8-2005

Personalization of web services: A study on the fit between web tasks and personalization mechanisms

Fiona Fui-hoon NAH
Singapore Management University, fionanah@smu.edu.sg

Keng SIAU
Singapore Management University, klsiau@smu.edu.sg

Min LING

Personalization of Web Services: A Study on the Fit Between Web Tasks and Person.

Conference Paper · January 2005

Source: DBLP

CITATION
1

READS
86

3 authors, including:

Fiona Fui-Hoon Nah

219 PUBLICATIONS **9,791** CITATIONS

SEE PROFILE

Keng L. Siau

Singapore Management University

563 PUBLICATIONS **14,513** CITATIONS

SEE PROFILE

1-1-2005

Personalization of Web Services: A Study on the Fit Between Web Tasks and Person

Fiona Fui-Hoon Nah
University of Nebraska - Lincoln, finah@unl.edu

Keng Siau
University of Nebraska at Lincoln, ksiau@unl.edu

Min Ling
University of Nebraska at Lincoln, mlling@unlnotes.unl.edu

Personalization of Web Services: A Study on the Fit between Web Tasks and Personalization Mechanisms

Fiona Fui-Hoon Nah
University of Nebraska-Lincoln
Email: fnah@unl.edu

Keng Siau
University of Nebraska-Lincoln
Email: ksiau@unl.edu

Min Ling
University of Nebraska-Lincoln
Email: mlling@unlnotes.unl.edu

ABSTRACT

Personalization is increasingly being considered an important ingredient of Web applications. In most cases, personalization techniques and mechanisms are used for tailoring information services to user needs. It is motivated by the recognition that a user has needs, and meeting them successfully is likely to lead to a satisfying relationship and re-use of the Web services offered. However, if the personalization mechanisms do not match the needs depicted by the tasks, it will decrease user satisfaction and performance. In this research, we use the cognitive fit theory to examine the fit between personalization mechanisms and Web tasks.

Keywords

Personalization, personalization mechanisms, Web tasks, cognitive fit

INTRODUCTION

The use of the Internet for various activities such as information searching and browsing, e-commerce, and communications is increasing. As the number of Web pages continues to increase dramatically, the problem of information overload becomes more severe when browsing and searching the WWW. Many types of personalization have been used in e-commerce. Personalization has the potential to customize the Web environment to individual users. However, little empirical evidence exists to support or assess the effectiveness and efficiency of today's Web personalization. In this research, we use the cognitive fit theory (Vessey, 1991) to address this question by examining the fit between Web tasks and personalization mechanisms.

LITERATURE REVIEW

Personalization

Personalization can bring value to individuals. Its objective, in the context of Web personalization, is to deliver information or services that are relevant to an individual or a group of individuals in the format, layout, and time intervals specified (Kim, 2002). Personalization tools enable enterprises to adapt their interactions with customers based on the customers' needs (Vlachakis, Eirinaki, & Anand, 2003). Personalization of Web services has been studied from various aspects. The first relates to communications. One role of personalization agents is to facilitate effective communications. This perspective is also referred to as "relational personalization" (Fan & Poole, 2003). On the other hand, personalizing Web experiences is termed "architectural personalization" (Fan & Poole, 2003) – the objective of which is to manipulate the Web environment to achieve functionality and aesthetic value of space and to convey a sense of personal and social identity. A personalization agent also aims to improve the Web environment for better and more meaningful navigations.

Personalization Mechanisms

There are two general mechanisms for applying personalization to a service: explicit or implicit. If personalization is achieved explicitly, it means that one part (either user or provider of service) "tweaks" the parameters of the service manually. In contrast, implicit personalization refers to mechanisms that adapt a service according to specific user behavior and assumed requirements (Jørstad, Dustdar, & van Do, 2004). Turoff (2001) defined 5 categories of web personalization: link, content, context, authorized, and humanized personalization. Rossi et al. (2001) presented 3 categories: link, content,

and context personalization. Terziyan (2001) described 3 levels: service, content, and dynamic personalization. Fan and Poole (2003) identified 4 perspectives: architectural, relational, instrumental, and commercial personalization. Wu et al. (2003) developed 5 personalization mechanisms: control, content, link, customized screen design, and anthropomorphic personalization.

From the past literature, we identified four main types of personalization mechanisms on the Web:

- *Context personalization*. As one of the control personalization mechanisms, it provides users the ability to know where they are and what they are doing on the Web. Turoff and Michie (1997) noted that the degree of control given to a user strongly affects a user's satisfaction with a given information system.
- *Content personalization*. Content is one of the most important items to personalize on websites. In order to provide optimized information for users, contents are selected using filtering techniques such as content or collaborative filtering.
- *Link personalization*. This approach attempts to select additional relevant links for the user, thus modifying the navigation space by reducing or improving the paths to related Web pages.
- *Humanized personalization*. This means making information systems act like humans. Most anthropomorphic customization is implicit, that is, the greeting that occurs when a user enters a website is not explicitly requested by the user.

Tasks on the Web

Tasks have been analyzed at different levels and based on different characteristics, including structure, repetitiveness, complexity of cognitive processes, and ambiguity. In organizational and social sciences, tasks are typically assessed according to their complexity (Campbell 1988). Bryne et al. (1999) observed 6 classes relating to tasks: use information, provide information, locate on page, go to page, configure browser, and react to environment. Morrison et al. (2001) presented 3 classifications for tasks: find, compare/choose, and understand. Chan et al. (2002) identified 2 task types: transaction and information retrieval. Sellen et al. (2002) defined 6 task types: finding, information gathering, browsing, transacting, communicating, and housekeeping.

Since we are interested in investigating the types of Web tasks that are undertaken in a typical person's daily life, the following five task types provided by Sellen et al. (2002) suit our research purpose well:

- *Finding*: Using the Web to find something specific. Searching is goal-oriented and very well defined. When carrying out 'Finding' activities, the task is clearly goal-oriented with focused questions in mind.
- *Information Gathering*: This is less specific than 'Finding'. It refers to using the Web to purposefully research a specific topic for various reasons. 'Information Gathering' activities tend to be more time-consuming and complex than 'Finding'. Hence, the goal of 'Information Gathering' is clear but the process is unstructured.
- *Browsing*: 'Browsing' refers to going to sites out of personal or work-related interest with no specific goal in mind. 'Browsing' differs from both 'Finding' and 'Information Gathering' in that it is not goal-driven or there is no clear goal.
- *Transacting*: Using the Web to execute a transaction to secure some future products or services. Though clearly goal-driven, such activities do not necessarily involve answering questions or seeking information: most involve directed, straightforward attempts to secure a service, order a product, or manage money.
- *Communicating*: Using the Web to participate in chat rooms or discussion groups.

THEORETICAL FOUNDATION AND HYPOTHESES

The past literature indicates that a fit between tasks and technologies will help to increase user performance. Based on the cognitive fit theory, we argue that user performance will be enhanced when there is a fit between information presentation (via personalization mechanisms) and Web tasks.

Cognitive Fit Theory

Cognitive fit theory (CFT) was developed to explain how graphical displays affect decision making processes and their outcomes (Vessey, 1991). According to CFT, decision makers develop a mental representation of the task and adopt decision processes based on the task and the presentation of information about the task (Vessey, 1991; Vessey & Galletta, 1991). Both

elementary tasks and decision tasks may be classified by the type of presentation that would best fit the task. When the information emphasized by the presentation fits the task, decision makers can use the same mental representation and decision processes for both the presentation and the task, resulting in faster and more accurate solutions (Vessey, 1991). Alternatively, when the presentation and task are not in line with or not supporting one another, decision makers have to adapt their decision processes to match the presentation (Perrig and Kintsch 1985), which may affect accuracy and increase the time taken to complete the task.

Figure 1 shows our research model.

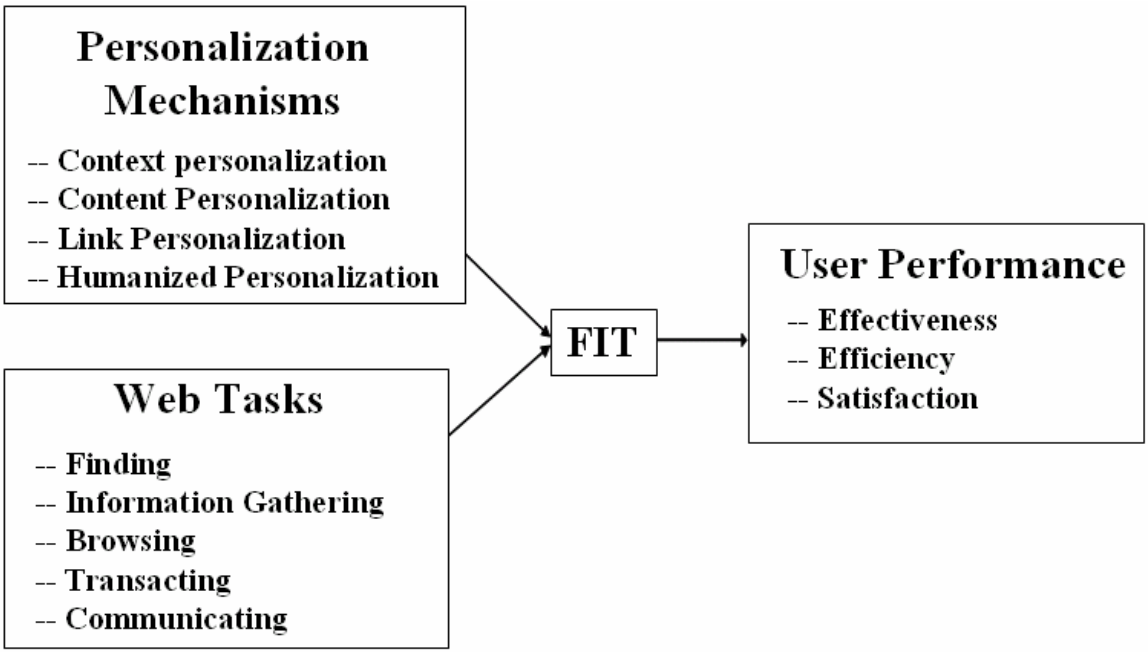

Figure 1: Research Model

Hypothesis Development

CFT (Vessey, 1991) suggests that a fit between presentation and task will affect problem-solving or decision-making performance. In this study, we propose that a fit between personalization mechanisms and Web tasks will increase user performance. The following are our research hypotheses and their justifications:

H1: For Finding task, Content Personalization and Link Personalization will increase user performance.

Finding is a goal-oriented task. This kind of search often involves not only multiple keywords, but also following links, and scanning through different documents and sites. Most of the search in Finding activities are short and self-contained. To provide optimized information to users, the contents can be selected using filtering techniques such as content or collaborative filtering. Link Personalization attempts to select additional relevant links for the user, modifying the original navigation space by reducing or improving the paths to related web pages. It helps users in the Finding task by going directly to the pages that contain the information they need.

H2: For Browsing task, Link Personalization will increase user performance.

Browsing activities usually involve scanning pages of text and graphics. Such activities may be thought of as similar to visual browsing in that they are not necessarily goal-driven, and are typically carried out to serve a specific personal interest or for entertainment purposes. Users of browsing tasks also rely heavily on headlines and summaries. Link Personalization allows users to quickly browse similar topics and can provide multiple links related to the user's topics of interest.

H3: For Information Gathering task, Context Personalization, Content Personalization and Link Personalization will increase user performance.

Such activities are mainly project-driven which often involve comparing and contrasting information across sites. Some information gathering activities are carried out for the purpose of gathering inspiring ideas for a project. Others refer to gathering background information on a project. Regardless, information gathering activities can be time-consuming and complex. More often than not, such meta-level tasks involve navigating multiple links and sites. Hence, link personalization is helpful. However, a more fundamental concern is that interim search results may not be preserved or that information may change in the future, making it hard to trace or get back to them. Context personalization provides users the ability to exert such control and trace-back mechanisms, thus providing more flexibility to the task. It allows users to interrupt, modify, continue, save, and/or terminate a process at any time. Content personalization facilitates the search for gathering information related to specific criteria or projects.

H4: For Transacting task, Context Personalization will increase user performance.

Though clearly goal-driven, such activities do not necessarily involve answering questions or seeking information. Most involved directed, straightforward attempts to secure a service, order a product, or manage finances or cash. Context personalization gives the user the ability and information to know where they are and what they are doing in a complex process or task. In some systems, the user is automatically led through a sequence of web pages based on the current user's task or preferences. This type of personalization mechanism can help increase users' efficiency and effectiveness. Wu et al. (2003) gave an example of how context personalization can help in a transacting task: the system may know from prior visits that the user wishes to do their own seat selection on an airline trip he or she has just purchased. The system then leads the user through a set of cabin displays showing which seats are available for the flight class purchased.

H5: For Communicating task, Humanized Personalization will increase user performance.

Most humanized customization is implicit, that is, the greeting that occurs when a user enters a website is not explicitly requested by the user. This personalization mechanism makes users feel that they are not only welcomed but they are also a part of the group or community, thus increasing users' satisfaction with the experience.

The above hypotheses are summarized in Table 1.

Web Tasks / Personalization Mechanisms	Finding	Information Gathering	Browsing	Transacting	Communicating
Context Personalization		X		X	
Content Personalization	X	X			
Link Personalization	X	X	X		
Humanized Personalization					X

Table 1: Fit Profiles

CURRENT STATUS AND FUTURE RESEARCH

A laboratory experiment is proposed to assess the fit between Web tasks and types of Web personalization. We are in the stage of designing the experimental study. We expect the findings from this study to contribute toward developing a better understanding of personalization for different types of tasks on the Web, and to provide guidelines to Web designers on personalizing websites. In our subsequent research, we are interested in extending our study on Web personalization to the mobile and ubiquitous contexts. Mobility will provide a richer context to Web personalization and allow location-based and context-based personalization.

REFERENCES

1. Byrne, M.D., John, B.E., Wehrle, N.S., & Crow, D.C. (1999). The tangled web we wove: A taskonomy of WWW use, *Proceedings of CHI*, 544-551.
2. Campbell, D. J. (1988). Task Complexity: A Review and Analysis, *Academy of Management Review*, 13, 1, 40-52.

3. Chan, S., Fang, X., Brzezinski, J., Zhou, Y, Xu, S., & Lam, J. (2002). Usability for mobile commerce across multiple form factors, *Journal of Electronic Commerce Research*, 3, 3, 187-199.
4. Fan, H., & Poole, M.S. (2003). Perspectives on personalization, *Proceedings of Americas Conference on Information Systems*, 2123-2130.
5. Jørstad, I., Dustdar, S., & van Do, T. (2004). Personalization of future mobile services. *9th International Conference on Intelligence in Service Delivery Networks (ICIN)*, 18-21 October, Bordeaux, France.
6. Kim, W. (2002) Personalization: Definition, status and challenges ahead, JOT: Issue May/June, Column 3, http://www.jot.fm/issues/issue_2002_05/column3
7. Morrison, J. B., Pirolli, P., & Card, S. K. (2001). A taxonomic analysis of what World Wide Web activities significantly impact people's decisions and actions. Interactive poster, presented at the Association for Computing Machinery's Conference on Human Factors in Computing Systems, Seattle, March 31 - April 5, 163–164.
8. Perrig, W., & Kintsch, W. (1985). Propositional and situational representations of text, *Journal of Memory and Language*, 24, 503-510.
9. Rossi, G., Schwabe, D., & Mattos Guimares, R. (2001) Designing personalized web applications, *Proceedings of International WWW Conference*, 10, Hong Kong.
10. Sellen, A.J., Murphy, R., & Shaw, K.L. (2002). How knowledge workers use the Web, *Proceedings of CHI*, 227-234.
11. Terziyan, V. (2001). Architecture for mobile p-commerce: Multilevel profiling framework, *Proc. Workshop on E-Business & the Intelligent Web*, August, Seattle, Washington.
12. Turoff, M. (2001) Personalization in user interface. http://eies.njit.edu/~turoff/coursenotes/CIS732/samplepro/CIS732FinalProject_Dezhi.htm
13. Turoff, M., & Michie, E. (1997). The design and evaluation of interactive systems, Unpublished Book, New Jersey Institute of Technology, Newark, NJ.
14. Vessey, I. (1991). Cognitive fit: A theory-based analysis of the graphs versus tables literature, *Decision Sciences*, 22, 219-241.
15. Vessey, I., & Galletta, D. (1991). Cognitive fit: An empirical study of information acquisition, *Information Systems Research*, 2, 1, 63-86.
16. Vlachakis, J., Eirinaki, M., & Anand, S.S. (2003). IKUM: An integrated Web personalization platform based on content structures and usage behavior. Retrieved February 28, 2005 from http://www.db-net.aueb.gr/magda/papers/itwp03-IKUM.pdf
17. Wu, D., Im, I., Tremaine, M., Instone, K., & Turoff, M. (2003). A framework for classifying personalization scheme used on e-commerce websites, *Proceedings of the 36th Annual Hawaii International Conference on System Science (HICSS)*, January 6-9, Hawaii. http://csdl.computer.org/comp/proceedings/hicss/2003/1874/07/187470222babs.htm