Patterns for E-commerce applications

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Abstract

In this paper we present some patterns we found in E-commerce applications. First, we briefly characterize these applications as a particular case of Web applications. We next review some Web patterns that can be used in E-commerce applications. Finally, we present five new patterns: Opportunistic Linking, Advising, Explicit Process, Secure Backtrack and Push Communication.

Introduction

The World Wide Web has become a popular platform for E-commerce applications. These applications combine navigation through an electronic catalogue with operations affecting this catalogue. In this sense e-commerce applications are a particular kind of Web applications with similar requirements: good navigational structures, usable interfaces, a clear domain model, etc.

However, E-commerce applications present new challenges to the designer: we not only need to help the user find what he wants (a product he will buy) but also ease the shopping process. For example we should keep him informed about new releases and, last but not least, keep him in the electronic shop for a longer time.

We have developed a conceptual framework for reasoning on design reuse in Web applications. In our approach [Schwabe98, Schwabe99], applications have an object model, a navigational view and the interface. While the object model deals with the usual application behavior, the navigational view defines the architecture of the hyperspace and the interface defines the look and feel of the application. While it is obvious that e-commerce applications will involve particular problems at the object level (related for example with the particular workflow of activities), we are mainly interested in design structures at the navigational level. In this paper we discuss some particular problems related with the navigation topology of a virtual store.

We have been mining patterns for designing Web applications for the last 5 years [Rossi96, Rossi97,Lyardet98, Lyardet99, Rossi99]. These patterns provide guidelines to organize the information hyperspace and to design usable interfaces. In some way, they are similar to Alexandrian patterns, as their aim is to assist the designer in the process of building confortable information spaces, where users can navigate or search information. Navigation patterns show how to push forward the basic hypermedia paradigm (on top of which we build Web applications), based on nodes, links and indexes and build more complex navigation arquitectures.

Some of the papers we mined before (See [Rossi99]) can be easily applied to the E-commerce field. For example the News pattern shows how to make the user aware of new releases by dedicating part of the home page to those news. The Basket pattern provides a way to postpone operations on products by putting them in a (shopping) basket. Finally the Landmark pattern helps to organize the site in sub-sites (shops) that are reachable from every node.

In this paper, we present other patterns that can be used to build successful Web applications. It is interesting to notice that while applying some of them, we solve an usual customer problem (how to find what he wants), others help to solve a problem of the store (how to get the user “seduced” with the store and not leave it). We will point those differences in each pattern.

Opportunistic Linking

Intent

Keep the user interested in the site. Seduce him to navigate in the site even when he has already found what he was looking for

Motivation

Suppose we are building a Virtual Store such as www.amazon.com. By entering the site we can buy many different products such as videos, books or CDs. We can explore the products, and besides we provide links to recommendations, comments about the products, news, etc. However, many users navigate with a specific target: for example buying one particular book. Once they have bought that book, they may leave the site.

One possibility is to add links to each product page to motivate the reader to navigate to other products. In a well-structured site, however, we must try to provide links with strong semantics to reduce the risk of disorientation. So, how do we reconcile these two requirements?

Forces

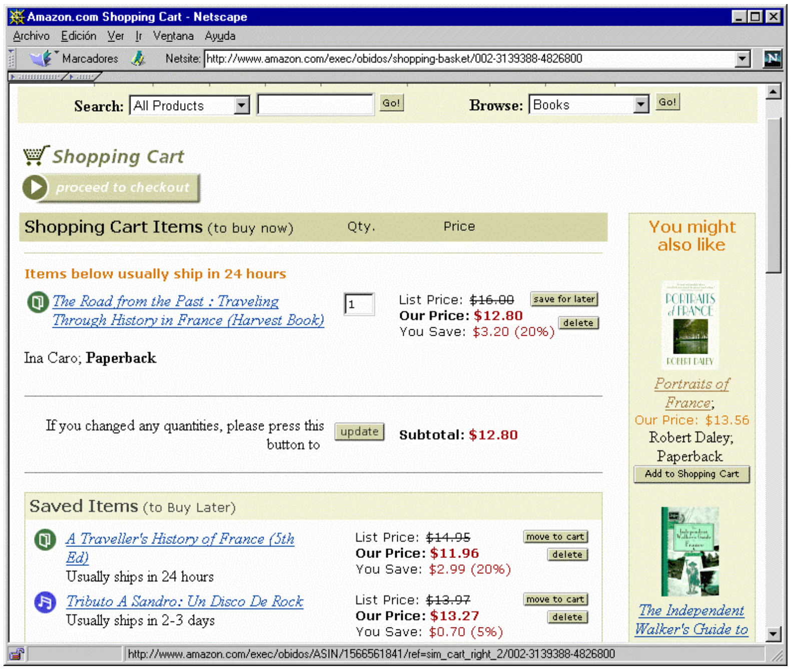
- We want to keep the user navigating in our store even after he bought something
- We don’t want to compromise the structure of the store by adding not meaningful links

Solution

Improve the linking topology by suggesting new products to explore from a given one. Use relationships with strong semantics to make the user feel confortable. Take into account that many of these links may change from day to day so that the interface should be defined accordingly. Notice that this pattern can also be used at the conceptual level to derive new relationships. However the intent is clearly navigational: keep the user navigating in a pleasant way.

Examples

Opportunistic Linking can be found in many electronic stores. For example in www.cdnow.com or www.amazon.com you may find CDs related with the one you chose. In Figure 1 we show an extreme example in Amazon.com. Once the user has chosen a book and put it in the shopping card, he receives a suggestion of another book he might be interested in.



http://www.amazon.com/exec/obidos/shopping-basket/002-3139388-4826800

Shopping Cart Items (to buy now) Qty. Price

Items below usually ship in 24 hours

The Road from the Past : Traveling Through History in France (Harvest Book) 1

List Price: ~~$16.00~~
Our Price: $12.80
You Save: $3.20 (20%)

Ina Caro; **Paperback**

If you changed any quantities, please press this button to

Subtotal: $12.80

Saved Items (to Buy Later)

A Traveller's History of France (5th Ed)
Usually ships in 24 hours
List Price: ~~$14.95~~
Our Price: $11.96
You Save: $2.99 (20%)

Tributo A Sandro: Un Disco De Rock
Usually ships in 2-3 days
List Price: ~~$13.97~~
Our Price: $13.27
You Save: $0.70 (5%)

You might also like

Portraits of France;
Our Price: $13.56
Robert Daley;
Paperback

The Independent Walker's Guide to

http://www.amazon.com/exec/obidos/ASIN/1566561841/ref=sim_cart_right_2/002-3139388-4826800

Figure 1: Opportunistic linking in amazon.com

Related Patterns

Opportunistic Linking is quite similar to Advising; in fact one may argue that what you are doing when applying this pattern (see Figure 1) is advising the customer. However, the intent is different. While opportunistic linking tries to keep the user inside the store by giving him new ideas to buy, Advising help him to choose what he wants.

Advising

Intent

Help the user find a product in the store. Assist him according to his wishes

Motivation

Many times users enter into a virtual store just to find some product they would like to buy. In a typical store there may be thousands of products and providing good indexes or search engines may be just a partial solution to give him some orientation. Applying the News pattern [Rossi99] we can show him new products or releases. However, news may change from day to day and besides we can not be sure that he will be interested in a new product.

Forces

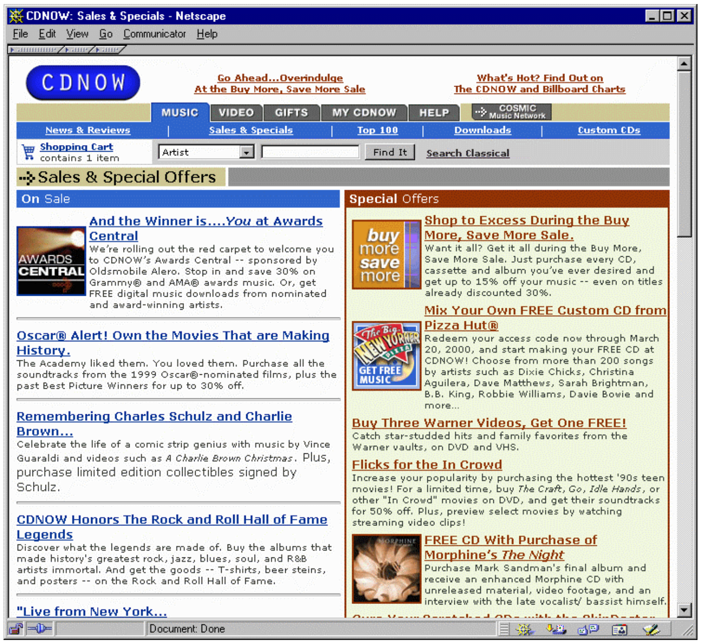
- Customers in an electronic shop may need to be assisted to find a product
- Search engines and indexes (for example taxonomic) are useful but they may be an incomplete solution
- We should take into account what the user may want

Solution

Build specific functionality for advising about products. This functionality may be implemented in different ways. For example, there can be a complete sub-system for recommendations as in www.amazon.com that use customer's profiles (in general their buying history) for recommending products. It may be more general, and present the user the best seller products, or products on sale, etc. The design of the advising facilities should not interfere with the global navigational structure

Examples

Advising is used in almost all virtual stores. For example, Amazon not only provide recommendations according to the user's profile but includes best sellers, updating hourly its list of 100 hot books. In www.barnesandnoble.com for example a bargain section is included in the home page together with general recommendations. www.netgrocer.com just give information about products on sale. In Figure 2 we show the structure of advising in www.cdnow.com. In www4.activebuyersguide.com one can find a complete site devoted to advising. Many E-commerce sites provide links to this site to provide "unbiased" descriptions of their products.



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Purchase Mark Sandman's final album and receive an enhanced Morphine CD with unreleased material, video footage, and an interview with the late vocalist/ bassist himself.

Figure 2: Advising in www.cdnow.com

Related patterns

Advising is similar to Opportunistic Linking. However, in this example the intent is to help the user find its way towards a product. While Opportunistic Linking is aimed at "trapping" the user once he found a product, Advising has a more general scope. In fact both patterns could be considered as specific versions of a more generic one.

Explicit Process

Intent

Help the user understand the buying process when it is not atomic

Motivation

In most virtual stores the checkout process is complex and involves filling different forms (shipping and billing address, information on credit card, etc). Taking into account the very nature of the Web the user may experience disorientation and may wonder if he had already filled some information and may be confused about the whole process. This may cause that he either cancel the process or he tries to backtrack to previous pages, perhaps leading to some inconsistent state (See Secure Backtrack).

Forces

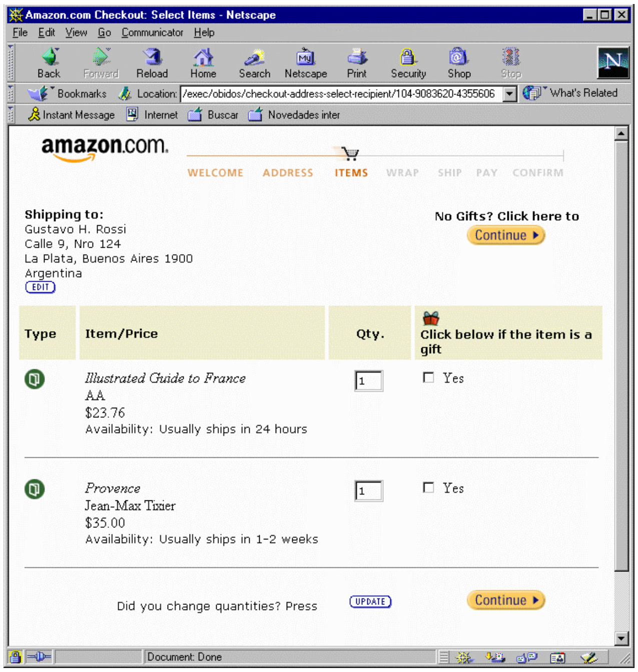
- The checkout or registering process may be complex
- Users tend to feel disoriented as they progress through this process

Solution

Give the user a perceivable feedback about the process by keeping him up to date about which steps he has already accomplished. This can be done by using a "progress" line or by just enumerating the steps and informing where he is now. Take into account the possible consequences of his backtracking (See Secure Backtrack) in order to minimize the possibilities of reaching inconsistent states.

Examples

In most stores we can find simple implementations of this pattern. For example in **www.barnesandnoble.com** for example, the customer has to progress through 7 steps that are clearly indicated in a sequential way. In **www.amazon.com** meanwhile the implementation is more elegant as shown in Figure 3. In the top of the screen you can see a process line indicating that you are in step "Items" and that you still lack four steps until finishing.


Amazon.com Checkout: Select Items - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Netscape Print Security Shop Stop
Bookmarks
Location: /exec/obidos/checkout-address-select-recipient/104-9083620-4355606
What's Related
Instant Message Internet Buscar Novedades inter
amazon.com.
WELCOME ADDRESS ITEMS WRAP SHIP PAY CONFIRM
EDIT
Continue
UPDATE
Continue
Document: Done

Shipping to:
Gustavo H. Rossi
Calle 9, Nro 124
La Plata, Buenos Aires 1900
Argentina

No Gifts? Click here to

Type	Item/Price	Qty.	Click below if the item is a gift
	Illustrated Guide to France AA $23.76 Availability: Usually ships in 24 hours	1	☐ Yes
	Provence Jean-Max Tixier $35.00 Availability: Usually ships in 1-2 weeks	1	☐ Yes

Did you change quantities? Press

Figure 3: Explicit Process in Amazon.com

Related Patterns:

Explicit Process is related with Secure Backtrack as they both tend to simplify and make the checkout (or other non-atomic) process safer. Explicit Process is a particular case of Process FeedBack [Rossi00]

Secure Backtrack

Intent

Provide safe undoing capabilities in a complex process

Motivation

As previously explained some process in e-commerce applications may be quite complex (as the checkout process). While indicating the step in which we are is useful, it may also happen the user misspelled some information or he may want to change some data in his order. The naive solution would be letting the customer backtrack (using his browser Back button), correct the corresponding data and re-do the process. However, as he may not be aware of the exact browsing semantics, it may happen that he finds an inconsistent state. For example, the shopping basket may have changed (if some items were changed for example). The problem with the Back button is that the semantic of backtrack can interfere seriously with the intended undo operation.

Forces

- The checkout or registering process may be complex
- The customer may need to undo some previous operation
- Using the Back button may yield unexpected results

Solution

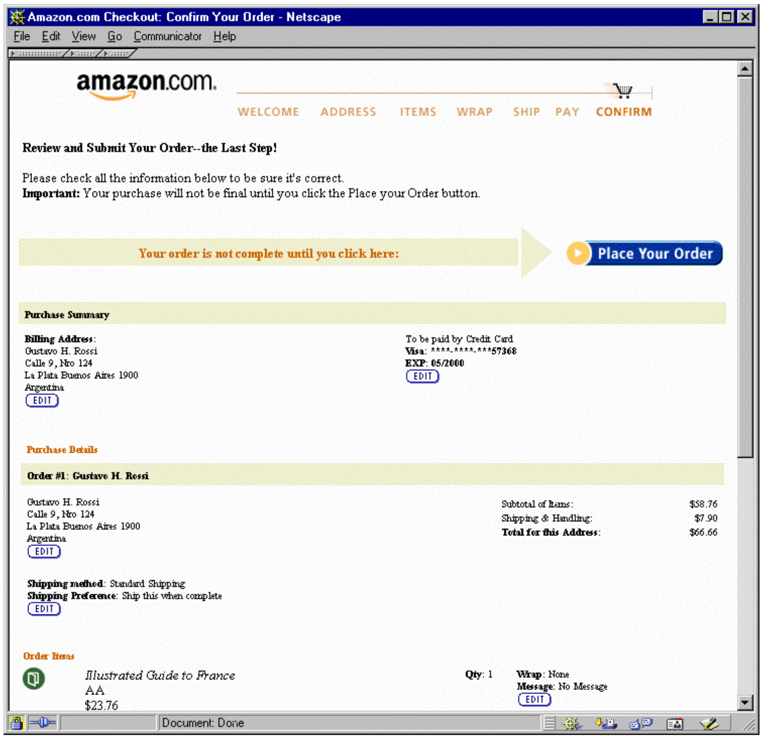
Provide the user with Undo facilities avoiding him to use navigation facilities for this purpose. The undo facilities will have to take into account the customer state in the process in order to be effective. Take into account the browsing semantics in order not to reach an inconsistent state. This pattern extends the idea of backtracking typical in Web applications adapting it to the application's semantics. Instead of returning to the last Web page (using the Back button), we return to the corresponding state to undo the operation. It is important to stress that this difference is specific to this domain as the Web is based on a simple hypertext paradigm with a general backtrack functionality.

Examples

We have found many different examples and implementations of this pattern in E-commerce applications. For example in **www.powells.com**, a customer is exposed to all the information in the confirmation step and he can choose to update or modify your data. Meanwhile in **www.amazon.com** (See Figure 4) customer information is added incrementally and he can choose to change previously entered data. Notice the small buttons near each information item, indicating that you can correct the information. When you select to edit the billing address for example, you return to the corresponding page, and once changed you can continue the process. Notice that we are using a backtrack-forward algorithm that changes the usual browsing semantics adapting it to the needs of the store.

Related Patterns

Secure Backtrack can be used jointly with Explicit Process keeping the user aware of his current state in the process.



Review and Submit Your Order--the Last Step!

Please check all the information below to be sure it's correct.
Important: Your purchase will not be final until you click the Place your Order button.

Your order is not complete until you click here:

Purchase Summary

Billing Address:
Gustavo H. Rossi
Calle 9, Nro 124
La Plata Buenos Aires 1900
Argentina

To be paid by Credit Card
Visa: ****-****-***57368
EXP: 05/2000

Purchase Details

Order #1: **Gustavo H. Rossi**

Gustavo H. Rossi
Calle 9, Nro 124
La Plata Buenos Aires 1900
Argentina

Subtotal of Items:	$58.76
Shipping & Handling:	$7.90
Total for this Address:	$66.66

Shipping method: Standard Shipping
Shipping Preference: Ship this when complete

Order Items

Illustrated Guide to France
AA
$23.76

Qty: 1

Wrap: None
Message: No Message

Figure 4: Secure Backtrack in Amazon

Push Communication

Intent

Simplify the searching process for customer-selected areas or products

Motivation

It is well known that the Web implements a so-called “pull” model. Customers visit a virtual store and pull the information by browsing through the information base. While this model works fine in most cases, there are situations in which it puts excessive burden on the customer. Suppose that he is interested in books on a particular subject or on making tourism to a certain place. How can we simplify the process of his finding that information? The naive, pull-based, solution is letting the user enter each day, find the corresponding information to see if it is what he wanted. Even when using the News pattern [Rossi99] it may happen that not all new products are announced. We could also use the Advising pattern and add each new product that may interest the customer to the list of advised ones. However, even in this case, the customer has to enter the store and find if the information is there.

Forces

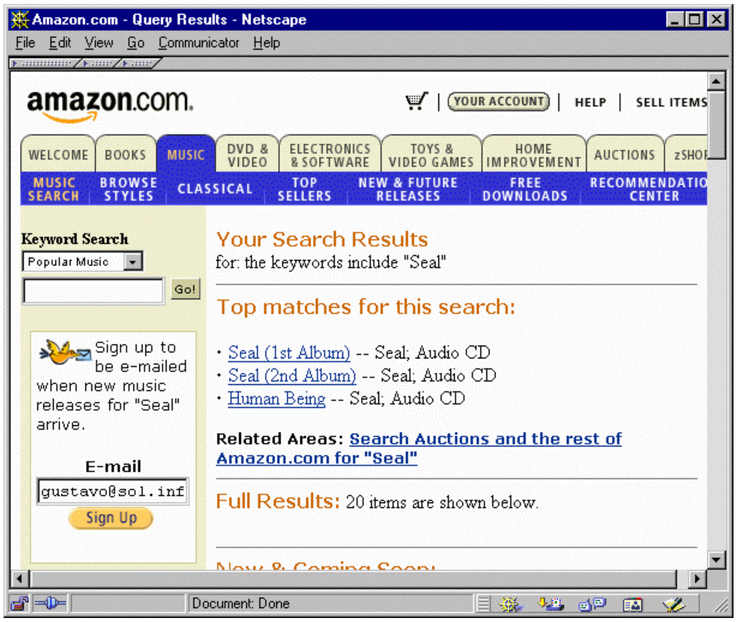
- Finding new information is not always easy
- User waste a lot of time connecting to find new products
- The basic Web model is pull-based

Solution

Combine the usual Web pull model with a push-based communication. Find ways to communicate with the customer without forcing him to find the information. This solution may have different implementations; for example the customer may subscribe to a given subject (or type of product) and receive a mail message each time a new item matching his interests has arrived. This email may directly contain the URL of the product for him to “pull” the information. Another possible alternative is to personalize his site using “channels”. Once he enters into a channel he finds the information on the content he is willing. Mailing and channels can be combined to improve customer access to the information. Notice that this pattern goes further in the usual communication metaphor between Web users and Web sites.

Examples

Most virtual stores provide some kind of subscription mechanism for helping customers know when a particular item has entered into the shop. In www.amazon.com for example, each time a customer search for a product (in a particular subject or area) he is invited to sign up to receive mails each time a new release arrives (See Figure 5). In www.izero.com, and www.netzero.com that provide free Internet access, Push Communication is used to send advertising to the user. Finally in Figure 6 we show the Expedia.com fare tracker. The customer selects an itinerary and he can receive feedback on cheap fares both by email or by having his profile updated (a kind of channel). In this example the customer may choose to go to his personal profile to have information related to his preferences. Finally in www.bloomeberg.com we can see a more extreme example of Push Communication. You can select some stocks and you receive (in a separate window) information about changes in those stocks in real time.



Sign up to be e-mailed when new music releases for "Seal" arrive.

E-mail: gustavo@sol.inf

Your Search Results
for: the keywords include "Seal"

Top matches for this search:

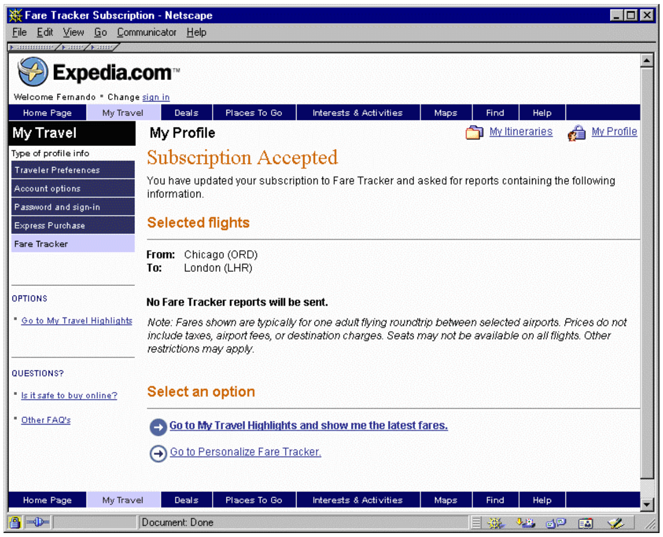
- Seal (1st Album) -- Seal; Audio CD
- Seal (2nd Album) -- Seal; Audio CD
- Human Being -- Seal; Audio CD

Related Areas: Search Auctions and the rest of Amazon.com for "Seal"

Full Results: 20 items are shown below.

New & Coming Soon:

Figure 5: Subscribing to a push service in Amazon



My Profile

Subscription Accepted

You have updated your subscription to Fare Tracker and asked for reports containing the following information.

Selected flights

From: Chicago (ORD)
To: London (LHR)

No Fare Tracker reports will be sent.

Note: Fares shown are typically for one adult flying roundtrip between selected airports. Prices do not include taxes, airport fees, or destination charges. Seats may not be available on all flights. Other restrictions may apply.

Select an option

Go to My Travel Highlights and show me the latest fares.

Go to Personalize Fare Tracker.

Figure 6: Push Communication in Expedia.com

Related Patterns

Push Communication may be considered as a particular implementation of the News pattern [Rossi99]. However, we preferred to differentiate these two patterns as they comprise quite different strategies for managing customer-shop communication and they involve different technologies.

The discussion underlying Push Communication can be rooted to the Observer design pattern. In fact we can consider the customer as an observer on a set of facets of the store and the communication (for example an email) as a particular implementation of the usual "update" message, typically found in object-oriented implementations. Once the observer received the email he pull the information. The discussion on granularity of changes can also be rooted to the discussion in [Gamma95].

Concluding Remarks

We have presented five new patterns for electronic commerce applications. These patterns focus mainly on ways to solve usual problem customers have to find and buy products in the shop. They provide hints to the Web application designer in order to make these applications more usable and effective both from the point of customers and owners of the store. By showing non-trivial extension of the basic Web model (based on nodes and links) these patterns help to improve the navigation topology and some aspects of the customer-store communication 'styles.

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