A Framework for Classifying Personalization Scheme Used on e-Commerce Websites

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Abstract

Personalization is a new system development approach for designing information systems that change configurations based on each user's needs and preferences. Although personalization capabilities are present throughout a large number of commercial software packages, they are just beginning to be incorporated into electronic commerce. Most of this personalization has been done in an ad hoc fashion. In this paper, we present a categorization framework for organizing the various types of personalization that have been attempted on web sites. We develop an algorithm for classifying web sites into high, medium and low personalization support and apply it to a set of well-known web sites such as amazon.com. Finally, we discuss why various web sites have high or low degrees of personalization depending on the organization's goals and product mix and also how personalization might have little or large impact on a web site's achieving its intended goal (e.g., sales, customer service, information dissemination, etc.) We also present future research that needs to be done to support our theories on how personalization impacts a web site's success.

Keywords: Personalization, Electronic Commerce, Recommender Systems, E-commerce

1. Introduction

Although the World Wide Web has only been in place for a little over ten years, its adoption and use has had a major impact on human access to information and commercial goods. The Web is heralded as a remarkable opportunity for even very small businesses to significantly expand their customer base. There are so many web sites that the web user is drowning in a sea of information with search engines being relatively weak flotation devices. Thus, many web sites attempt to develop unique support features for users to encourage repeat visits. One of these features is personalization, adjusting the web site to adapt to the individual user by either keeping an online database of each user or storing information on the user's machine via "cookies". A wide variety of personalization techniques exist. Although company's run their own marketing research and measure continuing user access, little is known about how effective the personalization schemes are in promoting return visits (stickiness), helping the user find information faster or simply making the user more satisfied with the organization supporting the web site.

This paper investigates current personalization strategies being used on web sites and develops a conceptual framework for web site personalization characteristics. We first review existing research that presents the various types of personalization schemes that have been developed for web sites. We then develop a high-level classification of personalization using two contrasting measures (1) the degree of autonomy used in the personalization and (2) the focus of the personalization (on the interface presentation or the content selection). From this classification scheme, we select a variety of web sites (e-commerce, information service, search engine, etc.) and classify them using an algorithm developed for our classification scheme into high, medium and low personalization sites. We then examine the results of this exercise and discuss why each of the web site owners might have chosen a high, medium or low personalization scheme depending on the type of service the web page is offering. Although the web sites we selected were not random, the results of our exercise suggest that degree of web site personalization

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might be a key decision for organizations to consider in their e-commerce strategizing.

Before we present our own framework for organizing personalization strategies, we need to develop a clear definition of what constitutes personalization and to review prior frameworks and organizational schemes that have been used to conceptualize personalization.

Most authors of personalization papers neither define nor categorize personalization. Their focus is mostly on the particular personalization mechanisms. We discuss the few who have presented either definitions or frameworks for personalization. McCarthy [7] defines personalization as the ability to customize each individual user's experience of electronic content. He perceives this content to take place along a number of dimensions that are: (1) different sources of content; (2) the arrangement of content on the screen; (3) the delivery mechanisms (system or user initiated) and the delivery vehicles (web browser, mobile phone, pager, etc.). Rather than developing these categories, he extends the discussion of personalization by focusing on adapting personalization techniques to ubiquitous computing where users occupy a physical non-virtual space. His classification is along user properties similar to the classification we apply in this paper.

Instone[4] defines a personalization system to be any piece of software that applies business rules to profiles of users and content to provide a variable set of user interfaces. He presents an information architecture for personalization that is based on user involvement (explicit vs. implicit) and what is profiled (user vs. content). Instone's framework is closest to our framework and is what we have adapted to carry out our web survey. His framework was designed to categorize software used for personalization. Ours is focused on evaluating the user experience with the personalization.

Palmer and Griffith [8] review web practices for the Fortune 500 companies. Although they do not look at personalization per se, they do look at the amount of technical effort embedded in each of the Fortune 500 web sites. They compare the technical richness of each web site to the product and value chain complexities of each industry. They conclude that it is not always appropriate for companies to invest in highly complex web sites, for example, in cases where they already have a rich set of alternate channels for distributing product (high value market chain) that would be affected by selling online. Although this study looks at all technical aspects of web page usage rather than personalization, its focus on business reasons for why or why not a company would have a richly developed web page also apply to a company's decision to personalize web pages.

Kramer, Noronha and Vergo [6] view personalization as an evolving set of tools that provide value to the end user. Although this might be true, we believe that the categorization of the tools into a framework that takes into account how the user perceives and uses the system will be better able to suggest new and useful tools for the user and also to help a business understand how to make decisions about personalization.

A very good review of personalization strategies is to be found in Rossi et al[10]. In this paper a large variety of personalization strategies are defined and exemplified. We have borrowed sixty percent of our subcategories from this paper. The paper makes no attempt to place the strategies into a higher level framework of software approaches. Its key organizing scheme is on the different ways that the physical web page can be adapted through content changes, link changes or structural changes. Our framework is organized around what the user perceives. This approach encompasses many of the same strategies but also adds user-focused ones such as control.

We define web personalization to be the adjustment and modification of all aspects of a website that are displayed to a user in order to match that users needs and wants. This includes modifications to the content that is displayed to the user, adaptations of the display itself and of the user's passage through the display, that is the set of links the user might take. What we do not perceive as personalization is the update or modification of a web site that occurs to all users, e.g., the presentation of a travel flyer announcing a special cruise deal. In addition, if a user indicates in a check box that they do not wish to receive email advertisements from a website, we do not perceive this as personalization. Thus, although our definition is broad-based, it clearly focuses on adaptations that are exclusively for the individual user.

2. Existing Personalization Technologies

In this section, major strategies for personalization are reviewed with a focus on how the personalization information is acquired.

2.1. Cookies

Cookies are small data files that are stored on a user's local machine. They are created when a user first interacts with a website. As the user provides information such as a name, address or other form of identification, the server running the website stores this

information on the user's machine. In follow-up visits to the website, the server can then identify needed information about the user without requiring the user to retype it. Cookies are usually small containing no more than simple user identification, e.g., a name associated with a computer id. The rest of the user information is usually obtained from the web server's database. Many websites use cookies as a basic technology for personalization. Users see this in the form of a welcoming address that uses their name, e.g., "Hello Dezhi, Welcome Back!"

2.2. Profile-based personalization

In order to be able to purchase or receive advanced services from most websites, users are required to register and enter personal information (user profiles) such as gender, age, interests, etc. Websites store this information in a database on the web server. This information is used primarily to support the user with "type once" operations such as maintaining the user's shipping address. Websites also use user profiles for personalized services. The user's postal code provides economic information so that the website can reorganize product access according to a customer's economic profile. For example, a featured wine sale might not be advertised to users residing in an area known to have a depressed economy.

2.3 Personal tools

Some websites allow users to create shortcuts (links) to the information that interests them most. In most online stock trading websites such as E*TRADE (http://www.etrade.com) and Datek (http://www.datek.com), for example, users can configure their own 'personal tools' that trace the stock prices they are interested in. In portal sites such as Yahoo! (http://www.yahoo.com) and MSN (http://www.msn.com), users can create a page containing personally chosen links. Personal tools differ from profile-based personalization because it is the user, not the software that creates the personalization.

2.4 Opportunistic links

Opportunistic links are automatic links generated by a set of rules triggered by users' online activity. For example, if a user purchases an airline ticket to Honolulu, Hawaii from a travel agent website, he/she may get additional links added to their ticket order web page that advertise hotels, excursions and rental car deals in Hawaii, or an email with these same links may be sent to the customer. Although opportunistic links can be combined with other types of personalization technologies, simple opportunistic links do not consider a user's personal preferences or prior purchase behavior. For example, one traveler might be an outdoors person interested in visiting rainforests and taking snorkeling tours. Another traveler might be more interested in history and visits to Pearl Harbor and Diamond Head. With opportunistic links, both travelers will get the exact same ads that are based solely on destination.

2.5. Recommender systems

Recommender systems provide personalized recommendations based on users' preferences. Collaborative filtering and content filtering are the two common technologies used to support the recommendations. Collaborative filtering relies on the purchase and evaluation behavior of past users. The preference profile of the current website user is matched to the profiles of all previous users of the website. Recommendations are made for product selection based on the products selected by the previous users that match the 'preference profile' of the current user [2, 3, 5]. The preference profile for the user is either obtained implicitly by observation of the user's purchase selections or explicitly through a user provided profile. Content filtering generates recommendations similar to collaborative filtering, but instead of matching a user to other users, the user's preference profile is matched to information known about each of the products on the website. The closest matches are then recommended to the user [9, 11]. Several recommender systems combine collaboration filtering and content filtering to improve recommendations [9]. Recommender systems use the most sophisticated software techniques to accomplish personalization. They are also the most likely to provide a finer grain of personalization tuned for each unique user.

3. A conceptual framework for personalization

The previous section listed various software techniques used for personalization. In this section, we apply a user /customer perspective to build a personalization framework. Our framework is based on (1) how much active vs. passive input has to be provided by the user and (2) what types of personalized changes are experienced by the user. We use this approach for categorizing personalization approaches because it represents the interaction of the user with the website which we believe to be the primary concern of website owners. Thus, some of the personalization schemes mentioned in section 2 will fall into multiple categories in our proposed framework simply because

they support more than one method for personalizing a website. Our framework is illustrated in Figure 1.

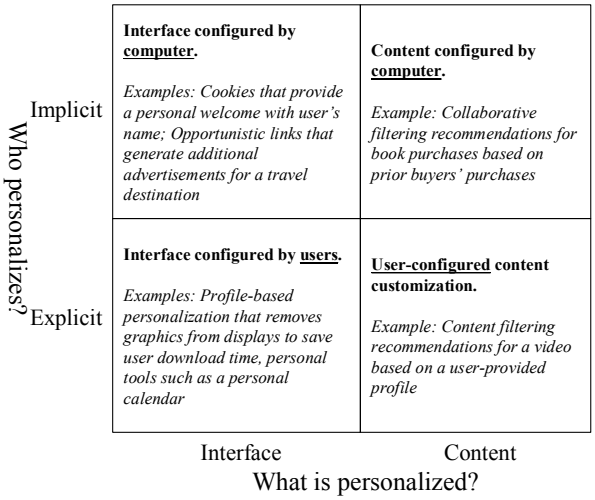

Figure1: A framework for personalized information systems

The framework is a simple two by two categorization of user involvement. Our first two categories deal with "who or what does the personalization." If the user actively and knowingly does the personalization, then we say that the personalization is *explicit*. If, on the other hand, the personalization is achieved by the website collecting information on the user's activity at the website, e.g., product purchases, time spent at various pages displayed, etc., without the user being fully aware of the underlying activity, we say that the personalization is *implicit*. Our second two categories deal with what is personalized. If the organization of information on the web page and the appearance of this information are adapted to user needs, we say that the *interface* is personalized. If, on the other hand, the information or links to information are modified to match a user's perceived needs, we say that the *content* is personalized. In the next subsection we map various approaches taken for web site personalization to the framework we have created.

In this section, we present personalization from a user perspective. The personalization embodies the multiple software techniques reviewed in section 2 of our paper, but is focused on what general types of support are carried out for the individual user. These new categories of personalization fit the framework shown in Figure 1 and they support our main goal in this paper which is to help website developers determine what types of personalization they should consider providing. The types of personalization we have identified are **Control**, **Content**, **Link, Customized Screen Design** and **Anthropomorphic** personalization. . We elaborate on each of these types of personalization in the paragraphs that follow.

3.1 Control Personalization

Control is the ability to interrupt, modify, continue and/or terminate a process once it has been started. Control personalization refers to the amount of control that is given to the user over their personalization. In essence, it is a meta-level form of personalization. For example, although a system may implicitly personalize a system for a user, control personalization would allow the user to decide whether to accept the level of personalization provided by the system. Many web sites request multiple pieces of information from a user before they allow a user to use various features or web pages. Control personalization would allow a user to bypass such requests. Other web sites provide recommendation services for various products stemming from previous purchases. A user with a high degree of control personalization would be given the opportunity to stop these recommendations. An alternate form of control personalization associated with recommendations is one in which the user would be able to specify the quality of the recommendations, thus adapting them further to their needs.

Control is an important aspect of user personalization. Turoff and Michie [12] note that the degree of control given to a user strongly affects a user's satisfaction with a given information system. They point out that the more computer literate the user is, the greater the user's need for a sense of control. Thus, any control personalization in a website has to be carefully tailored to support the wide range of computer-naïve to computer-savvy users the site will accommodate.

Context personalization is a type of control personalization. A "navigation context" is a set of nodes (screens or information) that are required to be viewed and acted on in sequence if a user desires to carry out a particular transaction with a web site. A sequence of web pages requiring a user to provide a shipping address and credit information for a purchase is an example of context navigation. Context gives the user the ability to know where they are and what they are doing in a complex process or task. Context personalization can be implicit or explicit. For example, amazon.com allows users to compress the payment process into one mouse click. This is an example of explicit context personalization. In some systems, the user is automatically led through a sequence of web pages based on the current user's task or preferences. For example, 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. This is an example of implicit context personalization.

3.2 Content Personalization

Content is one of the most important items to personalize on web sites. In order to provide optimized information for users, contents are selected using filtering techniques such as content or collaborative filtering. Content filtering techniques are usually used to support *explicit* content personalization, Collaborative filtering techniques are usually used for *implicit* content personalization. However, these boundaries are not stringently followed by web developers. Figure 2 presents an example of implicit content filtering found on the Amazon.com website. In this example, the user receives recommendations for new books based on prior purchases of the user and other buyers who have purchased similar books.

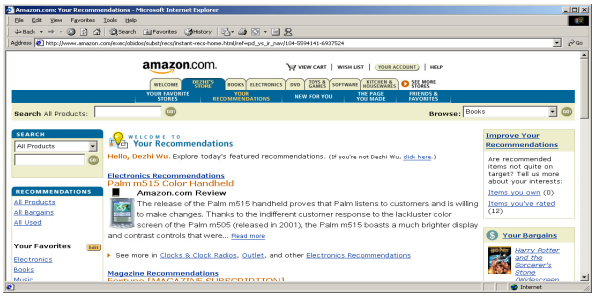

Figure 2. An example of a recommender system in use on the Amazon.com website. Products are recommended based on a user's previous purchases and on similar purchases by other users.

3.3 Link personalization

This approach attempts to select additional relevant links for the user, modifying the original navigation space by reducing or improving the paths to related web pages [10]. Link personalization can be implicit or explicit. For instance, favorites (bookmarks) in web browsers are explicit link personalizations while automatic link generation tools such as Dynamic Hyper Link Engine [1] are implicit link personalizations. "Personal tools" found in many websites such as Yahoo! and Excite are an example of explicit link generation while "opportunistic links" provide an example of implicit link generation. Figure 3 gives an example of explicit link personalization used by the Excite portal. The user is able to specify links of personal interest that will then continue to be displayed whenever the user accesses the excite web site.

Figure 3. Link personalization in Excite site – any of the link categories preceded by "My" are established by the user

3.4 Customized Screen Design Personalization

In addition to specifying favorite links or customizing fast checkouts at e-commerce sties, on some websites, the user is allowed to customize the look and feel of the website. This can be as involved as setting up a personal calendar and establishing a list of people permitted to see the calendar or as simple as specifying a service or special feature to be added to the home page of a website. For example, Travelocity.com allows a user to set up a fare watcher for various cities the user might want to fly to. This is displayed on the home page every time the user enters the travelocity website. Most screen design personalization is primitive. We have found no implicit cases of this form of personalization but they could readily exist.

3.5 Anthropomorphic Personalization

Anthropomorphic personalization means making information systems act like a human. For example, if the system greets "Hello, Dezhi . How are you today?" whenever a user logs in, it's an anthropomorphic personalization. To truly make a system behave in human fashion, a large amount of artificial intelligence work is required. Most anthropomorphic customization is implicit, that is, the greeting that occurs when the user enters the website was not explicitly requested by the user.

4. Applying the framework to high use web sites

A total of 27 current commercial and academic websites shown in Table 2 were selected and categorized using the framework we developed. The websites were not randomly selected but generated from our knowledge of what were publicized in the

press and through other news sources as popular web sites. We also selected the sites to represent a variety of service options. The web sites fell into the following categories: e-commerce, search engine (portal), information service, and financial service.

Table 1. The coding scheme for website personalization

Implicit Personalization	
Item	Score
3 [**CTNi**] Content personalization using implicit data (e.g. recommendation)	3
4 [**CTRi**] Implicit control personalization (e.g. automatic navigation customization)	3
5 [**ALK**] Automatic link personalization (e.g. Opportunistic links)	2
6 [**ANT**] Anthropomorphic personalization	1
Total	9
Explicit Personalization	
Item	Score
7 [**CTNe**] Content personalization using user's evaluations (e.g. customized news)	3
8 [**CTRe**] Explicit control personalization (e.g. user configured "one-click" payment)	3
9 [**ULK**] User configured link personalization (e.g. personal tools)	2
10 [**SCR**] Customized screen design	1
Total	9

[ ] – Abbreviation

We scored the degree of personalization of these websites based on the breadth and depth of personalization capabilities they offered. We assigned the previously described user-based personalizations (i.e., control, content, link, customized screen design and anthropomorphic) one of three possible scores. Control and content personalization were given a score of 3 because they can provide the user with web pages that are uniquely tailored by as much as 50 percent to the individual user and because this type of personalization aids the user in accomplishing the tasks or goals that are the reason for their web site visit. We gave link personalization a score of 2 because most implicit link personalization is in the form of opportunistic links, that is, the personalization is not customized to an individual user, but to any large set of users that fall into the opportunistic categories. We gave customized screen design and anthropomorphic personalization a score of 1 because most implementations are simple feature add-ons that do little to help the user navigate the web site or achieve their goals for visiting the site. These scores are summarized in Table 2.

We scored each of the websites based on the coding scheme shown in Table 1. For example, if a website offered recommendations using implicit preference data such as items previously purchased, we gave it a score of 3. If the website let users customize links, we added 2 to the score. Thus, each web site could receive a maximum of 18 points (for 9 implicit personalization and 9 for explicit personalization). We categorized those web sites with 7 or higher points as having HIGH personalization (●), those sites with 3-6 points as having MEDIUM personalization (•) and those sites with 0-2 points as having LOW (·) personalization. The thresholds for these categories were arbitrarily selected based on several pilot codings of web sites. Obviously, web sites that fall on the boundaries of our arbitrary levels could readily be placed in either category. We created these levels mainly to ascertain why those web sites that have chosen a higher degree of personalization might do so and what advantages they might obtain from this choice. An early first observation is how low the amount of personalization currently is on popular web sites given that we accept a score of 7 out of 18 possible points as a measure of a high degree of personalization.

Table 2. Categorization of 27 websites

Type Website	**Web Site's URL**	**Total Scores** (Degree of Personalization)
E-Commerce	http://www.amazon.com	**14** ●
	http://www.llbean.com/	**1** ·
	http://www.landsend.com/	**8** ●
	http://www.barbie.com/	**5** •
	http://www.travelocity.com/	**13** ●
	http://www.expedia.com	**3** •
	http://carpoint.msn.com/	**4** •
	http://www.dell.com/	**3** •
	http://store.apple.com/	**3** •
	http://www.cybermeals.com/	**3** •
	http://www.ebay.com/	**4** •
Search Engine	http://www.excite.com/	**15** ●
	http://www.msn.com/	**7** ●
	http://my.yahoo.com	**12** ●
Information Service	http://msn.espn.go.com	**5** •
	http://www.cnn.com	**0** ·
	http://www.nytimes.com/	**5** •
	http://www.ivillage.com/	**3** •
	http://www.hbs.edu/	**0** ·
	http://mitsloan.mit.edu/	**0** ·
	http://www.hicss.hawaii.edu	**0** ·
	http://www.acm.org/	**5** •
	http://www.webmd.com/	**7** ●
Financial Service	http://www.bluecross.com/	**0** ·
	http://www.citi.com	**6** •
	http://www.etrade.com	**8** ●
	http://www.datek.com	**2** ·

(Level of personalization: ● - high, • - medium, · - low)

The selected websites were coded by two researchers. The following steps were taken to ensure consistent

coding. First, the two researchers coded 5 websites together to establish a common understanding of how to code each of the personalization features. Then, they coded an additional 5 websites separately and compared their results. The inter-coder reliability was 76.2% (16 out of 21 personalization features were coded the same). The differences in coding were resolved through discussions, and the rest of the 17 websites were coded individually by one or the other of the two researchers. Table 2 presents the results of this coding exercise (detailed coding data are in the Appendix).

5. Discussion of the potential implications of our classification

If we examine Table 2 closely, we find that the web sites with the highest degrees of personalization are search engines (portals) and electronic commerce web sites. Those web sites with a low degree of personalization are primarily information service web sites. For example, the HICSS conference, ESPN and CNN web sites all have low degrees of personalization. Two major education centers, the Harvard Business School and the MIT Sloan School of Management have chosen not to undertake any personalization. The e-commerce sector has a mixed personalization distribution. One travel agent, Travelocity.com has a high degree of personalization while its competitor, Expedia.com has a low degree of personalization. Landsend.com scores high and its competitor, L. L. Bean has very limited personalization. What advantage would each of the above organizations gain by personalizing or not personalizing their web sites?

Table 3: Personalization Across Type of Web Site

Type of Web site	Number of this type	Average Score
E-Commerce	11	5.55 ●
Search Engine	3	11.33 ●
Information Service	9	2.78 •
Financial Service	4	4 ●

Table 3 shows the average personalization score for each type of business. E-commerce web sites sell various products to their customers. A returning customer who buys outdoor clothes, is likely to return to the site and buy outdoor clothes again. Similarly, a purveyor of videos, DVDs and books is likely to get purchases from a customer who has enjoyed past purchases. Therefore, sites that sell a wide variety of goods that entail repeat purchases from a customer are likely to benefit from customizing their web sites to individual customer tastes in order to encourage the customer to make additional purchases and to aid the customer in finding his or her purchase categories more quickly. The e-commerce sites that scored highest all used recommender systems to suggest new purchases. They also maintained user profiles to save user typing effort in repeat business. This suggests that L.L. Bean and Expedia.com might do well in adding more implicit personalization to their web sites. Other e-commerce web sites that scored average or low on personalization include cybermeals.com, carpoint.com, dell.com, apple.com and ebay.com. In the case of carpoint.com, it is unlikely that a user will make more than one purchase so that keeping profiles is not likely to engender additional business. Similarly, computer customers are unlikely to buy according to recommendations from like-minded souls. They probably have specific requirements for their computing environment already in hand. Cybermeals.com, however, could benefit from informed recommendations. Ebay is in a class by itself because its product varies daily. Therefore there is little advantage in finding customer matches for potentially non-existent product.

Financial services have a medium level of personalization, but derive their scores from explicit rather than implicit personalization Although financial services is a type of electronic product, it is a continuing electronic product, either insurance, a bank account or a stock portfolio. The key type of personalization that these services provide for their user is various personal tools and content personalization. In this case the user accesses the web site frequently, mostly for up to date information on the same specific items. The personal tools provided aid the user in manipulating and viewing the personal content.

Search engines provide personalization for completely different reasons than web sites that are either electronic commerce or financial services web sites. Search engines are, in essence, information services with one key difference. The type of information they will provide is not known until the user types in his or her query. Search engines do not have much primary product differentiation. Because users are unable to evaluate the quality of a search and thus compare search engines, the web sites need to compete in other ways. Personalization through the provision of personal useful tools is one mechanism for doing so. Thus, search engine sites provide free email, free calendar services, the ability to set up personal chat rooms, etc. These personal tools have little to do with the main service provided by the web site but tend to draw users.

In contrast to the e-commerce and financial services web sites, the content provided with information service

web sites is the product. The differences in the types of information provided (news, weather, health information, etc.) create product differentiation. Because visits to the web site are rarely related to previous visits, it is difficult for the web site to provide a significant amount of personalization. This is particularly true when the information is changing daily as it is at news sites. This is also true for health and medical information web sites that are likely to be visited only once or twice for each health issue. This is not as true at information sites that provide a set of procedures, rules and schedules to new collections of users who need this information on a regular basis. An example of this is a university web site that students can search for course schedules, university procedures and even their own grades. Because each student's plan of education is usually personalized (within university constraints), it will be advantageous to the student if his or her web access is personalized. For example, the web pages for the student's department could be more prominently displayed than other web pages. But university web pages have a dual mission. They also serve as advertisements to prospective students and their parents. Thus, they are visited, often only once, by a myriad of information seekers. There would be little advantage in personalizing this portion of the university web site. The MIT and Harvard web sites examined were external PR web sites. We suspect that password protected university web sites also exist for the enrolled student.

The HICSS conference web site is not personalized and this also makes sense. Users are not likely to visit the site frequently and are only purchasing one product, the conference. In addition, the information is volatile since it becomes irrelevant to most users once the conference has taken place.

Thus, from this quick evaluation of a variety of web sites, we can deduce that several key features are likely to determine whether an organization personalizes their web site or not. Given that personalization is costly, especially implicit personalization, there have to be good rewards that stem from making this software development decision. We list the key factors that we have deduced below.

Revisit frequency: If a user revisits the web site frequently, then personalization should be considered.

Purchase Relationships*:* If a user is likely to purchase items similar to items already purchased, then personalization should be considered.

Product Differentiation: If the product mix offered by the web site cannot be differentiated from competing web sites, then personalization that creates this differentiation should be considered.

Content Stability: If the content of a web site is relatively stable, then personalization should be considered.

What type of personalization are web sites most likely to exhibit? From our survey of 27 commonly known web sites, we find that explicit techniques are much more common than implicit ones. Table 4 gives a summary of the personalization counts for the web sites we investigated. Fifteen of the 27 sites used anthropomorphic personalization, that is, naming the returning web visitor. Since this is a trivial implementation, it is not surprising to see this widely used. After this, only 4 web sites support implicit control or implicit content presentations. Eighteen of the web sites provided some form of personal tools for the user and nearly half allowed the users to specify the content they wanted to see. So, although there is a lot of business press on how web sites of the future will be customized for each and every user, our small survey does not find this happening. Furthermore, for many product mixes, the value of customizing is not apparent.

Table 4: Types of personalization usage in the 27 common web sites examined

		Type of Personalization	Number of Web Sites
Implicit	**Interface**	Anthropomorphic	15
		Automatic Link	6
		Implicit Control	1
	Content	Implicit Content	3
Explicit	**Interface**	Explicit Control	6
		Customized Screen Design	7
		Personal Tools	18
	Content	Explicit Content	12

6. Future research issues and conclusion

In this paper, we presented a framework for organizing the various personalization approaches: taken by commercial web sites. The framework was not based on the various algorithms being used for customization nor was it based totally on what types of changes took place to the web site. We took a user's perspective in establishing the framework and structured personalization around how much the web site adapted to an individual user and also on how much customization was under the user's control vs. the

system's control. Once we set up our framework, we examined a set of representative web sites to see how much personalization each of them provided for their visitors. We selected these web sites with no a priori expectations of their personalization levels. What we found is that personalization is used unequally across web sites depending on the type of service the web site is offering. We distinguish between those web sites that are promoting the purchase and shipping of product vs. those that are delivering the product as part of the web site (information services and search engines). The distribution of personalization methods suggest that if an external product is being promoted by the web site, then a high degree of personalization is useful if visitors return often for similar products. In addition, the distribution suggests that if competing web-based products exist, then high personalization (especially in the form of personal tools) is useful for product differentiation. In no way have we demonstrated in this paper that any of these hypotheses are valid. Setting up our framework allowed us to evaluate a small collection of web sites. Future research is needed that looks at a much larger data set and that also compares the degree of personalization to external variables such as repeat sales, repeat visits, etc.

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Appendix: Detailed Evaluation Data

For each web site evaluated, a coding sheet was created to score the web site's personalization. This section lists the coding done for each of the web sites and provides an example of why that web site was considered to have a particular personalization feature. The coding is organized into each of the four types of web sites we examined, ie. E-Commerce Sites, Search Engines, Information Services and Financial Services.

1. E-Commerce Sites

Web Site URLs	Types of Personalization		Scores	Examples of Personalized Features On The Website	Total Score
www.amazon.com	Implicit	Interface	ANT=1	"Hello, Dezhi Wu".	14
			ALK=2	Provides opportunistic links automatically, such as new recommended book lists and so on.	
		Content	CNTi=3	Provides the recommendations based on collaborative filtering technologies.	
	Explicit	Interface	CTRe=3	Uses user's evaluations.	
			ULK=2	One-click check out.	
		Content	CTNe=3	Based on different users' ratings, the Amazon visitors could get different recommendations. Further more, based on the provided recommendations, the visitors could select and optimize their choices again.	
http://www.llbean.com	Implicit	Interface	ANT=1	"Thanks for logging in…"	1
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://www.landsend.com	Implicit	Interface	ANT=1	"Dezhi Wu".	8
		Content	CTNi=3	Provides personalized recommendation shopping lists and some pictures.	
	Explicit	Interface	SCR=1	User may create his/her own customized Jeans based on his/her shape, favorable colors and other habits.	
		Content	CTNe=3	Items options contain adding user favorable letters into the personalized clothing. The user could edit the layout of content.	
http://www.barbie.com	Implicit	Interface	N/A		5
		Content	N/A		
	Explicit	Interface	ULK=2	Provides user "Wish List" to shop.	
		Content	CTNe=3	User could select his/her own movie stars into his/her own collector club.	
http://www.travelocity.com	Implicit	Interface	ANT=1	After the users create the membership account, the interface will show: "Welcome, Dezhi Wu".	13
		Content	CTNi=3	The users could describe their own trip expert profile, then the system will provide you expert recommendations.	
	Explicit	Interface	CTRe=3	One-click check out and choose email to display on fair watcher interface.	
			ULK=2	Based on your selected destination, the relative links of rent-a-car, recreation sites etc. will be shown in the interface.	
			SCR=1	The users could select their display preference, such as date format, time format and so on.	
		Content	CTNe=3	User ratings for expert recommendations.	
http://www.expedia.com	Implicit	Interface	ANT=1	"Welcome, Wu Dezhi!"	3
		Content	N/A		
	Explicit	Interface	ULK=2	User could configure the departure and destination location. The sign-in screen shows the personalized links.	
		Content	N/A		
http://carpoint.msn.com	Implicit	Interface	ALK=2	Provides customize oil change reminders for next service date, recall report and personal auto page etc.	4
		Content	N/A		
	Explicit	Interface	ULK=2	Provides additional maintenance recommended procedure links, such as tire and wheel assembly, air cleaner filter/elements and so on.	
		Content	N/A		
http://www.dell.com	Implicit	Interface	ANT=1	"Welcome, Dezhi Wu."	3
		Content	N/A		
	Explicit	Interface	ULK=2	Personal tools to track order status.	
		Content	N/A		
http://store.apple.com	Implicit	Interface	N/A		3
		Content	N/A		
	Explicit	Interface	CTRe=3	One-click Ordering System. Personalized user's personalized iCard.	
		Content	N/A		

http://ww.cybermeals.com	Implicit	Interface	N/A		3
		Content	N/A		
	Explicit	Interface	CTRe=3	User may select, add and delete items to create his/her customized meals, and edit his/her orders. Meanwhile the user may check out by personalized way.	
		Content	N/A		
http://www.ebay.com	Implicit	Interface	ANT=1	"Hello, Dezhi (0) \-O-O-/ "	4
		Content	N/A		
	Explicit	Interface	SCR=1	The users could create their own interface layout, such as two column layout, newspaper layout and centered layout etc.	
			ULK=2	Personal tools to sell your own stuff based on your transactions.	
		Content	N/A		

2. Search Engines

Web Site URLs	Types of Personalization		Scores	Examples of Personalized Features On The Website	Total Score
http://www.excite.com	Implicit	Interface	ALK=2	Automatically provides "My Money", "My Weather", "My Lottery" and other links.	15
			ANT=1	"Hi, Dezhi."	
			CTRi=3	Legends: Grey-fixed content; Green-move within any column; Blue-move within center column.	
		Content	N/A		
	Explicit	Interface	CTRe=3	Move and add customized News Links	
			ULK=2	Personal tools: edit personal visited links	
			SCR=1	Move content, change color, choose border, header bar, header text, options to select time zones and so on.	
		Content	CTNe=3	Provides user's preferred news content.	
http://www.msn.com	Implicit	Interface	ANT=1	"Welcome, Dezhi."	7
		Content	N/A		
	Explicit	Interface	SCR=1	The user may change layout and color in the personalized page.	
			ULK=2	User may add new personalized links.	
		Content	CTNe=3	User may add and change new contents in the personalized page.	
http://my.yahoo.com	Implicit	Interface	ALK=2	Provides personal information reminder, such as "Gifts for your dad"….	12
			ANT=1	"Greetings! Welcome, dezhi. "	
		Content	N/A		
	Explicit	Interface	CTRe=3	The user has the control to add, delete and change the content in his/her Yahoo personalized page.	
			ULK=2	Example: when user uses "Yahoo Calendar", the system provide personal tool for user to create his/her own calendar, then user has options to display the calendar online by public, private or hidden ways.	
			SCR=1	User could change color, content, layout and add/delete pages in their personalized Yahoo screen.	
		Content	CTNe=3	Provides user's personalized news content.	

3. Information Service

Web Site URLs	Types of Personalization		Scores	Examples of Personalized Features On The Website	Total Score
http://msn.espn.go.com	Implicit	Interface	ANT=1	"Welcome, Dezhi Wu."	5
			ALK=2	News on Insiders.	
		Content	N/A		
	Explicit	Interface	ULK=2	My Insider: Customized Sports Page. It customizes the interface to highlight content of the users favorite sports and teams. It also includes the most recent site line headlines, insider scoop, and other featured articles.	
		Content	N/A		
http://www.cnn.com	Implicit	Interface	N/A		0
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://www.nytimes.com	Implicit	Interface	N/A		5
		Content	N/A		
	Explicit	Interface	ULK=2	Provides the personalized news links.	

		Content	CTNe=3	Provides personalized articles to the subscribers.	
http://www.ivillage.com	Implicit	Interface	ANT=1	"Hello, dezhi."	3
		Content	N/A		
	Explicit	Interface	ULK=2	Edit users' personalized hair-style based on the links to famous movie stars' hairstyles.	
		Content	N/A		
http://www.hbs.edu	Implicit	Interface	N/A		0
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://mitsloan.mit.edu	Implicit	Interface	N/A		0
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://www.hicss.hawaii.edu	Implicit	Interface	N/A		0
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://www.acm.org	Implicit	Interface	N/A		5
		Content	N/A		
	Explicit	Interface	ULK=2	New ACM portal provides gateway to ACM library. You may create your own carrel with the library, organize, store and share article interest.	
		Content	CTNe=3	The user could build bibliographies for future reference, and there is a "My Bookshelf" that could provide more personal interested book information.	

4. Financial Service

Web Site URLs	Types of Personalization		Scores	Examples of Personalized Features On The Website	Total Score
http://www.webmd.com	Implicit	Interface	ANT=1	Displays "Dezhi Tuesday, May 4, 2002 "	7
		Content	N/A		
	Explicit	Interface	ULK=2	Provides user favorable Newsletter: living better, latest news headlines and product alerts & approval.	
			SCR=1	The user could edit their customized homepage and choose his/her own display format.	
		Content	CTRe=3	Homepage customization: set up your own WebMD homepage with the hotlinks you want.	
http://www.bluecross.com	Implicit	Interface	N/A		0
		Content	N/A		
	Explicit	Interface	N/A		
		Content	N/A		
http://www.citi.com	Implicit	Interface	ANT=1	"Welcome, dezhi. You have 0 new notices."	6
		Content	N/A		
	Explicit	Interface	ULK=2	User could edit his/her personalized links.	
		Content	CTNe=3	Your bank accounts provide all personalized content.	
http://www.etrade.com	Implicit	Interface	ALK=2	Automatically provides the links for personal management for different kinds of stocks and so on.	8
			ANT=1	"Hello, Wudezhi. Where do you want to start?"	
		Content	N/A		
	Explicit	Interface	ULK=2	Provides user personalized investing, banking, lending and other news links.	
		Content	CTNe=3	Personal tools. This site could let user to create his/her personalized stock item portfolio and SmartAlerts.	
http://www.datek.com	Implicit	Interface	N/A		2
		Content	N/A		
	Explicit	Interface	ULK=2	Personal tools.	
		Content	N/A		