Lawson, 1994). Paper sketches are especially important during exploration phase of website design and designers attempt to explore different design possibilities without concerning themselves with lower level details (Newman & Landay, 2000).

Tseng, Moss, Cagan and Kotovsky (2008) noted that professional designers usually took a break when they encountered difficulties during conceptualization process to read magazines or webpage, seemingly without specific objectives, only returned to conceptualization process that new concepts tend to originate frequently. Laseau (1989) suggested that design involved the endless cycling process of "brain-hand-media-eyes". Schön and Wiggins (1992) proposed design process that follows theoretical model of "see-move-see", it was conformed a cyclical, interactive process between designer and using tools. This cycle working was likely one self-dialogue that discovered on the visual of "sketch-check-revision" when designers investigated their own conceptual sketches. Herbert (1993) indicated that design was the result of continuous "drawing-response-drawing" between sketches and media. Many studies focus on the domain of design thinking when they seek to clarify conceptualization process of design.

The role of Scenario-based design

The basic concept of scenario-based design (SBD) seeks to understand user task and user interaction which leads designer to consider the important issues and user needs to enable design (Carroll, 1995). In design, scenario design methods or situation-description methods primarily focus on future usage contexts for product to satisfy consumers' emotional needs at beginning of design process (Mcllroy, 2003). Alexander and Beus-Dukic (2009) defined a

scenario as communicating a situation, usually as it evolves through time in a series of steps. This design process of contexts was used to determine a user's behavior model through analyzing and interpreting behavior and using problem scenarios to construct procedures that are utilized to guide users to background theme. This method uses abstract and latent knowledge such as usage context, interactive models and key issues, such as the function base module for writing and scenario experiences, to resolve the important points of user design problem. User experience should include; user sees, hears and comes into contact with anything, their experience include factors; the product being easy to buy, easy to set up, easy to learn, easy to use, intuitive, engaging and useful (Vredenburg, Isensee, & Righi, 2002). Any experience is important for users (Shedroff, 2001). Although not all users' experiences can be applied to design, designers have to understand experiential elements that can be designed. The creation and sharing of scenario method is used to return to a context that has happened or to present future virtual experiences (Battarbee, 2001). First, designers using SBD methods for problem scenarios must actively search for new ideas to use in transforming problem scenarios into design scenarios (Rosson & Carroll, 2002). SBD using for information technology addresses five technical challenges that could help designers; coordinating design action and reflection, managing the fluidity of design situations, managing consequences that result from any given design move, recognizing, capturing and reusing technical knowledge that often lags behind needs of technical design and making design activities more accessible for better communication to stakeholders (Carroll, 2000).

A scenario-based design and an ethnographic study have previously been used as methods for user-centered design (UCD) as an analytic method (Park, 2011; Vincent, & Blandford, 2015). UCD has been popularized to improve the usability of websites, systems and many products (Vredenburg, Mao, Smith, & Carey, 2002). This study explores user-centered considerations of issues on preliminary design of BCHC information websites. In design conceptual development, the designer often uses various methods to originate a concept. Therefore, design method operations also emphasize the need for assistance in brainstorming design concepts. This study focuses on giving sufficient design information to designers in conceptual of design phase to explore whether this information can help with brainstorming ideas for BCHC information website concept. Furthermore, three questions of research hereunder;

RQ1: How is the feasibility of supporting tools based on a SBD method in creating BCHC information website design concept?

RQ2: Do the differences reveal between support tools based on a SBD method and traditional creative brainstorming methods during the concept developing process?

RQ3: Can this study discover any effects on BCHC information website due to using support tools as design methods?

Methods

Analysis user needs through interviews

Because the nature of SBD involves predictive descriptions, this study used interviews and observation to engage in user analysis to avert subjective production. The analysis of user needs was summarized from interviews with

three medical practitioners; a health hospital consultant, a doctor and a registered nurse were invited to determine that current promotional materials of health information in Taiwan hospitals focused on regular breast examinations, the communication of health information and instructions for breast self-examinations (BSE). The information focused on nurses, case managers and volunteers demonstrating BSE and preventative content of breast cancer DVDs in hospitals. Most users received professional BCHC information directly from hospitals. Environmental factors were considerably influential also (McCoy & Evans, 2002); thus, this study used treatment environment and procedures of Taiwan public hospitals to record the promoting ways of BCHC information - provided by consultation, promotion, broadsheets and promotional films. These findings were applied to the context configurations of problem scenario.

This study also interviewed twelve Taiwanese women (A1-A12) to represent prevention, treatment and follow-up periods. Prevention period; they are healthy without breast cancer (A1-A8). Treatment period; they have breast cancer and are accepting medical treatment (A9-A10). Follow-up period; they had breast cancer before (A11-A12). Interviewees all had experience in searching for health information online. The interview content included four topics such as family history of cancer, living habit, using what channel for BCHC information and knowledge of BCHC information. The average age of interviewees was 37.6 years; Nine of the twelve interviewees have someone in their family who currently has or had cancer (75%) and five of them have someone in their family who has or had breast cancer (41.7%). Therefore, the age distribution of interviewees and presence of cancer in their family histories generally conformed to conditions for crucial groups; their lifestyles and user characteristics had referential value for future studies. This study organized the lifestyles of users from above mentioned three periods and its results were;

1. Users in these three periods not only showed differences in terms of their needs and their urgency for BCHC information but also in their knowledge of BCHC. Women during prevention period generally didn't have the habit of regularly checking for BCHC information (A1-A7). These women only sought information if they themselves or their friends had similar diseases in which case they felt panic and increased their frequency of seeking medical help or online information (A3-A6, A8).
2. A summary based on the lifestyle experiences of interviewees had shown that women living at regular lifestyle and stress were important factors affected health under treatment and follow-up periods (A9-A12).
3. Women of three periods all had searching experience of BCHC information online. Among them, women during treatment period had the greatest urgency and time-sensitivity for seeking BCHC information. The frequency of these women searching BCHC information online was one to three times per week, their searches content focused on health information such as check-up schedules and post-operative diet recommendations.
4. Women of three periods all emphasized the reliability of BCHC information and primarily used hospital, television and internet.
5. Women above 50 tend to accept help from their children in searching for BCHC information online (A10-A12). They noted that they were difficult to read information on screen due to small font size and also unfamiliar with

interface operations.

6. Women in prevention period had more diverse using information access mediums of BCHC information than women in treatment and follow-up periods through media of computers, cell phones and iPod touch. Thus, they were relatively familiar with internet, WiFi and mobile internet, but didn't have strong impressions regarding the content of BCHC information (A1-A8). Women in treatment period had the greatest and most urgent needs for BCHC information and participated in regular meetings at the Kaihuai Association. These women regularly received BCHC information, citing attentive care on a psychological level as another important need (A9, A10). Women in follow-up period had ample experience with their own cancer treatment and could consult with their friends or acted as volunteers (A11, A12).

The construction of supplementary tools

This study used the BCHC information website's blueprint of the needs framework (Figure 1) and the problem scenario (Figure 2) as experimental support tools were configured hereunder;

1. First, the outcome of analysis' user needs based on interview with twelve Taiwanese women to summarize a blueprint regarding the framework of needs for BCHC information website. The problem scenario further developed by survey results, the aim was utilizing user's background environment, the user s' needs and lifestyles obtained from interviews and observation to adjust the orientation of BCHC information website.
2. The BCHC information website's blueprint of needs framework showed that three periods of users demand certain features from online BCHC information; a fast speed of learning, ease in operation, an increase of new knowledge, a review of BCHC information, personalized BCHC information and BCHC information consultation. Women in follow-up period who had participated in volunteering and medical nursing needed the functions of BCHC instruction and promotion. Not only computers but also smart phones and digital devices such as iPads with WiFi connectivity which could effectively resolve urgent user needs for browsing health information.
3. The problem scenario needed to add contextual factors presenting user needs and problems. The contextual factors included specific tasks, information needs and user knowledge (Wang, Hawk, & Tenopir, 2000). This problem scenario used interviewing results to determine online BCHC needs of users in three periods to develop 14 context storyboards (Figure 2). The content included scene of user reception of BCHC information, the opportunity and problems were encountered while searching online BCHC information.

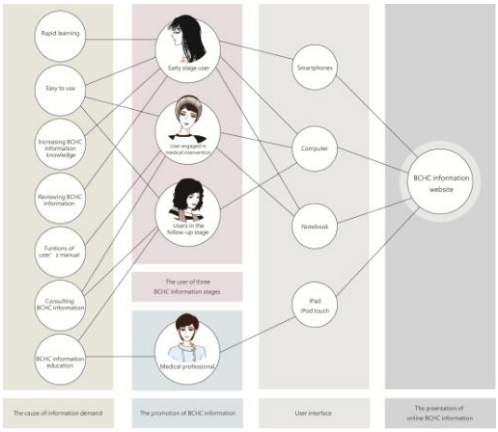


Figure 1: BCHC information website's blueprint of the needs framework.

Figure 2: Construction of the Problem Scenario.

To develop conceptual sketch by using SBD and data analysis

As regards nine designers' participating in experiment, they had exceeded five years of design experience and all had college education background. Nine designers had website design expertise and thus were permitted to participate in experiment. The experimental process included a conceptual sketch design and a post-experiment interview;

With BCHC information website concern the conceptual sketches would be developed after designers read support tools. The experimental instructions required that all designers propose at least three conceptual sketches for homepage, without any limitation on the number of subpages. After experiment, semi-structured interview included four questions on design concept, traditional methods, usage experiences and differences in designer's experience (Table 1) which could further understand their design concept and assist concept developing methods by themselves. The samples were taken as support tools' efficiency of BCHC information website conceptual sketches development, to measure the differences between traditional design and using these support tools for brainstorming. Verbal Protocols was used to allow designers engaging on more detailed description of design concept after experiment had ended. This technique originated in the field of cognitive psychology and cognitive science (Cross, 1999); by designers described their thinking, researcher could understand their process of thinking at short-term memory (Ericsson & Simon, 1993). Two encoders collected data from experiment and interview transcripts to extract important concepts for encoding. The encoded content was subjected to a reliability test before further analysis.

Table 1. The content of semi-structured interviews

Items	*Categories*	*Contents*
1	Conceptual design	Please explain your conceptual sketches for BCHC information website.
2	Traditional methods	Do you use any stimulated methods to assist you while you are implementing a design?
3	Experienced usage	Do the support tools increase your inspiration while creating a design?
4	Experienced differences	Are your design experiences different when you use the supplemental tools to carry out a design?

Encoding Reliability

Nine designers (B1- B9) participated in experiment to propose 42 conceptual sketches. The experiment summarizes designers' sketch concepts for improving health information browsing and interface operations which were used to propose design solutions for BCHC information website. Then, two encoders used the data collected in experiment, as well as the interview transcripts, to extract concepts from the solutions proposed by designers. A consistency percentage formula was used to measure the reliability of encoders (Holsti, 1969) and to test for consistency between items extracted by two encoders. The data analysis derived 112 items, with a calculated encoding reliability of 0.93; the reliability ($r \geqq 0.8$) is clearly acceptable and conforms to the Krippendorf's rule standard (Krippendorf, 2004).

Reliability = (2×average mutual agreement)÷[1+(2-1)× average mutual agreement]
Mutual agreement = (2×the number of complete agreements between the two encoders)÷(2×the number upon which the two encoders should agree)

The number of complete agreement between the two encoders=112-13=99
Average mutual agreement = (2×99)÷(2×112)=0.883
Reliability = (2×0.883)÷[1+(2-1)×0.883]=0.93

Additionally, this study used further Cohen's kappa "quadratic weighting" to test inter-rater reliability; an explanation of the kappa value is provided by Landis and Koch (1977). The result of k=0.819 is evaluated as "Almost perfect", coinciding with two encoders. The proportion of agreement observed is greater than the proportion of agreement expected due to chance, thus indicating data reaches a level of consistency.

$$K_w = \frac{\sum wf_o - wf_c}{n - \sum wf_c} = \frac{23.946}{29.212} = 0.819$$

Solution Concept

The encoded results (Table 2) show that designers proposed 5 solutions which are classed as Guideline, Menu, Graphics User Interface (GUI), Scenario and Game solutions. By ranking the 42 research samples (Table 3) for both homepage and subpage forms that GUI solution is clearly preferred first, followed by Scenario and Menu solutions.

Table 2. Encoding of Designers' concept

Items	*Coding*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*	*B7*	*B8*	*B9*	*Total*
Solution Scenario(SS)											
Guideline	SS-1	1	1	0	1	0	2	0	0	0	5
Menu	SS-2	0	2	1	1	0	0	1	1	2	8
GUI	SS-3	3	2	0	0	0	2	1	1	1	10
Scenario	SS-4	2	2	0	0	3	1	0	1	0	9
Game	SS-5	2	1	2	0	0	0	0	1	0	6
Work-Based Design (W)											
Observation & inspection	W-1	0	1	0	0	1	0	0	0	0	2
Referring to website information	W-2	0	1	0	0	1	1	0	0	0	3
Correcting graphics & text	W-3	1	1	0	0	1	0	1	0	0	4
Interviewing key users	W-4	0	1	1	1	0	0	1	0	0	4
Users' own experience	W-5	0	1	1	0	0	0	0	1	0	3
Group discussion	W-6	0	0	0	0	0	1	0	0	0	1
Design methods	W-7	2	0	0	0	0	0	0	2	1	5
Scenario-Based Design (S)											
Context	S-1	1	0	1	0	0	1	0	0	0	3
Scenario creation	S-2	1	0	0	0	1	0	0	0	0	2
Design details	S-3	0	0	0	0	1	0	0	0	0	1
Pre-information integration	S-4	1	1	0	0	0	0	0	0	0	2
Multifaceted	S-5	0	1	1	0	0	0	1	1	1	5
Users' demands	S-6	0	0	0	2	0	0	0	0	0	2
Speeding of stimulating development	S-7	1	0	0	1	1	0	1	1	1	6
Comparing with WBD & SBD (C)											
Different pre-works	C-1	1	0	0	0	1	1	0	0	0	3
Creates more scenario	C-2	1	1	1	1	0	0	0	0	1	5
More multifaceted	C-3	0	1	1	1	0	1	1	0	0	5
Cost effect	C-4	0	0	0	1	1	0	0	0	0	2
Addition of objectivity design	C-5	1	0	0	0	0	0	1	1	0	3
Total		18	17	9	9	11	10	8	10	7	99

1. Guideline

As regards the solutions on using functional concept of guidance and explanation, four designers proposed 5 conceptual sketches of map guidance as presentation form for homepage, proposing solutions including "*map-style browsing,…when menu is selected, one moves to target location* (B6)" and the "*use of virtual clinic map blocks to classify BCHC information, classifying the path-seeking system of users in three periods, so they can select information based on their needs* (B1)" to present the concept of individual BCHC path-seeking. Among the conceptual samples, designers didn't utilize map guidance method to develop subpages.

2. Menu

Focusing on operational flow as a means of presenting the solutions for BCHC information concept, three designers proposed 5 conceptual sketches in which menus were used to present simple BCHC information. These designers proposed, "*…basic horizontal menus…the menus link to sub-menus and the right side presents the latest information* (B3)" and that website should "*present one type of information on one page to simplify operational flow* (B4)".

3. GUI

Six designers proposed 9 conceptual sketches in which GUI was used to present homepage, "*…such as personal diagnostic sheet forms,…can be used to fill in personal information and system filters information needed by users* (B9)". GUI is most appropriate presentation form to subpages which can display personal BCHC examination data procedures. For instance, one of designers indicated that "*using graphic interface design for brainstorming to select data folders or selecting health information personnel to serve as a menu or button design, to go into subpage interface similar to diagnostic sheets* (B1)".

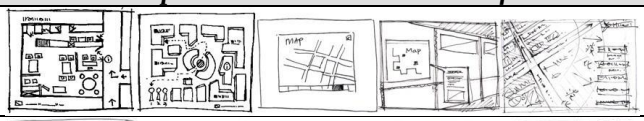
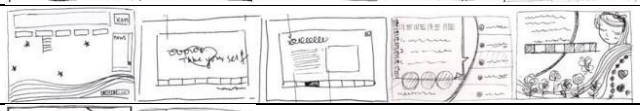
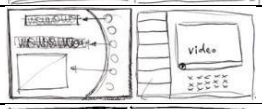
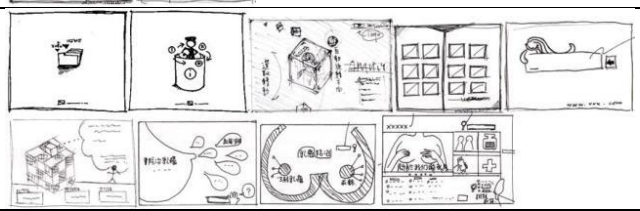
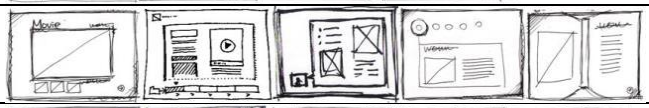
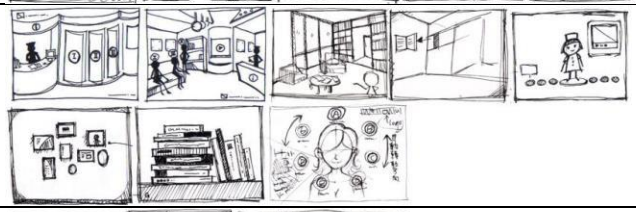
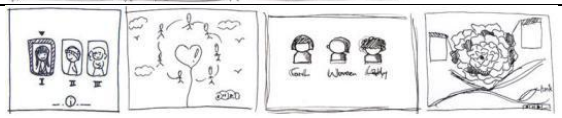
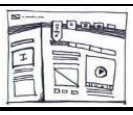
4. Scenario

Four designers proposed 8 conceptual sketches of scenario interface that dealt with typical situations encountered by users, one of designers pointed out expressing the spatial concept of virtual clinic such as "*users can click based on their usual feelings upon entering clinic* (B2)". Moreover, using the concept of virtual nurse roles to guide users into context, such as "*using virtual nurses as a character and after they click on icons, the nurse will start explaining* (B5, B6)".

5. Games

Focusing on interactive games for solutions, 4 conceptual sketches of game-based sketches had been proposed as homepage by three designers. On homepage, three female roles represent as three different age groups are used as menu for selecting and classify information. "*…the entry homepage uses different age groups for classification, providing information needed by different age groups* (B8)" or with role-based and contextual simulations as fundamental concept behind the website's design, such as "*the homepage have buttons that represent the roles of women in prevention, treatment and follow-up periods, clicking on them allows one to read information needed by women in different periods* (B1)".

Table 3. Conceptual sketches of BCHC website interface

Forms	*Categories*	*Development on BCHC Website Interface*	*Designers*
Guideline	Home Page		B1, B2, B4, B6
Menu	Home Page		B3, B4, B7
	Sub Pages		B2, B8
GUI	Home Page		B1, B2, B6, B7, B8, B9
	Sub Pages		B1, B2, B5
Scenario	Home Page		B1, B2, B5, B6
	Sub Pages		B2, B8
Game	Home Page		B1, B3, B8
	Sub Pages		B1

Discussion

A semi-structured interview was conducted to further understand differences between traditional design brainstorming and using support tools for concept development, a Verbal Protocol was used for encoding the results of interview hereunder;

1. Work-Based Design (WBD) is the conceptual brainstorming method traditionally used by designers.

Designers expressed their brainstorming experience on executing website design concept was primarily multilateral data collection; existing observation at related venue, to refer website's information and to search for relevant books, documentary data (B1, B2, B5, B7). The in-dept design information obtained discussion such as design needs of entrepreneurs (B3, B4, B6), experience discussion of related key users (B2, B8), discussion of design groups (B6). The preliminary data analyzing then constructed basic framework of website through various design methods to stimulate creative brainstorming and

classification during conceptual development such as Manddala method (B1), Brainstorming (B1, B8) and Directed Association (B9) were used for divergent conceptual brainstorming and KJ method (B8) of classification, filtering concept were used by designers to evaluate conceptual design (B1, B2, B8, B9). Interview results can be summarized hereunder; traditionally, designers carry out conceptual design by using work content planning for an implementation sequence, primarily relying on preliminary information collection and discussion as the source of data for conceptual brainstorming to further implement information analysis, framework establishment, conceptual synthesis, design evaluation and design completion. The overall conceptual brainstorming process primarily follows linear steps and procedures.

2. SBD can improve the speed of designers' conceptual brainstorming.

Designers used support tools after integrating information to utilize in situation-based conceptual brainstorming which primarily included 7 items of textual context, context creation, detail design, preliminary data integration, multifaceted brainstorming, user needs and increasing the speed of brainstorming. Most designers believed that the main feature of using SBD for concept design was to increase brainstorming speed. "*These support tools can effectively increase the speed and integration of designers' conceptual brainstorming* (B8, B9)". The benefits for designers in observing details and multifaceted user problems; using support tools can improve designers' attention to details. "*Some detailed parts that I haven't normally paid attention to were shown in support tools and it helps with design of details* (B5)". Support tools can further aid in observing multifaceted user's problems, "*Designer can directly and multilaterally associate related problems and user needs* (B3)". It shows that when using objective preliminary research, support tools could inspire designers to consider different aspects of user needs and increase breadth and conceptual fitness of the association. "*There can be more multifaceted key points for extended brainstorming and collected data from different aspects to complete more comprehensive conformity to user needs at the same time* (B2)". Support tools improve particularly conceptual brainstorming, because they have integrated preliminary data collection and content such as surveys and interviews. "*Because it reflects problem points and points for improvement, these support tools essentially summarizes related design information and conditions to designers* (B1, B2)". SBD can be effectively used for design association and conceptual synthesis; scenario-based models integrate designers' design thinking into the cycle of "information analysis to conceptual synthesis to design evaluation" which means that support tools also have positive influence on conceptual design process. Designers emphasized that support tools, using scenario guidance and development, can create an imaginative space within the narrative of story text which effectively allows for design association and conceptual synthesis, "*allowing for faster creation of a situation in the mind based on the images and script which can help designer carry out design association of topic* (B1, B7, B6)*…there are more rooms for imagination, support tools make designers feel likely they present at location and can make more helpful designs* (B5)*…different ideas can be created when implementing designs* (B7)".

3. SBD increases bilateral conceptual brainstorming more than WBD

The comparison of diversity between WBD and SBD that designers believed both difference in preliminary work, SBD could better encourage context creation, multifaceted brainstorming, cost-effectiveness and objective

design than WBD. Different of preliminary work exist; designers expressed that support tools not only helped with brainstorming but also decreased the amount of time needed. "*In past design experience, the preliminary work takes more time and period from reviewing data to implementing design usually takes longer. The advantage of support tools is that it takes less time to get to work and enhances the efficiency of implementation* (B5)". Designers using support tools differs from past experiences designing website concept; for example, "*…unless dealing with designs relating to animation or images, without preliminary design of script design, so using support tools for website design brainstorming differs from past design experience* (B1)". Support tools have improved contextual creation; except differences in information presentation, support tools made it easier for designers to understand design problems. "*It has a context that can help me associate ideas. With descriptions of images and texts, it is easier to understand information than with just images or just text* (B9)" and "*Compared with my design experience in the past, support tools had more concrete presentation of data, user and backgrounds* (B4)". SBD is better than WBD for systematic multifaceted brainstorming; Designers indicated that design methods were difference between support tools and WBD. The value of SBD could be developed into concrete and systematic scenario after integration of preliminary data, leading designers to design based on users' crucial questions. "*…support tools have more systematically guides designers' ideas, let designers avert their creating images from too broad, aimless or too abstract* (B6)". SBD has better cost benefits than WBD; As regards practical view, using support tools is one of advantage on effective time saving then reflects on lower design costs, "*after all, design projects have time and cost limitations, so the collection of images and text data for integration and meetings is the same as the cost devoted to most projects* (B3, B4)". Designers mentioned that Support tools can avoid subjective design biases; "*Support tools can invigorate content and depth of design thinking and can improve upon previous problems of using our own design and usage experiences as basis in subjective design* (B8)".

The diversity of WBD & SBD web concept design process

This study used coded data from the experiment and Verbal Protocols to clarify important points of design concepts and solutions to construct design experiment context for designers using SBD to develop BCHC website conceptual sketches. Norman (1986) proposed that activity cycle framework of system design is "goals, execution, interpretation and evaluation". It has been suggested in literature that design process consists of repeated iterations of three sequential activities; analysis, synthesis and evaluation (Alexander, 1964). During evaluation of support tools, it was discovered that website design activities are primarily divided into design problems, information input, design thinking and final output. Using support tools for "integrating design information and framework" change how designers receive information and time required for data processing in information input stage, thus changing design process from traditional WBD to SBD (Figure 3).

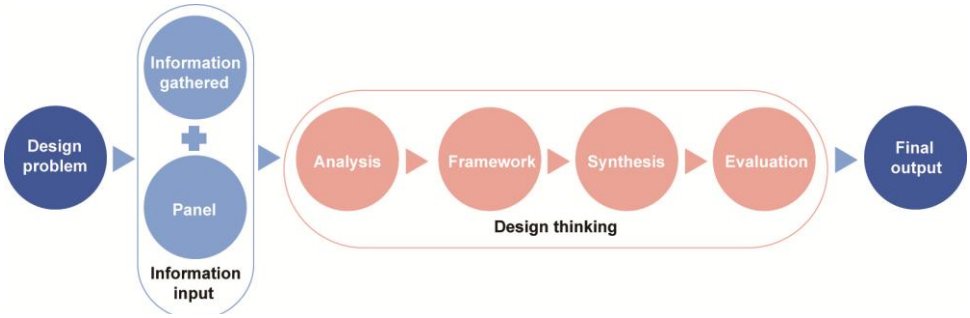


Figure 3: The Work-Based Web Concept Design Process.

Design is frequently seen as a problem-solving method and conceptual sketches are methods that manifest creative concepts. In the field of design education, scholars propose using the CPS (Creative Problem-Solving) model (Parnes, 1976) as a thought strategy, the use of systematic design methods (Archer, 1984) to resolve problems and developing the "Think-maps" thought process for design students (Oxman, 2004). The designers mention that during the process of WBD website design, different "design methods" are seen as important methods for inspiring creativity. The information presented by support tools for experimentation is seen as an example of using SBD method which is different from past methods of website design experience. Most designers respond that SBD design method can "effectively stimulate the speed of conceptual brainstorming" and that support tools can effectively inspire wider association and more suitable concept, thus helping designer to conform "multifaceted brainstorming" to "user needs". The results agree with conclusions of Tseng et al. (2008) who demonstrated that giving information high similarity information to designers before they consider solutions could stimulate creativity. Kokotovich (2008) mentioned that during an early phase of design process, thinking tools' using might assist with problem analysis. This effect is known as information integration and aiding design thinking method can encourage designers to develop deliberate thinking methods, such as using SBD methods to create support tools.

As regards the differences between WBD and SBD design methods, SBD use support tools to integrate design thinking into the cycle of "information analysis to conceptual synthesis to design evaluation (see Figure 4)". This finding of similar results found by Liikkanen and Perttula (2009), with process of concept creation during problem deconstruction was the same as process of repeated synthesis and analysis cycles. The results also showed that user-centered SBD differs from WBD in five ways; "a difference in preliminary design", "more situation creation", "more multifaceted brainstorming", "cost-benefit effects" and "subjective design conditions". Most designers stated that "more situation creation" and "multifaceted brainstorming" were the greatest benefits of SBD which means that using UCD methods to provide greater depth of information could guide designers in increasing speed and breadth of design concept brainstorming.

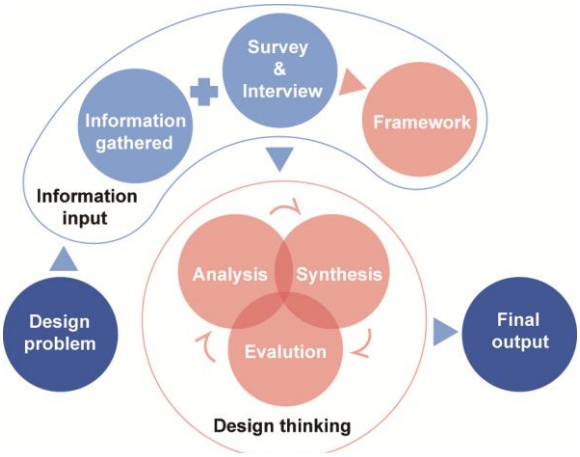


Figure 4: The Scenario-Based Web Concept Design Process.

Conclusion

This study explores user-centered considerations while using SBD to develop conceptual sketches for BCHC information website. Research interviews were used to obtain information about lifestyles of users during the analysis of needs which led to understand their behavioral models. Users expressed demand attitudes for BCHC information in each of three periods that reflected their understanding of health information, time-sensitivity and urgency. In prevention period, women use more diverse search channels of BCHC information; hence, many researchers expresses (Sillence, Briggs, Harris, & Fishwick, 2007; Winker et al., 2000) reliability online as one of important factors. With conceptual sketch design, nine designers used support tools for experimentation, producing 42 valid design samples that were grouped into 5 types of design solutions; Guideline, Menu, GUI, Scenario and Game. The consequence of study further indicated both homepage and subpages, GUI was the first choice for design solution then followed by Scenario. This expressed using a graphic interface, using interactive presentation forms for virtual roles can be displayed the best content of BCHC information website. Therefore, SBD can guide designers to discover users' needs, problems and to propose solutions subsequently.

Diversity of taking SBD proceeds conceptual brainstorming process and using traditional brainstorming process

The study also found that designers used traditional WBD for conceptual brainstorming during website design in a linear manner. Use of these support tools can help designers to integrate design thinking into conceptual brainstorming using the cycle "information analysis to conceptual synthesis to design evaluation". The consequence of research appearance in designers rely on different "design methods" in WBD to stimulate conceptual brainstorming such as Mandala method and KJ method, whereas SBD integrates preliminary design work that effectively use support tools to increase the speed of conceptual design brainstorming.

The support tools based on the SBD can be a design method for BCHC information website design

The SBD method was applied for brainstorming a website design concept when integrating result was shown, two effects had appeared; First, time of design costs could be reduced. Second, support tools created context and could effectively encourage designers to consider multifaceted user needs. Therefore, support tools were used to develop conceptual sketches of website so that potential problems could be discovered during pre-production of prototype design and provided more useful demands of creating design for users to avoid effectively the waste of subsequent development time. Clearly, SBD method can be used to construct BCHC information website effectively.

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