

## RESEARCH ON INTERNET-BASED COGNITIVE STYLE

Albert H. Huang, University of the Pacific, ahuang@pacific.edu

David C. Yen, Miami University, Ohio; yendc@muohio.edu

Shin-Yuan Hung, National Chung Cheng University, Taiwan; syhung@mis.ccu.edu.tw

### INTRODUCTION

The study of cognitive style was once an important research topic in the broad field of Management Information Systems (MIS), specifically for Decision Support Systems (DSS) in the 1970s' and the 1980s'. A great deal of efforts were devoted to study the role of cognitive style in the decision making process assisted by DSS. Cognitive style was regarded as an important factor in the design of DSS to help managers make better decisions. After numerous studies and tremendous research efforts, Huber (1983) published a landmark article arguing against the use of cognitive style as the basis for MIS and DSS design. Several convincing reasons were raised in his paper to explain why the attempt to study cognitive style and use it in MIS/DSS design was not productive. Further study would also be pointless. The article was widely cited and discussed (Robey, 1983). It created a significant impact on subsequent cognitive style research in the fields of MIS and DSS.

### NEW REASONS FOR COGNITIVE STYLE RESEARCH

Almost three decades have passed since the publication of Huber's paper against using cognitive styles as the basis for DSS design. Significant technological changes have happened during this period. The decision making and technology environment today is very different from what it was three decades ago. Several changes may have enabled cognitive style to become a legitimate and viable topic for renewed attention and further research.

First, the wide spread use of technology have changed the decision making and problem solving process. The processes are now more integrated with technology, especially the Internet, according to the Fleishman-Hillard's Digital Influence Index. Such changes have redefined the meaning of cognitive style. Traditional cognitive style measures may no longer be relevant, and new measures may be needed. The focus now should be on Internet-based cognitive style – how decision makers perceive, think, and remember with the use of the Internet.

Second, decision making assisted by technology is no longer the privilege of business managers. More users are using a wide variety of systems to assist many more decision making and problem solving tasks. In fact, anyone with access to the Internet is able to use some form of DSS to make decisions or solve problems. Consequently, the increased numbers of users and variety of applications have increased the impact of any potential benefit that might come from Internet-based cognitive style research.

Third, technology has enabled the collection of data previously not available. In the 70s', most data on cognitive style and process could only be collected using self-reported surveys from the decision makers themselves. Now, web sites are constantly tracking user online behaviors, including how they search, pick, process, and store information. Consequently, a large amount of data is available for the study of Internet-based cognitive style and process in the decision-making process.

Fourth, technology also makes it easier to implement the outcomes of cognitive style research. Many web-based applications already can change their user interfaces based on user profiles and preferences. Consequently, integrating user cognitive style into DSS should be possible.

### Perceiving with the Internet

A significant change in recent years is the growing reliance on a single channel of information source - the Internet (Kursan & Mihic, 2010; Groves et al., 2010; Largan et al., 2010; Wilson et al., 2010; Zhang & Pinkleton, 2009; Hiltunen et al., 2009; Forrest, 2009; Frosch, 2008; Chatzidakis & Mitussis, 2007). The same traditional sources of information are still available. Yet, they might not be used as heavily as before. For many people, the first step to find a solution to any problem often is to search the Internet. For example, students now rarely use the printed resources from the library to solve homework problems. Instead, the great majority of them simply search the Internet for solutions or clues (Megnigbet, 2006). Printed sources are used, only when the information cannot be located online. The same is true for other types of problem solvers and decision



makers. For example, researchers are using online article databases for their studies. Consumers are relying more and more on online reviews to make purchase decisions (Bickart & Schindler, 2001; Bialogorsky, Gerstner, & Libai, 2001). Business managers are using the Internet to check the backgrounds of employees and job applicants (Clark & Roberts, 2010). Furthermore, many people now rely on only a few dominant search engines or portals as the starting point of problem solving and decision making.

To summarize, decision makers or problem solvers are increasingly using the Internet and relying on the same information portals to obtain information. The devices used are also similar. The information they ultimately select could be different; but the methods and processes leading to it are similar. In other words, the perceiving stage of the cognitive process has become more uniformed for many tasks and people. Such standardization could have significant implications on the cognitive process and the way cognitive style is defined.

### **Thinking with the Internet**

The thinking part of the cognitive process is to analyze the information perceived. With the growing number of Internet based applications and pre-processed data, the thinking stage of problem solving or decision making is also different from what it used to be. Take home shopping for example, a potential home buyer in the past typically received a list of homes for sale from a real estate salesperson. Detailed information for each individual home would be printed on separate sheets of paper. Other information, such as neighborhood, shopping, schools, crime rates, and community information would need to be obtained from other sources. In other words, the information was scattered, unorganized, and are in different formats. The home buyer or a good real estate salesperson would have to collect it, integrate it, and process it to help select the right home.

In today's environment, the home shopping process is quite different. Internet is the first step for many potential home buyers. Numerous web sites provide a large amount of information about homes on the market. Although the basic content might be the same as before, the information is likely to be highly processed, well integrated, logically organized, and methodically formatted to ease the burden of the home buyers. As a result, home buyers no longer need to spend as much time to process the data as they did before. In other words, the thinking stage has

been changed or possibly reduced. Home buyers still need to think; but they could focus on different part of the thinking process. There are numerous other examples of pre-processed information available on the Internet that might have changed the thinking portion of the decision making or problem solving process.

### **Remembering with the Internet**

Information needs to be committed to the memory of decision makers to be used in making decisions. Due to limited memory capacity of decision makers, the decision-making process is often constrained by the availability of information (Simon, 1957).

Technology development in the last three decades has significantly change information availability, which in turn changed the way users remember information (Sanchez & Wiley, 2009). For example, the use of cell phones decreases the needs for memorizing frequently used telephone numbers. The use of GPS systems eliminates the needs to memorize directions and addresses. The use of electronic calendars reduces the needs to remember appointments, meetings, birthdays, and other events. Searchable databases eliminate the needs to remember the location of information. For business decision makers, data warehouses and data mining software reduce the need to memorize important business information for synthesizing and pattern recognition. Besides reducing the need for memorizing information, increased availability also changes the scope of information used for decision making. Decisions makers are no longer constrained by their limited memory capacity. Whatever is available online is what could be used in decision making.

Changes in information availability might also affect the cognitive process to some extent. For example, the memory capacity of the decision maker may not be as important as before. Instead, the ability to access and utilize online information resources quickly may be as important as the ability to memorize information. At the same time, the lack of information committed to the memory of decision makers might also change the decision making process.

### **INCREASED POTENTIAL BENEFITS OF COGNITIVE STYLE RESEARCH**

The variety of Internet-based systems that support decision making has significantly increased in the last decade. These systems are no longer limited to assisting structural business decisions using mathematical models. Instead, many systems are



available for helping millions of users making a variety of everyday choices. For example, applications are available on the Internet to help consumers make purchase decisions about gifts, cars, homes, insurance policies, and many other products (Häubl & Trifts, 2000). Even for business users, DSS are no longer limited to middle managers. Different systems are available to assist employees performing different levels of tasks. The expansion in the variety of systems and the increased number of users have made the potential impact of any design improvement based on cognitive style greater, and more likely to justify the efforts in research and implementation.

In addition to increased potential impact, the objectives of modern DSS are also different from what it was in the 70s' and 80s'. One of Huber's (1983) arguments was that the use of DSS that fit user cognitive style could further reinforce decision makers' idiosyncratic predispositions. This result was certainly undesirable for traditional DSS. Yet, it might not be so for other types of systems. Many Internet-based systems are not developed purely for the benefits of the users. They are developed by businesses for their customers and potential customers. The purpose is not simply to help users making unbiased decisions; but also to entice users and motivate purchasing. Therefore, re-enforcing users' cognitive style might be a desirable outcome from the web site's perspective.

There are existing evidences showing that user cognitive preferences have been considered in the design of web-based systems. For example, many applications and web sites allow users to customize the sizes, layout, options bar, menus, color scheme, and format of data. As Robey (1983) suggested in his responses to Huber (1983), system designers do not need to act like master chefs who assemble all the ingredients to make a productive information system. Instead, system designers only need to provide the ingredients and tools for the users to assemble the ingredients together themselves. Many modern software applications are designed based on this principal. They provide users the flexibility to customize the interface and functions. Technologically savvy users, who are abundant today, are capable of customizing a user interface that meets their own cognitive preferences.

**MORE DATA ARE AVAIALBLE FOR  
RESEARCH ON INTERNET-BASED  
COGNITIVE STYLE**

Another significant change for cognitive style research is that more data are available now. In the

traditional cognitive style studies, researchers often relied on self-reporting data from the subjects, because the perceiving, thinking, and remembering processes were internal and difficult to observe. When the cognitive processes (perceiving, thinking, and memorizing) are integrated with the Internet, the processes become more explicit. Many steps in the cognitive process could be recorded by the computers in the background unobtrusively. In fact, the collection of data related to user cognitive processes has been performed by web sites for some time. Many companies have been systematically gathering data for just about every aspect of user behavior on the Internet (Malhotra, Kim, & Agarwal, 2004). Researchers could use such data to study Internet-based cognitive styles and their effects on decision making or problem solving, instead of relying on self-reporting questionnaires used in previous studies.

(References available upon request)