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The Effects of Web-based Technologies on Knowledge Transfer

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Does using enhanced Web-based services increase problem-solving skills?

Web-based technologies are entering into our lives at a rapid pace and significantly affecting our learning habits. Due to the arrival of powerful information technologies, major challenges to organizations are viewed as the producing and processing of knowledge. Internet portals represent an extension of knowledge transfer for users. Suppose you are an individual interested in learning more about the products or services of a company. Will the information, service, and perceptions of the quality of the company's Web-based services strongly influence your decision to retain its products and services? Quality is defined as a property that brings more clarity to a problem [4]. Can a company successfully transfer its product knowledge to its Web pages? Will your Web-based domain knowledge and experience influence your choice of products and services?

Domain knowledge is used in this article to learn about and develop a better command and insight of Web-based services [6]. The knowledge transfer paradigm provides a strong theoretical basis for describing how domain knowledge

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influences individuals' adoption processes by learning and innovating [1, 11]. Studies regarding knowledge transfer between firms have demonstrated that knowledge transfer can benefit their productivity [3]. By transferring existing knowledge from a Web-based domain to a target such as retention, individuals can learn about a company's products and services. Individuals can also use Web-based technologies to effectively innovate a company's products and services for their use. We advanced research on knowledge transfer by identifying tools that are more likely to transfer knowledge. Knowledge transfer is linked with relational knowledge-based assets (for example, tutorials, online chat rooms, FAQs, and so forth) providing an organization with a unique asset. Here, we consider the importance of knowledge transfer as it relates to quality variables and retention of customers' business. Our results were partially mixed in that knowledge transfer was significant for information quality and system quality, and not for service quality. Apparently, individuals are better able to understand the benefits of knowledge transfer for Web-based information and system enhancements as it applies to retaining company services. Future research should examine why transfer of knowledge for service quality is not as effective.

Significance of Study

Knowledge transfer as it relates to individual satisfaction indicated a nonsignificant relationship. This result may have been affected by the complexity of the satisfaction construct. That is, individuals may have a difficult time in transferring knowledge to a factor that relates to several significant indicators.

Experience was also deemed an important factor for retention of company services [12]. Experienced individuals, more than those with less experience, appear to produce better abstract representation of an organization's information quality and system quality (for example, by concepts or a "deep structure"). These extensive problem structures of high-knowledge individuals may have permitted broader solution strategies, whereby low-knowledge individuals proceeded through a list of constraints that limits them to take action. Experienced individuals may have been able to better cluster (create meaningful groupings) the Web-based information, as well as display greater inferential capability.

The linkage between experience and knowledge has consequences not only through the direct effect on individual retention but also via the information processing context in which customers operate. Organizations may be able to capitalize on educating their customers in the use of their Web pages, thereby increasing their competitive advantage. Individuals may find new ways of learning regarding world, general, and specialty knowledge.

Study Limitations

Some of the limitations of this study include controlling for technology impediments such as bandwidth for Internet connection. For example, someone with a dial-up connection may not be able to use an online chat room and may view support as slow, whereas a better system (such as a cable modem or DSL connection) may have different results. We also viewed a subset of buyers comprising students; although students are active participants in the use of Web-based services, they may not be representative for all groups. Future studies may consider including control variables such as completion time thereby enabling a better insight on the efficiency of using Web-based services. Although feedback from professors administering our experiment indicated that students' learning is affected by many Web-based services tools (including forums, FAQs, search, tutorial, online chat rooms, downloads, and upgrades), future studies may consider only one tool for better experimental control.

This article helps further research by examining quality dimensions of retention of customer services. These dimensions (information quality and system quality) imply that knowledge generation and transfer is an essential source of an organization's sustainable competitive advantage. Organizations may further benefit by acquiring and storing this knowledge in the organizations' memory and by making comparisons between current design (information quality, service quality, and system quality) problems and the past solutions, retrieving that knowledge to generate new solutions to improve customer retention. This new knowledge can be created in specialized Web-based knowledge centers assisting individual relations. This creation of new knowledge can be converted into new and improved products, services, and processes.

Knowledge Transfer

Internet portals represent an extension of knowledge transfer for users. That is, Web-based services provide learning through tutorials, FAQs, and search. Individuals can use tutorials to gain deeper knowledge and FAQs provide a quick link to solutions for previously known issues and problems. FAQs are particularly beneficial to novices and they provide a quick entry point to learn about the company's products and services. Conversely, search tools allow users to ask random questions and receive automatic

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responses from the knowledge repository. Search engines parse individuals' questions, search for potential matches from the knowledge repository, and provide potential solutions.

Knowledge transfer is generally thought of as embedding knowledge in interactions involving people internal to an organization. We extend the literature by examining individuals external to the firm. We contribute to the notion of knowledge transfer providing firms with a competitive advantage through individuals' domain knowledge about its products and services. For example, in an online forum individuals post their questions through an interactive medium in which other individuals participate and provide solutions. A forum makes it possible for individuals to get answers to their questions, view and respond to other participant's questions, and learn about the company's products and services. In most cases company representatives moderate forums. Forum moderators answer questions, provide additional references, and bundle supplemental components that complement the individual's products and services. Transfer of knowledge improves system quality by providing quick feedback, a variety of alternatives, predictable screen changes, and enhanced customer support.

Web-based tools build on Argyis and Schon's [2] notion that learning is assisted by occasions for reflection. Certain tools (such as forums) bring together individual users and the organization to jointly reflect and interpret information. They put together different knowledge structures for collective examination. We argue that individuals reflect upon their experiences and perceptions and discuss processes (for example, via online chat rooms) to make sense of their own assumptions and motives. We add to the knowledge literature by assuming that answers and solutions are captured into a Web-based knowledge base, so individuals can reuse them in the future. Hence, we hypothesize Web-based services that transfer knowledge impact retention.

Finally, in a forum, experience enhances problem-solving knowledge and, in the process, turns novices into relatively more expert types. That is, transfer of knowledge is considered more beneficial to experts when viewed as an empirical phenomenon, residing in action and becoming "organizational" in the acquisition, diffusion, and replication of those actions throughout the organization. For example, one's experience of the Web-based services can influence the entertainment, enjoyment, and fun use of information.

The following example illustrates knowledge transfer enhanced by Web-based technologies. Suppose you want to paint your home. What color combination would work best? What supplies do you need? How do you organize your project? One possible resource is the Web-based services offered by Benjamin Moore at www.benjaminmoore.com, where users can learn about painting, paint products, and more. Start by looking at the many project ideas available on the Web site. Select your paint using the paint selector that allows you to visualize a variety of color combinations for the wall, trim, and floor. When you finish your selection save your choice in the project plan you created using your member account. Determine the amount of paint you need using the paint calculator; input the height and width of your walls, trim, windows, and doors and let the paint calculator determine the amount of paint needed for your project. Click on the problem solver to learn about the causes and solutions of peeling and by clicking on a few more links you can learn about supplies, cleanup, preparing, priming, and painting. You can even learn

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about architectural styles and their history from the 19th and 20th centuries. For the safety conscious homeowner, the material safety data sheet is a click away. You can now click on forums and discuss your options with individuals that have similar interests. Do you still need additional information? Click on the online chat room and discuss your questions with the support staff. These Web-based services provide a detailed learning experience; this is not unique to the Benjamin Moore Web site.

Questionnaire and quality measures used in the study.

Survey Questionnaire
Information quality:
1. The Web-based support I use is an accurate source of information. 2. The Web-based support I use provides timely information. 3. The Web-based support I use has up-to-date information. 4. The Web-based support I use is entertaining. 5. The Web-based support I use is enjoyable. 6. The Web-based support I use is fun to use.
Service quality:
1. The Web-based support I use provides the right solution to my request. 2. The Web-based support I use presents a useful alternative to solve my problem. 3. The Web-based support I use is dependable. 4. The Web-based support I use tells me exactly when support will be performed. 5. The Web-based support I use gives me prompt service. 6. I trust the Web-based support I use. 7. I feel safe when making transaction on the Web-based support I use.
System quality:
1. The Web-based support I use provides quick feedback. 2. The Web-based support I use gives me a variety of alternatives for solving my problem. 3. The Web-based support I use has a natural and predictable screen changes. 4. The Web-based support I use makes it easy to contact the customer support manager. 5. The Web-based support I use makes it easy to get to customer support information.
Satisfaction:
1. My overall satisfaction level with regard to the Web-based support I use is better than what I expected. 2. The Web-based support I use is WORSE than I thought it would be. 3. The overall quality of the Web-based support I use was better than I thought it would be.
Retention:
1. I will continue to use Web-based support in the next 3 months. 2. I will continue to use Web-based support in the next 6 months. 3. I will continue to use Web-based support in the next 12 months.

METHOD

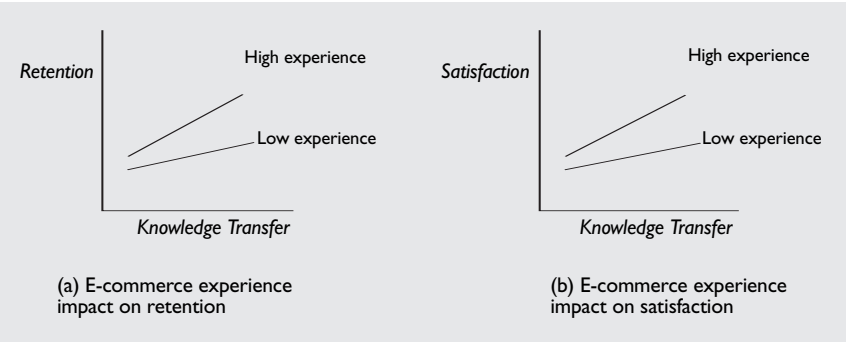
The quality measures for information, system, and service in our study are shown in the sidebar, which displays the questionnaire we used; measures for satisfaction and retention are also listed in the sidebar. Information quality aspects on the Web are found to have the traditional information quality measures such as accuracy, currency, and timeliness and entertainment factors such as enjoyable and fun. Together these factors indicate the ability of the Web interface to inform and impact the individuals' domain knowledge.

System quality is a measure of the information processing system itself. Quality of system design has been identified as critical for the success of a Web site design. We looked at system interactivity (feedback, alternatives, and predictability) and access (easy to access information and easy to personnel). Interactivity is the extent to which users can participate in modifying the form and content of a mediated environment in real time. Interactivity is a desirable feature of the Web: it positively affects the quality of online systems by providing a two-way communication channel [8]. Access refers to convenience in operating hours and length of time spent waiting to receive service [9]. A more accessible online system is one that is available for customer use whenever they wish to use it. Additionally, it is one that makes it easy for the customer to make contact with organizational management and service personnel.

Parasuraman et al. [9] specified five factors for traditional service quality: tangibles, reliability, responsiveness, assurance, and empathy. They created a well-known instrument, SERVQUAL, for assessing overall service quality. We identified items that apply for Web-based

applications and used them in this study, including right solution, dependable, prompt service, trustworthy, and safe.

Satisfaction has often been used as an indication of good customer support. To measure satisfaction in this study, a three-item instrument was adapted from Danaher and Haddrell [5] to develop a measure of satisfaction with the application interface provided to the user. In an online setting, it can be argued that, to the user, the interface is the application.



(a) E-commerce experience impact on retention

(b) E-commerce experience impact on satisfaction

Hypothesized relationship for e-commerce experience.

Retention is the customer's willingness to return and use the online system. Users of an effective online system could be expected to react by returning to the online system for more services. Willingness to return indicates the customer has been well served in the past and plans to get similar products or services in the future. In this light, retention is an impact at the individual level. Customers who are satisfied with the services of the firm are thought to be willing to return for more. Prior research indicates improved customer support should result in customer retention [10]. A four-item instrument for measuring retention was adapted from prior research [7].

Thirty-one professors from U.S. universities, 50% from the western region and 50% from midwestern and eastern regions, participated in the study. Participating professors indicated their course assignments require students to engage in Web-based services tools like forums, tutorials, FAQs, search, downloads, upgrades, and chat rooms. The course assignment typically asked students to download software, to learn from the tutorials, upgrade computers, engage in forum discussions, purchase goods and return goods, and inquire about additional support. The subjects used the same Web sites; the professors distributed the survey questions to their students, whose majors included 45% information systems, 26% business, 15% accounting, and 14% other disciplines.

We obtained 556 usable responses out of 726 completed surveys. The gender ratio was 46% female and 54% male with majority of the students (75%) under 25 years of age, as might be expected from a college population. We had 8% graduate and 92% undergraduate students. We found no differences between students based on gender or major. Sixty-eight percent of the respondents used their Web interface several times a month and 32% of the respondents used their Web interface on a monthly basis. Eighty-six percent of the participants had more than one month of e-commerce experience.

Results

We analyzed the effect of knowledge transfer on information quality, service quality, systems quality, satisfaction, and retention using F statistic. Our data supports that frequency of system use significantly affects information quality and system quality. As predicted, frequency of system use (for example, FAQs, forums, tutorials, search, online chat rooms, upgrades, and downloads) has a significant effect on information quality. An ANOVA test indicated individuals with more experience have higher retention rates than users with less experience (see the figure here). Further, the results indicated FAQs are particularly beneficial to novices and they provide a quick entry point to learn about the company's products and services. However, experts appear to benefit more from search tools that allow them to ask random questions and receive automatic responses from the knowledge repository. However, the figure suggests that novices over time can improve their knowledge about a company's products and services by using Web-based services tools like forums to find immediate answers to their questions and to articulate their questions. While individuals can "pull" the desired information from the Web-based services, the same tools can be used by the organization to "push" information about its products and services. For example, query responses are displayed in the central pane leaving the margins for displaying additional company information (such as links to similar products and services). The margins provide space that can be used to educate individuals about the company.

Conclusion

The results of our survey instrument indicate individuals are more likely to learn, become more innovative, and increase their problem-solving skills when using enhanced Web-based technologies. Web-based service can be depicted as a knowledge

asset: it is an online medium where individuals seek answers to their questions about the products and services they own or intend to own. The quality of the information individuals receive, the quality of the service experienced during the interaction, and the quality of the computer system used to access the information enhance the individual's experience when using Web-based services. C

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