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AN INFORMATION ARCHITECTURE PERSPECTIVE ON PERSONALIZATION

1. WHAT IS INFORMATION ARCHITECTURE AND WHY IT MATTERS

Information architecture is the structural design of shared information environments (AIFIA, 2003). In terms of e-commerce web sites, the information architecture encompasses the organization of the content and functionality, the labelling system and the navigational scheme (Rosenfeld & Morville, 2002). Users interact directly with the user interface of a web site: scanning a list of links and selecting one, clicking on an icon to add an item to their shopping cart, and filling out a form. Users also interact with the content directly: reading introductory text to determine what each category is about, studying product details descriptions and pictures to see if this is what they want to buy, and comparing specific product features. The information architecture is the “invisible” layer between the user interface and the content.

In typical e-commerce sites, the information architecture specifies:

- The major organizational scheme of the site, such as by topic, by audience type, by task. Amazon.com is organized into stores (“electronics” and “baby”), many airline sites are organized around tasks (“search for fares” and “check in for your flight”) and several computer companies use audience groupings (“home office”, “small business”, “government”).
- The product organizational system, such as by price, by brand, by use, by category. The product categorization scheme is the most important aspect of helping users find what they want.
- The labels used for the product categories and functionality. For example, does “Bonus bonanza” convey the proper brand for the site while also letting users know this is the section of sale items?
- The global navigation: the links that are persistent across the pages of the site. The most important items, such as the shopping cart and search, as well as the major organizational schemes (stores or tasks) are usually the ones worthy of such prominence within the information architecture.

- The local navigation: how users navigate within a product category, for example. The music section of a store will have different local navigation than the clothing section.
- The contextual navigation: how users navigate across the major sections to get to “related items” and how the business enables “cross-selling”. This often includes linking from the book section to music and videos products. For example, a Star Trek book would have related links to Star Trek videos, DVDs, toys and clothing.

As this “middle layer”, the information architecture is often hard-coded directly into the web site. For example, the global navigation is pasted directly into the top of the site’s pages, making it difficult to add or remove links across the site. Or, product sub-categories are added directly to pages and as products evolve over time, the sub-categories could become empty – yet they remain on the page. More sophisticated sites create a separate layer for the information architecture – a meta-data layer. The information architecture components are specified as meta-data on objects and the site is generated dynamically from the meta-data. For example, labels for categories are not embedded in a page or the product descriptions but instead come from a database. Thus, changing a product category label from “Bikes, scooters and more” to “Wheeled vehicles” is a simple change because products are tagged to the category and the label is generated separately.

This dynamic, middle layer for the information architecture is a crucial requirement for personalization systems. This level of abstraction provides the ability to generate different experiences based on attributes of the user – it enables personalization.

The chapter next goes into detail on this information architecture framework for personalization. The framework connects user profiles with content profiles and uses personalization rules to determine the user experience.

The framework acknowledges the centrality of the information architecture to the personalized user experience, but it does not provide answers: it only us a means to structure our questions. In this, there are still many unanswered questions for personalized user experiences. The remainder of the chapter presents the changing landscape and what research issues need to be addressed. Personalization is changing the basic hypertext model – bringing content to users instead of forcing users to concentrate on navigation. The resulting shift in the information architecture of e-commerce leads to many design questions of how we convey to users where they are and who they are.

2. AN INFORMATION ARCHITECTURE FRAMEWORK FOR PERSONALIZATION

The information architecture framework (Instone, 2000) is a model that shows how IA impacts the various aspects of the personalized experience. The meta-data

connects the user and content profiles while the personalization rules bring the system components to the user interface.

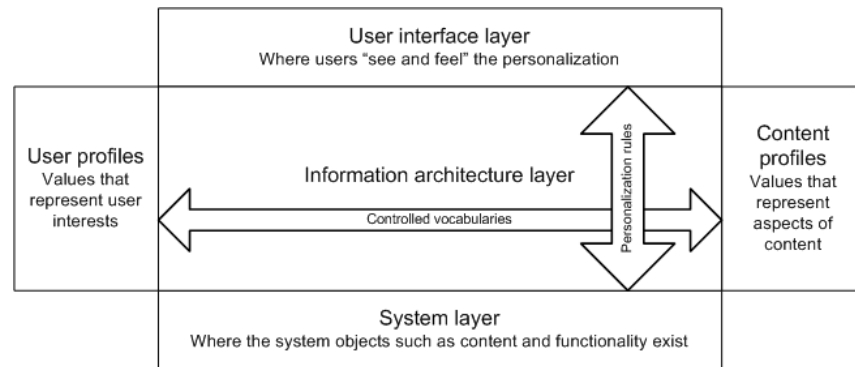


Figure 1. The information architecture layer defines the meta-information that connects the user profiles with the content profiles. The IA layer also includes personalization rules that use controlled vocabularies to build the personalized user interface from system components.

2.1 User and content profiles

Users will have certain characteristics that will need to be tracked for personalization. These attributes could describe:

- where they are located (geographically)
- what their role is (buyer, manager, assistant)
- what their interests are (science fiction books, Frank Sinatra music, mainframes, animal print clothing)

Similarly, the content will have characteristics that will need to be leveraged for effective personalization. These could be:

- price
- creator of the product: author (of the book), singer or composer (of the music), artist (of the artwork)
- brand of the product
- location where the service is offered

These sets of attributes and their possible values are governed by a controlled vocabulary. For each attribute, there needs to be a consistent set of values used throughout the entire system. For example, many products have variations on their names. If users can specify they are interested in “PlayStation 2” but the information

about the product is tagged “PS2” there will be gaps in the personalization. In addition to standardizing on a product vocabulary, the other profile values must be synchronized. Values could include geography (are profile values based on country, state, city or postal code?), topic (what subject category scheme is used?) and person (how do you resolve the common occurrence of misspelled author names in book classification?). This part of the information architecture forms the foundation for the personalized user experience. The strategic IA decisions, such as the taxonomies chosen and the granularity of the tagging, will affect the quality of the personalization as much as the tactical execution (the accuracy of the tagging).

2.2 Personalization rules

The controlled vocabulary provides the foundation for a quality user experience. A very good “static” (non-personalized) e-commerce site can be built based on a controlled vocabulary, but to get personalization, you need specific business rules that govern how user and content profiles are matched up. The personalization rules will be a combination of business requirements (selling more higher margin products, for example) and user requirements (such as finding products that match their interests).

Personalization rules bridge the gap between the system objects of content and functionality and the user interface. A personalization rule will determine when certain users see certain pieces of content and how specific functionality is presented. Some rules can be content-focused, such as showing the featured sale items for all users on the site home page. To support a personalized user experience, however, the rules need to be based on user profile values. “Show sale items from categories the user has purchased from before” would be a more personalized rule: for example, users who have purchased Jazz music would see sale items tagged “Jazz music” and not sale items tagged “Mystery novels”.

2.3 Profile layer

To understand the information architecture layer in more detail, we can break it down into sub-layers for profiles and vocabularies.

The top sublayer is the profile layer, where specific values for the attributes are used to determine what content to present to which user under what conditions. A user’s profile exists here and can be changed explicitly by user actions (such as filling out a form that requests particular profile information), or implicitly by certain actions (such as buying certain products). Likewise, a profile of the content exists and is matched with user profiles through a set of rules.

Meta-information for a piece of content can be changed explicitly by users, such as by reviewing a movie with a “thumbs up” rating. Users can also implicitly modify the content profile. For example, purchases of a product can be tracked and enough purchases could change the value for popularity of that product from “average” to “hot,” thereby affecting other users’ experiences.

User Involvement	User Profile	Content Profile
Explicit	Fill in a form of where they are located, what they want to subscribe to, etc.	Pick a favorite brand for different types of products.
Implicit	Viewing several pages on a single product.	Products purchased, which products were purchased at the same time.

Table 1. Users can be explicitly or implicitly involved in setting user and content profiles

The level of user involvement is an important aspect of personalization because:

- Too much explicit user involvement up front usually turns users away.
- A mix of explicit and implicit over time supports lifecycle personalization and allows users to build up a sense of trust before they commit more sensitive profile information.
- Users can set content profiles to affect *other users'* personalization results (often called collaborative filtering).

In addition to having users set attribute values, they can be set manually (by system managers) or automatically by some software process.

Profile Setting	User Profile	Content Profile
Manual	<ul style="list-style-type: none"> – Managers assign profile values for users (such as after a sales call) – User assigns own profile (see table 1) 	<ul style="list-style-type: none"> – Humans tag content by assigning values to attributes – Humans validate automatic classification recommendations – User assigns content profile (see table 1)
Automatic	<ul style="list-style-type: none"> – The system detects certain values, such as browser version or language. 	<ul style="list-style-type: none"> – Auto-classification software assigns attribute values based on rules and concept extraction, such as assigning brand name values based on text in product descriptions.

Table 2. Profiles can be set by humans (managers, users) or by software

Combining manual and automatic profile setting provides the most economical way to leverage the information architecture and implement personalization features.

2.4 Vocabulary layer

Beneath the profile layer are the vocabularies which regulate the assignment of attribute values. At the vocabulary layer, the attributes themselves are defined and the set of acceptable values (preferred terms) are specified. The relationships between attributes are defined, such as child and parent attributes. For example, if we know that a user owns a “German Shepherd,” then a thesaurus can take us to a broader term “Large Dogs,” which we can match with products for “Large Dogs,” and in the end display transportation cages that are the right size for this German Shepherd owner.

Both users and content have their own attributes, but they are likewise coordinated to make sure that the higher-level profile information is in sync.

Or, defined in the reverse, the vocabulary is the set of all attributes and values, while a profile is merely one specific instance of the vocabulary (for a specific user or for a specific piece of content).

2.5 Personalization rules across the profile and vocabulary layers

The personalization rules operate at the profile and vocabulary sub-layers. The most powerful rules operate on the set of attributes as a whole, at the profile sub-layer. When user and content profiles share the same attributes, then we can make rules that work for all values of those attributes. For example, we can make a profile rule that states: *show CD's sung by this user's favorite artist*. If the user profile has a “favorite artist” attribute that shares the same values as the content profile’s “sung by” attribute, we can make a general-purpose rule that works for all values.

If profile-layer rules are not possible, we would have to make a series of lower-level rules based on each value in the vocabulary:

- If the `favorite_artist` is “Elvis,” show CDs `sung_by` “Elvis Presley.”
- If the `favorite_artist` is “The Beatles,” show CDs `sung_by` “Paul McCartney” and “John Lennon” and “Ringo Starr” and “George Harrison.”

In these examples, we are using personalization rules to make up for gaps in the information architecture: “Elvis” tagging is not consistent and bands like “The Beatles” have to be hard-coded as a rule instead of designed into the IA.

Vocabulary layer rules based on specific values of the user and content profiles often point out a weakness in the IA layer. They are useful in isolated cases, however, to cover rapidly-changing business needs. For example, we might want to offer the sale price for all users whose `breed_ownership` is “Daschund” because they are turning out to be some of the most loyal customers. Or we may want to feature video games whose brand is “Nintendo” (because we make more money on them at the current time) but not whose brand is “PlayStation.” Since the business

context changes rapidly, it is usually best to use the personalization rules as the means of implementing them in the short term and eventually embedding them into the controlled vocabularies and tagging over time, as needed.

2.6 Implications of the framework

The information architecture-centered framework for personalization defines a middle layer that includes controlled vocabularies and personalization rules. It shows how user attributes and content are mapped together and how the rules leverage them to build a personalized user experience. The framework helps explain what happens beyond the technology: what is involved in making personalization effective. As such, it is a useful for asking additional research questions (beyond what personalization features users want and what algorithms to use to offer recommendations).

The next section introduces some of the research questions raised by the information architecture framework and even more fundamental research issues driven by an IA perspective, such as the hypertext metaphor change that personalization demands.

3. IA RESEARCH ISSUES FOR PERSONALIZATION

3.1 *Current practices*

The first place to apply the information architecture perspective on personalization is to document current e-commerce best practices within the IA framework. Understanding things like how current e-commerce sites gather user profile values implicitly and explicitly, what controlled vocabularies are used, and how personalization rules are used to address user and business needs will help us identify gaps in the best practices and recommend areas for further research.

Wu, et al, 2002, used this IA framework to categorize the personalization on current sites. Twenty-seven popular websites were evaluated based on various types of implicit and explicit personalization. E-commerce sites scored high on personalization in support of differentiating products and recommending purchases. Research questions that arose from the study include understanding the differences between physical product e-commerce (such as buying a book and having it shipped) and information product e-commerce (such as buying access to information online).

The Wu study is merely a first step in the process of systemically analyzing personalization practices in order to help us understand the larger issues. Studies involving more comprehensive sets of site, more refined coding schemes for personalization, and tying the analysis to business factors (such as sales effectiveness and repeat business) are needed.

3.2 *Changing the direction of hypertext*

An information architecture perspective on personalization must go beyond documenting best practices, however: it must address the fundamental way that personalization changes the way users think about e-commerce.

Personalization as a whole takes us a step closer to Ted Nelson's vision of Xanadu (Nelson, 1993). Most of the web today is "ordinary hypertext", where users go from page to page via links. Pages are grouped into sites. This navigation metaphor uses language like "visit my site", "go to this page" and "you are here". On the web, the site is the basic unit of place, with conventions such as the site logo going in the upper left of the page and taking users to the site home page (Adkisson, 2002). Search engines group resulting pages into sites. Billboards, TV ads and t-shirts point users to sites in order to get them to do their e-commerce there.

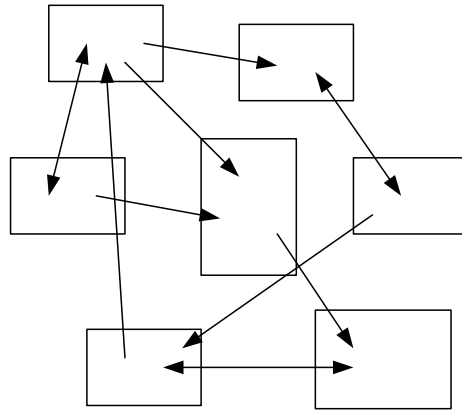


Figure 2. In ordinary hypertext, users navigate from place to place – users go to the information. Each rectangle is a “place” and users evaluate where they are to determine where to go next. (Adapted from Nelson, 1993)

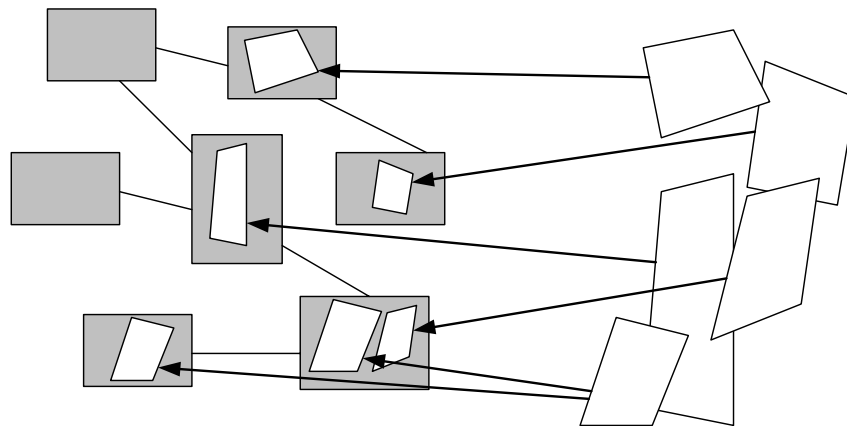


Figure 3. In compound hypertext, the key flow is reversed – the content comes to users in different contexts. Each rectangle is a “context” and content is adapted to each context. When the adaption is based on user profiles, this is called “personalization”. (Adapted from Nelson, 1993)

Pages almost always include indications of where a user is within the site. The most common user interface element to convey where you are has turned out to be

the breadcrumb (Instone, 2002). Other conventions are used less often but include highlighting the current section the user is in and the “site map on a page”.

Whether the “lost in hyperspace” problem is real or not, there are very good reasons to tell users where they are for e-commerce. Customers need to know who they are doing business with: buying a PC directly from the manufacturer is different from going thru a reseller, which is different than buying from a student in Edmonton.

Finding the right product is the key first step to purchasing it, and letting users know where they are helps them figure out where to try next in their quest for whatever they want to buy. Also, knowing where you are helps you return there at a later date – complex purchases evolve over time so being able to find something a second time.

The navigation metaphor is therefore a crucial part of the user experience for e-commerce sites. This is merely “ordinary hypertext” however – personalization is a step closer to Nelson’s “compound hypertext” where the basic metaphor is reversed. Instead of users going from place to place, the content comes to the user in a personalized user experience. Instead of visiting a site, you can personalize your portal to go get the local weather, sports scores and best car prices from your favorite sites and bring them to you. Instead of being obsessed about where you are, you need to worry about where things are coming from, why they are here, and what else are you missing.

Even without personalization, e-commerce sites have found the value of compound hypertext and have implemented in various ways. One example are product category pages – pages where a user has chosen a high level product category but there are subcategories that they can choose from before getting to a specific product list page.

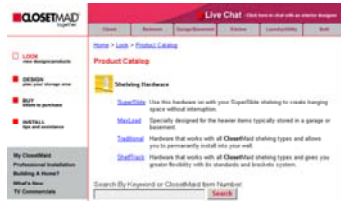
There are commonly 4 different types of product category pages, depending on how products are “bubbled up” to the category level.

Level 1 – No products are listed on the category pages, users must select a subcategory before seeing any products

Level 2 – A few “featured products” are presented by the main purpose of the category page is to drill down into a subcategory

Level 3 – The focus of the page is shifted to a selected set of products, but selecting a subcategory is still available

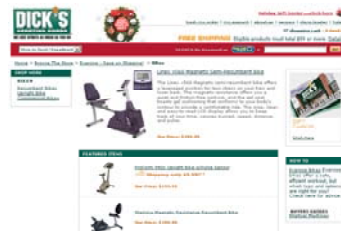
Level 4 – All products are presented at the category level and subcategories become optional filters for users



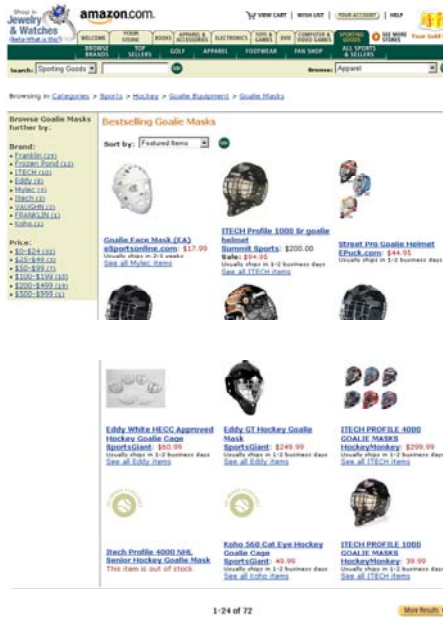
Level 1
No products are listed on the category pages; users must select a subcategory before seeing any products



Level 2
A few "featured products" are presented (on the right) but the main purpose of the category page is to drill down into a subcategory



Level 3
The focus of the page is shifted to a selected set of products, but selecting a subcategory (on the left) is still the key navigation



Level 4
All products are presented at the category level (1-24 of 72 here) and subcategories become optional filters for users (brand and price in this case)

Figure 4. Each level of product category page shows more and more products, gradually shifting the model from ordinary hypertext to compound hypertext.

Aspects of compound hypertext are finding their ways into current e-commerce implementations, even without personalization. Compound hypertext in combination with personalization provides that most significant changes in the conceptual model for e-commerce.

3.3 *Compound hypertext and personalization*

In e-commerce, the ordinary hypertext metaphor is about not getting lost as you find the right store and the right section within that store. Compound hypertext means products will be easier to find as they are not buried in the back of the store. Personalized compound hypertext means that products will be brought forward based on your personal profile. It is this control over how content is presented that drives the personalization experience.

One concern with e-commerce personalization is the possibility that you may not always be in complete control over what you get. You will be able to subscribe to certain services that work and remove ones that do not, but there are also forces at work trying to figure out what you need even before you realize it. That is part of the world of business – you are a buyer but people are also allowed to try to sell to you. The grey line between selling people what they want and convincing them to buy what you want to sell is based on the quality of the personalization.

Although in theory you could have a pure navigation metaphor at one end of the spectrum and a pure personalization metaphor at the other, the real world is a combination of both. You go to a site, log in, and get a personalized experience within that domain. Within that site's personalized experience, some content is brought to you based on your profile, but you are also free to “wander around” and go to other pages. Even if you start at a personalized portal, it only takes a click or two before you realize you have gone to a new place: you might have gotten the local sports scores brought to your portal, but when you indicate that you want to read the corresponding game summaries, you are whisked away to espn.com – and it quickly turns into yet another ordinary hypertext experience.

It is this mixing of the navigation and personalization metaphors in compound hypertext that raises the most fundamental questions about how to design personalized user experiences. As new as the web is, many conventions have formed for the navigation metaphor – how to tell users where they are and where they can go next. Most conventions for the personalization metaphor are not as well set. And the relationship between the two metaphors will be the main user experience challenge for e-commerce sites over the next few years.

4. NAVIGATION AND PERSONALIZATION EXAMPLES

The classic “lost in hyperspace” problem has been translated to the web (Instone, 1997) as: Where am I? What is here? and Where can I go next? This had lead to a set of design patterns (Van Duyne, 2003) that help users understand where they are on the web: what site they are at, what section of the site they are in, and what the page they are on is all about.

Personalization is changing this. Instead of concentrating on where you are, the more important questions are becoming Why is this here? and What am I missing? “Why is this here” addresses the logic that is used to personalize the experience. For example, why is a certain set of books recommended: is it based on my past purchases, or because of some other aspect of my profile such as gender, interests or

even by some inferred behaviour (such as spending a lot of time browsing a specific category). “What am I missing” addresses the concern that any personalization can be limiting and users often want to “step out of it” to get a generic and comprehensive experience. For example, if a list of products is personalized, then how do users get to the full list that is not personalized?

4.1 Where am I design

A key design point for the navigation metaphor is indicating where a person is so that they can evaluate where to go next. For example, Figure 5 shows an example where the global navigation area at the top of the page is used to indicate the brand (Eddie Bauer logo) and store (Clothing & Gear tab). The local navigation area on the left tells us where are in the Men’s department and the section devoted to Shirts. The design is supposed to help users figure out where to go next, such as drilling down to select a shirt by its name or filtering by selecting a type of shirt on the left. The design is also supposed to convey other aspects of the sites information architecture, such as there being a totally different women’s store. When users do not pick up on these design cues, they often get confused. For example, a user might select the WOMEN link and expect to be taken to a page about Shirts for women since this is a page about shirts for men. Helping users understand differences like this, between global and contextual navigation, are one of the main purposes of Where-am-I design.

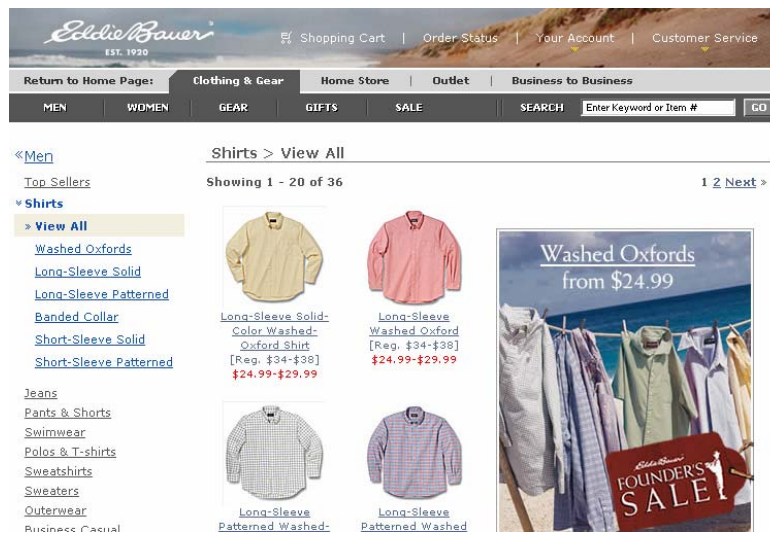


Figure 5. At eddiebauer.com, users are told they are at Eddie Bauer, in the Clothing & Gear store, in the Men’s department and finally, in the Shirts section.

An open question is just how much Where-am-I design to present to users. Too much of it means the content itself is drowned out. A minimalist design would eliminate most of the global and local navigation, leaving only perhaps a breadcrumb to tell users where they are: none of the 75 major e-commerce sites studied by Adkisson, 2002, did this however. So there is definitely a perceived need for Where-am-I navigation for e-commerce.

4.2 Who am I design

Personalization adds a new layer to the user interface design questions. Instead of only having to answer Where am I, What is here, and Where do I go next, personalization requires us to address three more questions in order to create a compelling user experience:

- Who do you think I am? – The profile information that is the basis for the personalization
- Why is this here? – The rationale for the personalized experience, the rules that are determining what content is being presented, for example
- What am I missing? – The experience one would get without personalization and being able to turn off all or part of the personalization process

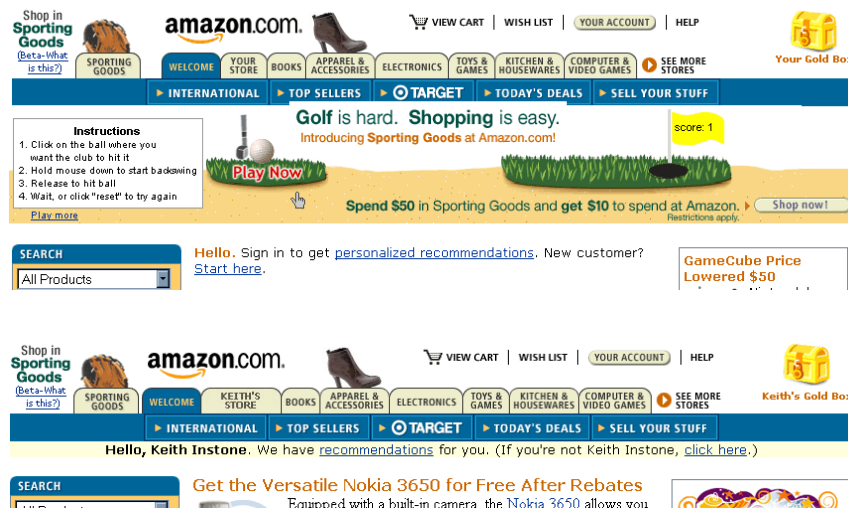


Figure 6. The top portion of the figure is amazon.com for an anonymous user: "Your store" and "Your gold box" indicate the features that can be personalized. Below: after logging in, my experience becomes "Keith's store" and "Keith's gold box" and I am greeted by name. These global navigation changes persist throughout the experience.

4.2.1 Who do you think I am

The first question users may ask in a personalized environment involves understanding who the system thinks they are. Are they logged in, and if so, what profile is being used to personalize their experience? A common follow-up would like be – “And how can I get you to forget something about me so that you no longer use it to personalize?” (The privacy implications are large, but we will focus on the user interface design only.)

Most personalized web sites say “Hello” to you by name on the home page as a way to let you know that you are logged in. As you navigate deeper, reminding people who they are becomes hit-or-miss. Amazon.com changes the global navigation to remind you but other sites, such as Wal-mart.com, do not.

Beyond just knowing it you are logged in or not, the key user question is about the details in their profile that are driving the personalization. Often this is a simple checklist that can be managed via “you account” functionality.

I am interested in:

<input type="checkbox"/> Big Game Hunting	<input type="checkbox"/> Saltwater Fishing
<input type="checkbox"/> Waterfowl Hunting	<input type="checkbox"/> Freshwater Fishing
<input type="checkbox"/> Upland Bird Hunting	<input type="checkbox"/> Fly Fishing
<input type="checkbox"/> Turkey Hunting	<input type="checkbox"/> Rod and Lure Building
<input type="checkbox"/> Black Powder	<input type="checkbox"/> Camping
<input type="checkbox"/> Reloading	<input type="checkbox"/> Auto/ATV
<input checked="" type="checkbox"/> Archery	<input checked="" type="checkbox"/> Dog Training
<input checked="" type="checkbox"/> Men's Clothing	<input type="checkbox"/> Boating
<input type="checkbox"/> Women's Clothing	<input type="checkbox"/> Gifts/Furnishings

In order to receive clothing specials and promotions according to your sizes, please choose your sizes below.

Male
 Female

Shirt/Jacket size:

Pants size:


Glove Size:

Hat Size:

Boot/Shoe Size:

Figure 7. An outfitter store lets you select your interests and clothing sizes within your profile.

Video Recommendations
The Big Comfy Couch - Picky Eaters/Naptime for Molly
From the back cover
 Give Your Child a World of Fun & Learning!




The Big Comfy Couch is the safe, cozy place for preschoolers to learn about the world around them. This highly acclaimed, award-winning series shares a child's point of view--and provides a playful environment for fun and discovery. Your child will laugh... [Read more](#) | [Why was I recommended this?](#)

▶ See more in [Kids & Family](#), [Television](#), and other [Video Recommendations](#)

Why was I recommended this? Close window

We recommended...



The Big Comfy Couch - Picky Eaters/Naptime for Molly
 VHS
 List Price: \$14.98
 Price: \$14.98
 Used & new from \$9.75
 I own it | Not interested

Because you purchased or rated...

Purchased or Rated Items	Not Rated	Dislike it <> love it!
 The Big Comfy Couch - Patience, Molly/Squeaky Clean VHS	⊖ ?	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
<input checked="" type="checkbox"/> Use for Recommendations		
 The Big Comfy Couch - Tricks Can be Tricky/Full of Life VHS	⊖ ?	○ 1 ○ 2 ○ 3 ○ 4 ○ 5
<input checked="" type="checkbox"/> Use for Recommendations		

Save changes

Customers who bought the items above also bought:



Time Out & Manners Matter
VHS



Big Comfy Couch - Red Light Green Light
VHS

More like this More like this

Are recommended items not quite on target? [Improve your Recommendations.](#)

Close window

Figure 8. Amazon.com does several things to tell you why you are seeing what you are seeing. Above, it labels a section of the page “Recommendations” to tell you this is the personalized part of the page – and not the same as the generic product listings. If you click on “Why was I recommended this?” you get the lower part of the figure. Here it says this video was recommended because you previously bought two videos from the same TV show. You can have items removed from consideration for recommendation and even rate the product poorly so that similar products will not be recommended again.

More complicated editing of a profile is also necessary. For example, if a gift was purchased for someone else, users need to be able to mark it as a gift or have it deleted from their profile so that it does not improperly influence future personalization.

4.2.2 *Why is this here*

Once the level of trust is built and people feel that the system correctly knows who they are, the next questions arise about why users are seeing what they are seeing. Is a list of products the generic list that everyone sees, or has it been personalized in some way? If it has been personalized, then what rules were used to alter the experience?

The most common way to tell users why something is there is to separate the “recommendations” from the generic products – see Figure 8. Other possibilities include:

- Telling users why a list of products was sorted a certain way – for example, “Toys are listed from least expensive to most expensive because you have indicated that price is more important than brand”
- Explaining a business rule that is driving a special offer – for example, “Customers like you who have purchased vitamins from us in the past year can save 25% on the following health products”
- When featuring products, list the profile value that is being used – for example, when listing hunting products, label the items listed because of an indicated interest in archery as “Featured archery items”

4.2.3 *What am I missing*

Once users know why the personalization is happening, they will also need to be able to “opt-out” of it any time. The immediate need for users is for them to temporarily turn off the effects of the personalization so that they can evaluate whether what they are missing is important or not. The most common way to do this is some of “see all” feature. For example, if a user profiled themselves as disliking Madonna and therefore her list of recent musical releases always omits her music, then there should be an easy way for her to see *all* recent releases, regardless of profile values – and thus including Madonna’s music.

The design could make this an all-personalization-on or an all-personalization-off, moded design. Or it could offer various layers of de-personalization. For example, if I were at a video games store, I might be profiled as owning a “PlayStation 2” and preferring family video games, suitable for 4 players, and with a rating for “Everyone”. But that could be a very limiting set of the all possible video games, so I could be offered ways to relax one of those profile values to gradually expand the range of possible video purchases. For example:

- PlayStation 2, Family, Everyone rating but for fewer than 4 players
- PlayStation 2, 4 players, but not classified as family nor rated for everyone
- Family, Everyone, 4 players, but for Xbox

5. FUTURE RESEARCH

The framework laid out here for understanding the design implications of personalization does not answer any questions, however – it just raises awareness of how little we already know about users’ expectations from personalization. In fact, the web and its early navigation metaphor are still young and we do not understand it well enough yet.

As personalization becomes a more important part of e-commerce, it will cause us to ask many of the following questions. These fundamental concerns about personalization should become a key item on the human-computer interaction research agenda.

- How do we design the interface to convey to users “who you are”? How much detail about who-they-are do users want to know – is just acknowledging that they are logged in enough, or do they want every aspect of personalization documented for them to review and change? How explicit should the personalization be?
- What user interface design conventions are needed to help users understand what the system knows about them (who they are), what effect it is having on their experience (why is this here) and how they can overcome the effects of personalization (what is missing)?
- How do the navigation and personalization metaphors co-exist? Is it better to discard the ordinary hypertext metaphor entirely and make the compound hypertext metaphor the primary model? When they co-exist, how to users “get in” to the personalization and how do they “get out” of it?
- How do users conceive of personalized e-commerce vs. other e-commerce? Do they “browse” a navigation-metaphor site but “subscribe to” a personalization metaphor site? Is a personalized page viewed as a different version of the “anonymous” page? When users log in, do they envision a whole new site experience, starting at the home page, or do they see their personalized experience as an adjunct to the default, non-personalized experience?
- Do users even care about what “magic” is happening behind the scenes in terms of personalization? Do they only care about the personalization rules if something unusual happens – but if the experience is good, then they would rather remain oblivious to what is happening? Is the personalization driven by privacy concerns and thus should always be explained in terms of what information is being shared and how it is being used?

For the human-computer interaction field to remain relevant to the evolving world of e-commerce, it must start addressing these personalization issues.

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