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網頁螢幕配置對可找尋性與易讀性的影響
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行政院國家科學委員會補助專題研究計畫 ■成果報告 □期中進度報告

網頁螢幕配置對可找尋性與易讀性的影響

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摘要

本研究共有兩項研究目的：第一項為發展螢幕配置易讀性的計算公式。本研究提出六項評量公式來評估螢幕的易讀性，分別為：網頁中導引目錄與內容的比率、區塊尺寸的差異化、圖像種類的差異化、背景和前景顏色的對比、資訊密度以及區塊對齊的數量。以四個螢幕配置不同的 yahoo.com 網址首頁為工具，利用上述六項公式來計算易讀性。並將計算結果與使用者調查結果比較，歸結出此六項評量對於網頁易讀性的確有顯著影響。

第二項研究目的為藉由模板比對(template matching)技巧來了解使用者瀏覽網頁時的選擇性注意。如果網頁資訊的配置和瀏覽者所期待的相符則可改善網路資訊的可找尋性。實驗是利用 240 位大學生對於特定網站瀏覽的回憶圖進行分析；實驗結果顯示參與者對於指定網站開啟頁面的結構有先入為主的認知模板架構。實驗發現三項關鍵性的特質會影響使用者在進行搜尋資訊行為時對所瀏覽網頁的模板認知：(1)區隔機制將網頁中的資訊區域按照目標資訊的內容分為相關區與不相關區 ；(2)藉由群組機制，如對比顏色、框架與框線以及特殊的字型和字體大小，將網頁拆分成供瀏覽資訊的基本單位；(3)吸引力機制，透過關鍵字或與想要搜尋到的資訊相關的圖片來吸引瀏覽者的注意。研究結果可幫助網頁設計者深入了解使用者在瀏覽網頁資訊時的心理建構。

關鍵字：螢幕配置設計、易讀性評估、選擇性注意、網頁介面設計、模板比對

Abstract

This research has two purposes: first is to formalize design guidelines of legibility. This research proposes six measurements of screen legibility: screen ratio of navigator to content, font size variety, variety of icon types, color contrast between background and foreground, content density, and number of alignment points. These six factors were then use to measure the legibility effectiveness of the startup page on four different yahoo.com sites. Combined with the results from a survey study, we concluded that all six factors were validated to be attributes with a significant and measurable impact on web site legibility. The second purpose is uses the technique of template matching to understand the selective attention of users in browsing websites. The "findability" of online information would be improved if the arrangements of information of a web site were the same as what viewers expected. Utilizing the method of content analysis with 240 university student subjects, we conducted an experiment on information retention from browsing an assigned shopping website. The result of the experiment showed that participants had a preconceived template of how the start page of a web site is supposed to be structured according the task at hand. It was found that three attributes are critical to the viewer template model for information searching behavior: (1) the segmentation mechanism separating the location of target information, either in index or content area; (2) the grouping mechanism break to down a webpage into basic units for browsing information via factors of contrast in colors, frames/margins, pictures and distinctive font size; (3) the attraction mechanism to attract viewer's attention through key words or pictures related to the current task. The results of the study can help the web designer to better understand user's mental construction of the visual information on a website.

Key words: Screen layout design, Legibility measurement; selective attention; interface design of websites; template matching

1. Introduction

Information is becoming more and more complicated in Web pages and thus increasing the difficulty of online searches. Creating effective measurements of Webpage legibility would help minimize the time Webpage designers spend sorting through massive information. Previous studies have proposed several measurements for web page design but lacked of enough empirical studies to validate them. Therefore the first purpose of the research was to develop complete measurements of web pages with empirical invalidation.

Second, according to the cognitive theory, complicate information is first perceived by human eyes, then processed and translated by the brain through the filter of selective attention. We hypothesize that when viewers see a webpage, they use what cognitive theory calls “template matching” to apply a template built up through past experiences of what’s important and where things belong. This internal map is then used to create an efficient task strategy, to segment the page, and to categorize the information. This research tried to understand the attributes of template on users in browsing websites. The “findability” of online information would be improved if the arrangement of information of a web site were the same as what viewers expected.

2. Literature Review

For the sake of understanding the mental processes in informational web browsing, we provide the following summary of previous research into human perception of information legibility.

2.1 Measurements of legibility on Web pages

To formulize the design guidelines of legibility on Web pages, we summarized of previous researches into six key measurements as follows:

(1) Legibility of Screen Ratio (LR) is the ratio of navigator/content. Best performance is achieved when the LR reports at 23/77 (van Schaik &Ling, 2003).
(2) Legibility of Font Size variety (LS) is based on the Principle of Economy - a careful and discreet use of display elements to get the message across as simply as possible (Ngo, Teo, Byrne,2000; Fu, Su, Chiao, 2007).
(3) Legibility of Density (LD) measures the portion of the screen that is filled with objects. The best ratio is 50%.
(4) Legibility of Alignment (LA): In order to make the screen look clear and simple, the smaller the number of alignment points, the better (Ngo, Teo, Byrne,2000; Fu, Su, Chiao, 2007).

(5) Legibility of Icon Type (LI) is based on the Principle of Economy. Design should look as simple as possible (Ch'ng & Ngo, 2003).

(6) Legibility of Color Contrast (LC): Three principles are integrated to craft the formula of LC. Firstly, the combination of colors that had higher levels of contrast between background and foreground (BW, YB) generally led to better performance than combinations of lower contrast (Ling & van Schaik, 2002). Secondly, color design is better when it looks simple and does not exceed more than 4 hues per screen (Shneiderman, 2004). Thirdly, the impact of color on visualization depends on the size of the area in which the color is used (Moon & Spencer, 1944).

2.2 Mental limitations and perceived complexity of web pages

The reason why information is considered complicated is because sometimes there is too much of it to be processed by the brain. When the information is first viewed by the human eye, hundreds of thousands of optical neurons read in an impressively vast amount of data. In fact, as understood by the mental perceptual model, the processing capability of the optical nerves is able to handle virtually any volume of information elements (Xing, 2004).

The brain however, has only seven chunks in its short term memory compared to the hundreds of thousands of optical neurons in the eye, and this limited capacity is unable to fully process everything relayed from the eyes into meaningful and useful information (Norman and Bobrow, 1975). To cope with this mismatch in processing ability and input volume, the mind uses a filter mechanism to sort the input, by only selectively processing information understood to be interesting or important. Everything else that is irrelevant to the user's task at hand is ignored, which is the mechanism that is commonly referred to as "selective attention". Therefore when a viewer looks at complex information, his or her eyes will register all the objects, but his or her mind will not "see" and use all the details; the ignored messages will not be mentally processed any further (Norman and Bobrow, 1975; Abernethy, 1988).

2.3 Template-matching

Template matching is the generic name for a set of techniques used to quantify the similarity between two objects, or some part thereof, in order to establish whether they are the same or not (Brunelli, 2009).The technique originally was proposed by Bem and Funder (1978) and resulted in the development of a specific language for describing people and situations. Template-matching technique has been applied to many different areas, from explaining human behaviors in social psychology (Bem and Lord, 1979) to digital image recognition in computers.

The way our brain selectively process information is it uses the attributes of what we see, to distinguish the interesting from the unimportant. So the question is, out of all the attributes

to choose from, how does the mind decide which to use? In fields ranging from psychology and artificial intelligence to neuroscience, the mental simplification mechanism lies in the template-matching technique. The technique states that as human beings try new tasks, each experience forms an impression of which details are important to the task, where they belong, and creates a type of expectation.

3. The Experiment

The study contained two experiments: (1) to validate the proposed measurement; and (2) to analyze the possible template matching models.

3.1 Subjects

The subjects were 64 undergraduate volunteers for the first experiment and 240 undergraduate for the second experiment. To account for differences in subjects' attention capacities and cognition styles, the study utilized an "Embedded Figure Test" to check whether the subjects' cognitive styles were field dependent or field independent. Field independent learners are better at construction, organization, and analysis of information in an open multi-media learning environment than learners who are field dependent (Lin and Gayle, 1996;). 80% of the subjects were field independent and 20% were field dependent, but there were no significant differences in results between the two groups in our final analyses

3.2 Data collection and analyses

To validate the measurement of legibility, this study selected four Yahoo websites from Japan, USA, Taiwan, and Korea and used them as controls for varying Website properties. The structure model proposed by Ngo et al. (2003) was used to analyze graphical patterns in Web pages. In Ngo et al's study, the actual content of the graphics is replaced by squares in order to form "structure models" of the Webpage. The basic unit of analysis is a 'chunk' of the page, represented as a single rectangle in the structure model .

For the second experiment, we conducted an experiment on information retention when users browse one of the two famous commercial websites in Taiwan: either Yahoo Shopping center (http://buy.yahoo.com.tw) or PChome Online (http://shopping.pchome.com.tw). The task assigned to the subjects was to find a good Panasonic digital camera. The task targeted digital cameras because the complexity of the product requires buyers to know a good amount of information before investing money into this relatively expensive item, and in addition is also something of interest to Taiwan youths.

The procedures of the experiment are: first, before browsing the target Website, participants were asked to draw what their ideal start page of an e-commerce Website meant to handle the task. Then, browsing time was limited to only ten seconds per webpage, before

users were required to make a mouse click to navigate to the next page, in order to force users to filter out irrelative information and get to key information quickly. The screen was then turned off and subjects would draw a mental image of the webpage just viewed before continuing on. This allowed us to figure out subjects' mental templates and their searching and browsing strategy for each web site. All browsing steps were repeated until the final target was reached.

The structure models of the start page and the final page of the Website drawn by the subjects were then analyzed through content analysis,. Categories were formed through a systematical, quantitative and objective process. First, the recording unit of the content analysis was defined. In the second step researchers define the categories in each recording unit of the content analysis. Because template categories were coded based on three individual coders' subjective interpretations, reliability was an important issue. Inter-coder reliability was calculated through Hoslti's (1969) inter-judge agreement method. All inter-judge agreement scores were higher than 0.9, which indicated that the assessment process was highly reliable.

4 Discussions and conclusions

4.1 Measurements and validation

A summary of the six formula of measurement is provided below:

(1) Legibility of screen ratio (LR):

$$LR = 1/ \ | W_{nav} - 23 \ | \ \in [0,1]$$

where W_{nav} is the width ratio of navigator to total screen.

(2) Legibility of font size variety (LS):

$$LS = \frac{1}{n_{size}} \quad \in [0,1]$$

where n_{size} is the number of sizes and n is the total number of objects.

(3) Legibility of density:

$$LD = 1 - 2\left|\frac{\sum_i^n a_i}{a_{frame}}\right| \quad \in [0,1]$$

where a_i and a_{frame} are the areas of object *i* and the frame, respectively; and *n* is the number of objects on the frame.

(4) Legibility of alignment (LA):

$$LA = \frac{3}{(n_{vap} + n_{hap} + n)} \quad \in [0,1]$$

where n_{vap} and n_{hap} are the numbers of vertical and horizontal alignment points,

respectively; and n is the number of objects on the frame.

(5) Legibility of icon type (LI):

$$LI = \frac{1}{n_{type}} \qquad \in [0,1]$$

where n_{type} is the number of sizes and n is the total number of objects.

(6) Legibility of color contrast (LC):

$$LC = \sum_{i}^{4} C_i \times A_i - \sum_{5}^{n} C_i \times A_i \qquad \in [0,1]$$

where Ci is the degree of contrast between background and foreground and Ai is the % of icon area in the web page.

Utilizing these six legibility factors to evaluate display pages of four international yahoo.com sites, we calculated the legibility ranking, in order from most legible to least, to be: USA, Japan, Taiwan, and Korea. We then conducted a survey with real human users to verify the theoretical results, finding our theoretical projections to be a validate match to recorded human opinion. Yahoo Japan was effective in providing variety in: position of navigator, font size and icon type. Yahoo USA was effective in providing connections between groups using space and alignment. In the end, we can conclude each of the six legibility factors contains a real and significant impact on web page legibility.

4.2 Template matching models

Several mechanisms formed a viewer's information searching behavior on a web site.

4.2.1 Segmentation mechanism: location

Table 1 Searching strategy

Recording Unit	Category	Starting page		final page		χ^2	P value
		No	%	No	%		
Attention location	focus index area	12	5	0	0	30.14	.001**
	scan other area also	226	94	218	91		
	focus advertisement area	0	0	18	8		

Note: ** means significant at .005

Viewers utilize their past experiences from Web-browsing when making an information searching decision. Each time when viewers looked at a web page, they mentally processed the web page by segmenting it, grouping the information, and making their next interaction

decision according to the attention mechanisms on the web page. If the viewer's understanding of the task through these three mechanisms matched the design of web pages, the information could be filtered more quickly from the starting page to the target page. Otherwise, viewers might need to take more steps at a slower pace. In this experiment most viewers looked for an index in a specific location -- either at the top or on the upper left side of the start page – in an attempt to narrow the scope of the search (Table 1). But on the final page, to find the target product, they focused on the product advertisement area located in the middle or right side of a web page. In both the starting page and the final page, the viewers did not pay attention to any locations irrelevant to their current purpose.

4.2.2 Grouping mechanism

Table 2 Distinguished chunks

Recording Unit	Category	Starting page		final page		χ^2	P value
		No	%	No	%		
factors for grouping chunks	location	213	89	206	86	16.61	0.02
	containing keyword	107	45	88	37		
	contrast in color	89	37	47	20		
	distinguished frame	232	97	220	92		
	size variety	19	8	17	7		
	font variety	114	48	96	40		
	containing picture	150	63	175	73		

The second attribute of an information searching template for web sites is the grouping mechanism. People don't read the information on a web page line by line, instead the basic unit of information is taken in one chunk at a time, with each chunk possibly containing texts and graphics. The important factors for grouping web page information into chunks were found to be: location, presence of keywords, sharp contrast in color, grouping information by frames and/or margins, distinctive chunk size, distinctive font size and presence of pictures (Table 2).

4.2.3 Attention mechanism

The attention mechanism corresponded to the subjects' purposes and determined what factors attracted viewers' attention. Viewers searched for icons with keywords such as "3C" or "digital camera" on the starting page (Table 3). On the final page containing many different Panasonic camera choices, subjects were attracted to the keyword or image of the product, with particular attention paid to the product's appearance, function, and price. In both the starting page and the target page, the viewers largely ignored information irrelevant

to their current purpose.

Table 3 attention

Recording Unit	Category	Starting page		final page		χ^2	P value
		No	%	No	%		
Prompt for action	location	77	32	8	3	79.53	0.000**
	Key word	209	87	234	98		
	Contract in color	2	1	3	1		
	Distinguished frame	20	8	1	0		
	Font variety	0	0	1	0		
	In first screen	0	0	3	1		
	Containing picture	0	0	5	2		
Concentration on view	noticed	226	94	200	83	10.28	0.001**
	very precisely	11	5	30	13		
No. of chunks	Below or 3	27	11	72	30	28.5	0.000**
	4-7	139	58	116	48		
	Above 7	74	31	47	20		

Note: ** means significant at .005

User perception of “easy to use” likely related to the web site being consistent with their cognitive template, therefore in terms of practical implications, we suggested that Website designers match the layout with users’ possible cognitive templates. Users’ internal templates determined their searching strategies, their preferred location for valuable information, and their factors for distinguishing target chunks of information. This study offers a template pattern with three attributes (mechanisms) for information searching behavior on e-commerce web sites. We demonstrated an example of what template matching model could be in searching for a specific product. Future research could continue to verify this template matching model in the other kinds of searching tasks, such as those without a clear search target when browsing the Web, tasks that look for extended information, or those which search for “all” types of available product. Beside information searching tasks, many pleasurable usages of the web may also need “easy to learn” and “easy to use” interface designs. The template matching process might also help to improve understanding of how users navigate the interface layouts of games or social network applications such as blogs or Facebook, thereby allowing for easier to learn or perhaps purely intuitive interfaces.

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國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

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□ 實驗失敗

□ 因故實驗中斷

□ 其他原因

說明：本研究按照原計畫進行兩類實驗: 一是分析造成使用者認知易讀性不同的可能原因並發展能有助於計算認知易讀的公式。另一個實驗是測驗使用者在瀏覽網頁時的認知策略存在的可能情形。希望能就上述研究成果完成期刊兩篇論文在投稿中。

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 ■未發表之文稿 ■撰寫中 □無

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其他：（以 100 字為限）

說明：本計畫希望能完成兩個論文: 一是螢幕配置易讀的計算公式還在撰寫中。二是Template-matching on Web site browsing，完成後投稿到Computer & human behavior期刊，但被退稿，已按照評審回覆的意見補強樣本數，目前還在整理理論文獻及分析新樣本準備再次投稿。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以500字為限）

本研究是研究對於網頁上複雜的資訊如何可以比較容易尋找的初始研究，面對目前商業網站常需要在一個頁面上呈現非常多的資訊,所以這是一個熱門且需要有更深入了解的議題。

本研究發現某些螢幕配置因素會造成使用者對該網頁認知資訊的複雜有影響，例如:網頁上的資訊區塊如果能對齊，藉由這樣比較美觀的呈現會讓使用者知覺複雜降低。雖然這樣，卻並不一定能幫助使用者在非常短的時間找到他要的資訊，因為沒有突顯重要資訊的效果。有些因素雖然可以幫助突顯重要資訊，但如果使用過度反而會增加使用者認知的複雜。本研究是根據以往文獻選了六個因素，藉由4個功能類似的首頁所呈現的綜合效果，以受試者的實證認知複雜去證明有影響。

但是如要進一步研究這6個因素所造成的知覺複雜效果個別的影響，則需要至少有2^6(=64)個不同的網頁工具(instrument)去進行實驗，其實每個因素如果只用2種情形(存在或不存在)好像還是太粗糙。但如果增加因素的可能值，所造成實驗工具種類的增加又太大了，所以研究者藉由第2組實驗(瀏覽者對網頁的回憶圖)分析，發現瀏覽者會對瀏覽的網頁產生一個認知的結構，藉由這個認知的結構與資訊搜尋問題的搭配，使瀏覽者能夠非常有效率的找到他要的資訊。去簡化上述公式。

國科會補助專題研究計畫項下出席國際學術會議心得報告

日期： 99年 9 月 16 日

計畫編號	NSC 98- 2410 - H - 004 - 009 -		
計畫名稱	網頁螢幕配置對可找尋性與易讀性的影響		
出國人員姓名	傅豐玲	服務機構及職稱	政治大學資訊管理系 副教授
會議時間	99年 8 月 16日 至 99年 8 月 18日	會議地點	中國北京
會議名稱	(中文) (英文) International Conference on Hybrid Learning 2010 (ICHL 2010)		
發表論文題目	(中文) (英文) Comparison of Students' Satisfaction and Dissatisfaction Factors in Different Classroom Types in Higher Education		

一、 參加會議經過

本次研討會共2天半，包括有3場Keynote speeches, 10個sessions 的論文發表(每個session約有4-6篇paper發表)，以及3個半天的tutorial 教學(免費的)。主要主題是談blended learning 的新科技、教學法、學習績效評量、學習經驗、教學程序改良等等。主題比較集中，所以很容易吸收。

本次研討會共有來自世界各地的學者及少部分企業人士參與，包括德

國、西班牙、美國、新加坡、香港、台灣…等等。可能有上百人吧!當然人數上還是以中國大陸的學者最多。比較多是資訊教育方面的專家。也有少數資管界的。

我的報告是安排在17號早上，是屬於學習者對學習環境、教學法及教學效果滿意的認知。我自己覺得報告的算清楚，現場聽眾反應也算熱烈，有人問問題，還有一位中國「遠距教學」雜誌的編輯跟我邀稿，希望我能改寫成中文稿給他。

二、 與會心得

我自己覺得這次收穫最大的有兩方面: 一是第三場的tutorial 教學，我覺得那個老師教得超棒的，不但講得清楚，而且舉的例子很生動。這是我在研討會中第一次參加tutorial，以往別的研討會的tutorial大多都需要另外付費，所以我沒有參加。跟一群也是大學老師的「學生」一起上課，果然大家的學習精神都很棒，也與老師的互動良好，真是一個美好的經驗(暨使旁邊的人有體味也變得不難忍受了)。

第二方面覺得很棒的是主辦的幾位學者都很熱心，也很務實。我跟他們談到對研討會未來發展的建議，他們都很誠懇的回應，讓我很開心。

能跟一群研究領域相近的同行一起分享真是件開心的事，尤其這次會議是在北京師範大學，吃住都在學校裡，完全感受不到北京的擁擠，真是好。

三、 考察參觀活動(無是項活動者略)

無

四、建議

無，謝謝國科會這些年都慷慨資助我參加國際研討會，收穫很多。

五、攜回資料名稱及內容

本次研討會部分論文被收錄在 LNCS 期刊6248期，其他的研討會論文在研討會論文集Hybrid Learning 2.0

六、其他

大會有安排長城的旅遊(第三天下午，自費)，真是擁擠與壯觀。

無研發成果推廣資料

98 年度專題研究計畫研究成果彙整表

計畫主持人：傅豐玲	計畫編號：98-2410-H-004-009-
計畫名稱：網頁螢幕配置對可找尋性與易讀性的影響	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	0%	篇	
		研究報告/技術報告	0	0	0%		
		研討會論文	0	0	0%		
		專書	0	0	0%		
	專利	申請中件數	0	0	0%	件	
		已獲得件數	0	0	0%		
	技術移轉	件數	0	0	0%	件	
		權利金	0	0	0%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	0%	人次	
		博士生	1	1	40%		本計畫支持蘇秋紅博士論文
		博士後研究員	0	0	0%		
		專任助理	0	0	0%		
國外	論文著作	期刊論文	0	2	100%	篇	本研究希望能就研究成果完成兩篇期刊論文，一篇在撰寫中，一篇已經投稿後被退稿正根據審查意見在修改中。
		研究報告/技術報告	0	0	0%		
		研討會論文	0	1	100%		本研究希望能就研究成果完成一篇研討會論文，已投稿2011HCI(Human computer interaction) 國際研討會，結果12月中會知道。
		專書	0	0	0%	章/本	
	專利	申請中件數	0	0	0%	件	
		已獲得件數	0	0	0%		
	技術移轉	件數	0	0	0%	件	
		權利金	0	0	0%	千元	

	參與計畫人力（外國籍）	碩士生	0	0	0%	人次	
		博士生	0	0	0%		
		博士後研究員	0	0	0%		
		專任助理	0	0	0%		
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)		無					

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 □未發表之文稿 ■撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：(以 100 字為限)

本計畫希望能完成兩個論文:一是螢幕配置易讀的計算公式還在撰寫中。二是Template-matching on Web site browsing，完成後投稿到 Computer &amp； human behavior 期刊，被退稿已按照評審回覆的意見補強樣本數，目前還在整理理論文獻及分析新樣本準備再次投稿。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）（以500 字為限）

本研究是研究對於網頁上複雜的資訊如何可以比較容易尋找的初始研究，面對目前商業網站常需要在一個頁面上呈現非常多的資訊，所以這是一個熱門且需要有更深入了解的議題。

本研究發現某些螢幕配置因素會造成使用者對該網頁認知資訊的複雜有影響，例如:網頁上的資訊區塊如果能對齊，藉由這樣比較美觀的呈現會讓使用者知覺複雜降低。雖然這樣，卻並不一定能幫助使用者在非常短的時間找到他要的資訊，因為沒有突顯重要資訊的效果。有些因素雖然可以幫助突顯重要資訊，但如果使用過度反而會增加使用者認知的複雜。本研究是根據以往文獻選了六個因素，藉由 4 個功能類似的首頁所呈現的綜合效果，以受試者的實證認知複雜去證明有影響。

但是如要進一步研究這 6 個因素所造成的知覺複雜效果個別的影響，則需要至少有 26(=64)個不同的網頁工具(instrument)去進行實驗，其實每個因素如果只用 2 種情形(存在或不存在)好像還是太粗糙。但如果增加因素的可能值，所造成實驗工具種類的增加又太大了，所以研究者藉由第 2 組實驗(瀏覽者對網頁的回憶圖)分析，發現瀏覽者會對瀏覽的網頁產生一個認知的結構，藉由這個認知的結構與資訊搜尋問題的搭配，使瀏覽者能夠非常有效率的找到他要的資訊。去簡化上述公式。