Effects of menu design for Personal Digital Assistant (PDA)on users' operating performance

賴月圓、王安祥

E-mail: 9223443@mail.dyu.edu.tw

ABSTRACT

With the rapid speed of science and technology advance on computers, PDA (Personal Digital Assistant), which provides the functions of medical, financial, and entertaining information management, has gradually become a popular product. The operation and interface of a PDA are significantly different from those of desktop personal computers (PC); consequently, the guidelines for the interface-design of VDT (Visual Display Terminal) cannot be entirely applied to the interface-designed PDA. Two experiments were designed in this study to discuss the effects of design factors for a PDA on users' operation performance. Experiment I investigated the effects of layout types of the menu (scrolling and hierarchy) and users' using stage (the first, second, third, fourth, fifth, and eighth days) on users' performance in operating the PDA menu displayed in the first, second, and third pages. The findings of the experiment indicated: (i) Both operating time and clicking number did not show significant differences when subjects adopted either scrolling or hierarchical menu displayed in the first page. Both operating time and clicking number showed significant differences; however, when subjects adopted menu displayed in the second page. The effect of hierarchical menu was better than scrolling menu. When subjects adopted menu displayed in the third page, only operating time showed significant difference. (ii) Regarding the effects of using stage on users' operating performance, it showed significant effects in menus displayed in the second and third pages. With the increasing of using time, the operating performance also advanced. Experiment II investigated the effects of layout types of the menu (WinCE and Palm) and users' using stage (the first, second, third, fourth, fifth, and eighth days) on users' performance in operating the PDA menu displayed in the first, second, and third pages. In addition, subjects' subjective preference on Palm and WinCE menus was also investigated. The findings of this experiment indicated that (i) Subjects performed significant differences on Palm and WinCE menus display on the first and second pages. Palm menu resulted in better subjects' operating performance. However, Palm and WinCE menus displayed on the third page operating time did not result in significantly different subjects' operating performance. (ii) Clicking number showed significant difference only on menus displayed in the second page. Subjects performed the best in the fifth stage. However, operating time showed significant difference on menus displayed in the first, second, and third pages. With the increasing of using time, the operating performance also advanced. (iii) Regarding the subjects' subjective preference on Palm and WinCE menus, subjects preferred Palm menu design.

Keywords : PDA(Personal Digital Assistant), scrolling, hierarchy, Palm, WinCE

Table of Contents

REFERENCES

[1]王瑩玨(2002)「手持設備之行動遊歷輔助工具之研究」國立交通大學傳播研究所碩士論文。
[2]林煜超（1996）「不同人員在視窗軟體之圖示介面學習績效評估」聯合學報，14，261-273。
[3]唐國豪、蔡麗珍（2001）「選單搜尋輔助設計與功能鍵配置之使用度分析:以行動電話為例」，工業工程學刊，18，120-130。
[4]陳美慧、何明泉（2000）「產品迷你化設計之研究-以PDA 為例」，工業設計，11，89-94。
[5]陳潭、賴衍孔（2003）「從人因工程觀點探討PDA螢幕與其他閱讀媒體對閱讀績效影響之相關研究」，中華民國人因工程學會2003年論文集。175-185。
[6]郭彥谷（2001）「PDA介面資訊傳達與工作效能關係」，國立交通大學傳播研究所碩士論文。
[7]梁成一、陳富明、陳尤澤、蔡佳穎（2000）「PDA手寫輸入的書寫穩定度之探討」，工業設計，11，81-88。
[8]張宏彰（2000）「無線終端設備系統架構之競爭研究以Palm OS、EPOC、WinCE為例」國立台灣大學商學碩士論文。
[9]張春興(1989)，心理學，東華書局，台北市，29，111-151。
[10]楊伯元（2000）「電腦繪圖軟體使用者圖像選單設計之研究」， 大同大學工業設計研究所碩士論文。
[11]蔡麗珍（1999）「複雜功能消費產品選單設計與功能鍵配置之使 用度分析-以行動電話為例」,逢甲大學工業工程研究所碩士論 文。
[12]劉明強（2002）「軟硬體介面互動性探討以行動電話為例」，國 立交通大學應用藝術研究所碩士論文。
[13]潘倩慧（1998）「視窗輔助介面對搜尋作業在認知處理層級上之 研究」，逢甲大學工業工程研究所碩士論文。
[14]ANSI/HFS 100-1988, (1988) American National Standard for Human Factors Engineering of visual display terminal workstations, Human Factors Society, Inc., Santa Monica, California.
[15]Albers, M. and Kim, L. (2002) An Overview of Web Design Issues for Personal Digital Assistants, Technical Communication, 49,45-60.
[16]Buurman, R.D. (1997) User-centered design of smart product, Ergonomics, 40, 1159-1169.
[17]Farooq, M.U. and Dominick, W.D. (1988) A survey of formal tools and models for developing user interfaces, International journal of Man-Machine Studies, 29, 479-496.
[18]Gaver, W. W., (1991) Technology affordances. In:Conference on Human Factors in Computer Systems, Addison-Wesley, New Orleans, 79 -84.
[19]Gessler, S. and Kotulla, A. (1995) PDAs as mobile WWW browsers, Computer Networks and ISDN systems, 28(1-2), 53-59.
[20]Hayhoe, G.F. (2001) From desktop to palmtop :creating usable online documents for wireless and handheld devices, Professional Communication Conference, IPCC 2001, IEEE International 1-11.
[21]Hayes, J.R. (1978) Cognitive Psychology, Dorsey Homewood, IL.
[22]Huang, S. M., Shieh, K. K., and Chi, C. F. (2002) Factors affecting the design of computer icons. International Journal of Industrial Ergonomics, 29, 211-218.
[23]Hwang, S.L., Wang, M.Y., and Her, C.C. (1988) An experimental study of Chinese information displays on VDTs. Human Factors, 30, 461-471.
[24]Jones, M., Marsden, G., Mohd-Nasir, N., Boone, K., and Buchman, G. (1999) Improving Web interaction on small displays. Computer

Networks, 31, 1129-1137.
[25]Koubek, R.J. and Salvendy, G. (1991) Cognitive performance of super-expert on computer program modification tasks, Ergonomics, 34, 1095-1112.
[26]Kamba, T., Elson , S.A., Harpold, T., Stamper, T., and Piyawadee, S. (1996) Using small screen space more efficiently, Conference proceedings on Human factors in computing systems, 383-390.
[27]Kacmar,C.J., and Carey, J.M.,(1991) Assessing the usability of icons in user interface. Behavior and Information Technology, 10, 443 -457.
[28]Lodding, K., (1983) Iconic interfacing, IEEE Computer Graphics and Applications, 4, 13 -23.
[29]Marcuse, A., Ferrante, J.V., Kinnunen, T., Kuutti, K., and Sparre, E. (1998) Baby Faces: User-Interface Design for Small Displays. Proceedings of the ACM Conference, CHI'98 April, 18-23.
[30]Nielsen, J., (1990) Miniatures versus icons as a visual cache for videotext browsing, Behavior and Human Factors Society 33rd Annual Meeting, 380 -384.
[31]Parton, D., Huffman, k., Pridgen, P., Norman, K., and Shneiderman, B. (1985) Learning a menu selection tree:training methods compared. Behaviour and Information Technology, 4, 81-91.
[32]Sanders, M.S. and McCormick, E.J. (1993) Human Factors in Engineer and Design. New York:McGraw-Hill.
[33]Shneiderman, B. (1998) Designing the User Interface: strategies for effective Human-Computer Interaction. Third Edition. Addison Wesley Longman. inc.
[34]Snowberry, K., Parkinson, S.R., and Sisson, N. (1985) Effects of help fields on navigating through hierarchical menu structures, International journal of Man-Machine Studies, 22, 479-491.
[35]Schwarz, E., Beldie, I.P., and Pastoor, S. (1983) A comparison of paging and scrolling for changing screen contents by inexperience users. Human Factors, 25, 279-282.
[36]Seppala, P. and Salvendy, G. (1985) Impact on depth of menu hierarchy on performance effectiveness in a supervisory task: Computerized flexible manufacturing system. Human Factors, 27, 713-722.
[37]Tang, K.H. (2001) Menu design with visual momentum for compact smart products, Human Factors, 43(2), 267-277.
[38]Treu, S. (1994) User Interface Design: A Structured Approach, Plenum Press New York.
[39]Vicente, K.J., Hayes, B.C. and Williges, R.C. (1987) Assaying and isolating individual differences in searching a hierarchical file system, Human Factors, 29, 349-359.
[40]Wood, D.D., Roth, E.M., and Stubler, E.F. (1990) Navigating through large display networks in dynamic control applications, Proceedings of the 34th Annual Meeting of the Human Factors society, Human Factors Society Santa Monica, 396-399.
[41]Wood, D. (1984) Visual momentum: A concept to improve the cognitive coupling of person and computer, International journal of Man-Machine Studies, 21, 229-244.
[42]Wolfgang, J.K. (1990) On the preferred viewing distance to screen and document at VDU workplaces. Ergonomics, 33, 1055-1063.
[43]Wickens, C.D. (1992) Engineering Psychology and Human Performance. Harper Cillins,N.Y.
[44]Weidenbeck, S. (1999) The use of icons and labels in an end user application program:an empirical study of learning and retention. Behavior and Information Technology, 18, 68 -82.
[45]Young, S.L. and Wogalter, M.S. (1990) Comprehension and memory of instruction manual warnings conspicuous print and pictorial icon. Human Factor, l32, 6, 637-649.