

# Design and Development of a Cooperative Shopping System with Shared Discussion Space

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## Abstract

*At current on-line shops, buyers almost independently enjoy shopping without anyone's help. However, there are many cases where they cooperate with people such as personal advisers or salespersons at real shops, especially at apparel shops.*

*In the process of cooperation many evaluation data on candidate products are exchanged between buyers and personal advisers. These evaluation data can be used for various services and marketing activities at the shop side.*

*We propose a shared discussion space for cooperative users by sharing information on candidate products and evaluation data on them. The shared discussion space provides a dynamic configuration mechanism from many viewpoints of criteria in order to help buyers to decide which item to buy.*

## 1. Introduction

With the increase of on-line customers of the Internet, sales of the on-line shopping market is now exploding. On-line shopping does not limit time and space for customers so that they can select products and pay money wherever and whenever they like. On-line shopping gives other benefits to customers that conventional retails and catalog shopping cannot offer.

Currently the popular kinds of products sold on-line are computers and their peripherals, books, travels, compact discs, etc. Clothing has not been popular and were often regarded as inappropriate products to on-line shopping. However, in late 1998, it was reported that clothing is the most rapidly growing category of products sold on-line, and customers of catalog shopping would shift to the on-line market.

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\*currently, Keyence Corp.

Clothing is different from books, computers, etc., because customers have their own subjective standards to select products. They often need help from their acquaintances or salespersons to decide which product to take. We propose an environment for on-line customers to cooperate with each other to select products with a shared space where they can discuss on several items and compare them. This environment can also give benefits to shops by feeding back the behavior data of customers.

In this paper, the authors describe a cooperative model on shopping activity based on a simple experiment and propose a user interface to facilitate evaluation of candidate products and reuse it. We also mention an implementation of this cooperative shopping system taking the case of neckties.

## 2. Analysis

### 2.1. Problems in on-line apparel shops

We focus on the problems of user interfaces at on-line shops that cannot be solved only by improvements of the infrastructure of the Internet. The drawbacks of the user interface at current on-line apparel shops are described as follows.

**Products retrieval by keywords** It is often very hard for general consumers to search their favorite products efficiently because they must know various technical terms about colors and patterns. It is also a serious problem that it is difficult for customers to find better products in retrieval results because they are just displayed in the order of product ID.

**Inconvenience of virtual shopping carts** A virtual shopping cart is an extension of conventional one provided at real shops. Customers can keep any product in it temporarily before purchasing. Almost all virtual

shopping carts, however, only have a list of candidate products. They lack functions that help customers evaluate them and decide which item to buy.

**Insufficient personalization** Customers have a great variety of preferences, but conventional on-line shops equally serve them. There are a few on-line shops recommending products according to individual preference with techniques of collaborative filtering. However, this type of services are applicable to only those who have already purchased some products, not for new customers.

## 2.2. Cooperation on online shopping

As argued above, in case of on-line shopping of clothing, customers (hereafter, *users*) often need help to select products to buy. We give two roles for users: a *buyer*, who buys a product for his/her own usage, and an *adviser*, who virtually goes shopping with the buyer and give advice to the buyer. *Salespersons* can sometimes help users, too.

There exist some systems where a customer can get help from the shop (e.g., [1]), but advising between customers is our original focus.

In current on-line shopping there are few cases that buyers cooperate with advisers and salespersons. However, cooperation has the following advantages.

**Consulting with advisers** There are many cases that buyers consult which product to buy with their advisers. Especially at apparel shops it is helpful to a buyer if he/she can ask advisers whether product is suitable to him/her or not. Only those who know buyers well, like buyer's friends or spouse, can give this type of advice. General reviews found at on-line book stores such as Amazon.com are insufficient at on-line apparel shops.

**Acquisition of evaluation data of products** Buyers mostly do on-line shopping by themselves. In this style of shopping, only information on finally purchased products is given to shops even if they decide which item to buy after some hesitation. However, with system support, a shop can acquire evaluation data on products by observing the exchange of evaluation between users cooperating with each other. It can obtain not only evaluation data on single item but relative evaluation data between two or more items.

**Offering services based on the evaluation data** By using evaluation data in the process above, it is possible to offer the following helpful services to buyers that are not observed at conventional apparel shops.

- Ranking the retrieval result

- Retrieval by words such as “nice design” or “fashionable”
- Personalization
  - recommendation according to buyer's evaluation of candidate products
  - telling preference to others by using personal shopping histories (collaborative filtering)

## 3. Cooperative model of shopping activities

### 3.1. An experiment for user modeling

We attempted a simple experiment (Figure 1) to investigate the style of actual cooperation between buyers and advisers on the Web. In this experiment, the functions necessary for the cooperative shopping between distant users were found. Subjects used the Netscape Communicator as a Web browser, and visited various on-line shopping sites. If a product that they liked was found, they could put it in a shared shopping cart.

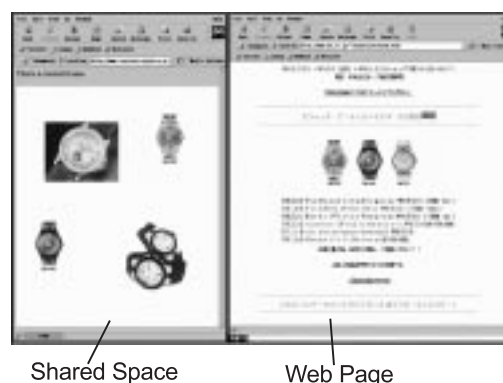


Figure 1. Screen of the experiment

Features of the tool used in this experiment were as follows.

- A shared space (shared shopping cart) to place the image of products from Web pages
- Functions to move, resize, and delete image icons in the shared space

By using this tool, subjects could share various products from multiple Web sites as candidate products. They could arrange the candidate products by moving, resizing, and deleting images of them in the shared space. Detailed information about an item could be easily shared by simply visiting the page that has its image.

Subjects were requested to have conversation as much as they could on shopping. The experiment was carried out by two groups of two people. The two groups were tested more than thirty minutes at each time. In the experiment, the conversation protocol was recorded with a tape recorder, and operation histories were recorded as data files.

### 3.2. Cooperative processes on shopping

As a summary of the experimental results, we can say that there are three phases as follow in cooperative shopping.

1. Individual product retrieval
2. Exchange of product evaluation
3. Sorting out candidate products

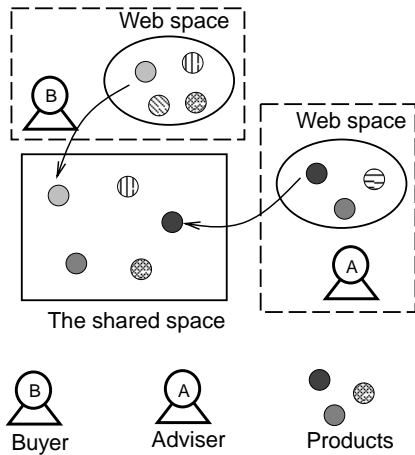


Figure 2. Individual product retrieval

At the first stage (Figure 2), users search adequate products for the buyer. The buyer tells the adviser the type of products the buyer wants, otherwise the adviser asks the buyer what kind of products the buyer wants. The adviser often helps the buyer search products, if the buyer is not familiar with the product retrieval. If a product suitable for the buyer is found, it is placed in the shared shopping cart (the shared space) and easily recognized by the other one.

At the second stage (Figure 3), they exchange their opinions on some candidate products in the shared space. As is often the case with this stage, the buyer's evaluation conflicts with the adviser's one. These conflicts, however, activate their cooperation.

At the third stage (Figure 4), users (usually a buyer) try to sort out all the candidate products considering evaluation data on each user or whether or not they suit the buyer.

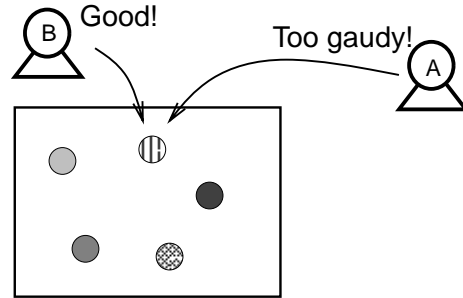


Figure 3. Exchange of product evaluation

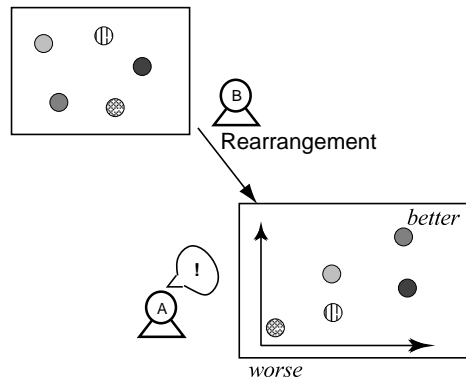


Figure 4. Sorting out candidate products

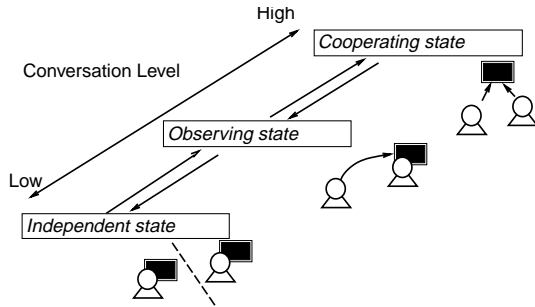
### 3.3. User's state transition

On on-line shopping each user retrieves, evaluates, and sorts out products in his/her own screen of their Web browser. Therefore every user does not always look at the same screen (non-WYSIWIS). However, each user often has to look at the same screen (WYSIWIS), for example, when one user directly advises the other how to search products, or when they want to share the search result.

It is important to support the cooperation taking account of the following user states (Figure 5).

**Independent state** In this state, users retrieve preferred products by themselves. In this state the screen is not shared among users. Therefore the user can concentrate on the products retrieval without being disturbed by other users.

**Observing state** In this state, the system should provide a WYSIWIS environment where a user can only observe other user's window, but cannot issue commands for the window. A user move to this state when he/she wants to observe the view of the partner, or when the partner calls him/her to show retrieved products.



**Figure 5. User's state transition**

**Cooperating state** In this state, the system should provide a WYSIWIS environment where each user can issue commands for other user's window, such as retrieval commands, rearrangement of products to check coordination, etc. Users can communicate most smoothly in this third state.

A user's state may be changed by other user's request as well as the user's own intention.

This state transition model can be extended to include salespersons. The relationship between users and a salesperson is asymmetric. For example, a buyer can change a salesperson's state from "independent state" to "cooperating state" to ask the salesperson to give information on retrieved products, while a salesperson must not force the buyer to change his/her state.

## 4. User interface

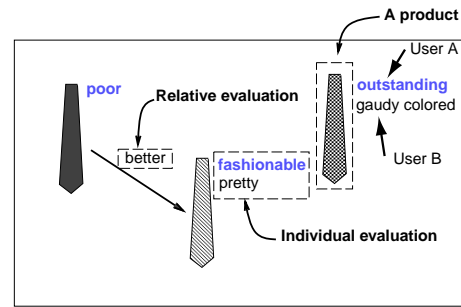
### 4.1. Shared discussion space

When users cooperate with other users on their shopping, some mechanisms for sharing candidate products are required. We propose a space for sharing candidate products. Here, we describe the user interface taking the case of neckties.

With this user interface we provide a shared discussion space, a component for searching neckties and a component for checking the coordination with suits and shirts.

The space is a two-dimensional space, and users can place the image icon of products from the retrieval result considering whether it matches suits and shirts. Image icons can be placed anywhere as users like (Figure 6).

In the shared space, two types of evaluation are supported: *independent evaluation* and *relative evaluation*. The former is displayed at the right side of an evaluated item. The latter is displayed near the arrow connecting two items. When evaluation words by multiple users are given to an item, they are displayed on different lines respectively



**Figure 6. An image of shared discussion space**

so that they are not piled up. Each evaluation has its own color according to the user who added it. A short glance will be enough to distinguish the evaluation of any other users.

On cooperative shopping it is very important to share not only the products themselves but also the intuitive evaluation of them. For example, advisers can recognize what kind of products they should find by referring to the intuitive evaluation provided by buyers.

In order to sharing intuitive evaluation, users grade the products with seven ranks before placing them on the shared space. It is reported that a seven point scale is enough to get the reliability of data[3]. This evaluation can be always modified whenever users want. In this way the adviser can be easily aware of what products the buyer wants.

### 4.2. Reuse of evaluation data

#### 4.2.1 Binding of product evaluation

Users' evaluation is also displayed on the chat screen. When referring to evaluation sentences of an item, it is hard for users to look for them out of many evaluation sentences with scrolling the chat screen. This problem is solved by binding evaluation sentences to a product ID.

On this user interface, users are required to specify products that they try to add evaluations to. Evaluation data are recorded with product IDs both in independent evaluation and relative evaluation. Therefore it is possible to bind evaluation data based on a certain product ID without analyzing the statements in the chat (Figure 7).

#### 4.2.2 Giving relations between products

A relative evaluation between two products is represented with an arrow connecting the two products with a relative evaluation word (i.e. an anchor) such as "better" or "more colorful". As the number of cooperative shopping experi-

### Chat log

```

user1>A is .....
user2>B is .....
user3>C is .....
user2>A is .....
user3>C is .....
user1>D is .....
user3>E is .....
user2>A is .....
user1>A is .....
user2>B is .....
user3>C is .....
user2>A is .....
user3>C is .....
user1>D is .....
user3>E is .....
user2>A is .....
user1>A is .....
user2>B is .....
user3>C is .....
user2>A is .....
user1>A is .....
user2>B is .....
user3>C is .....
user2>A is .....
user1>A is .....
user2>B is .....
user3>E is .....
user3>A is .....
    
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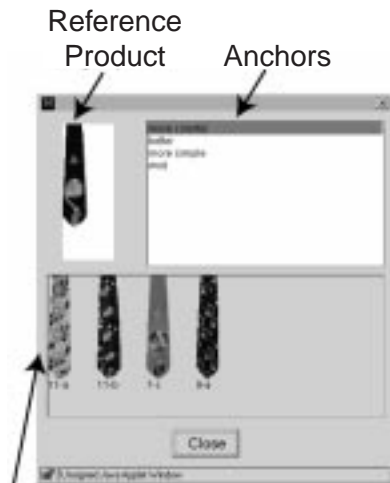
Filtering by product A

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a viewpoint of product A
user1>A is .....
user2>A is .....
user1>A is .....
user2>A is .....
user2>A is .....
user1>A is .....
user2>A is .....
user3>A is .....
    
```

**Figure 7. Binding of product evaluation**

ences increases, more relative evaluation data will be acquired and relations among products will get complicated.



**Figure 8. Reuse of relative evaluations**

Users can navigate in the linked products by following various anchors as they like (Figure 8). This means users can find another products that are evaluated higher (lower) than the original product.

### 4.3. Dynamic configuration of products in the space

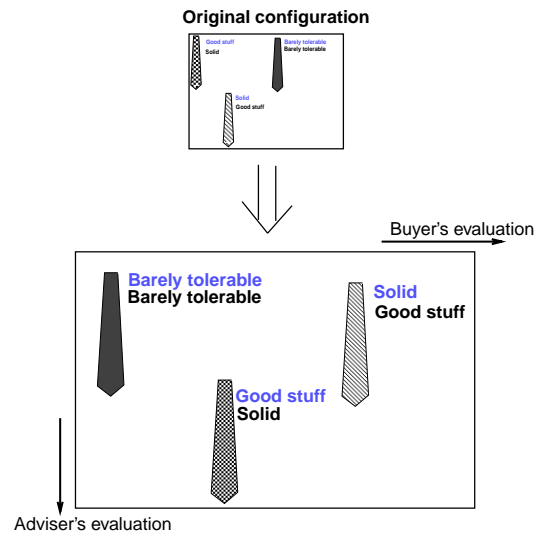
When buyers decide which item to buy with advisers, they consider several criteria such as,

- Each user’s evaluation (or a sum of them)
- How well the item coordinates with other clothes

- Amount of sales according to the generation, season, etc.
- Delivery

However, it is not possible for users to view products in the shopping cart from different viewpoints. The shared discussion space can help users decide which item to buy by dynamically changing the configuration of candidate products in the space by various criteria.

The shared space is a two-dimensional space and has two axes of coordinates. By assigning these two axes to particular criteria respectively, it is possible to visually classify candidate products.



**Figure 9. Configuration by each evaluation**

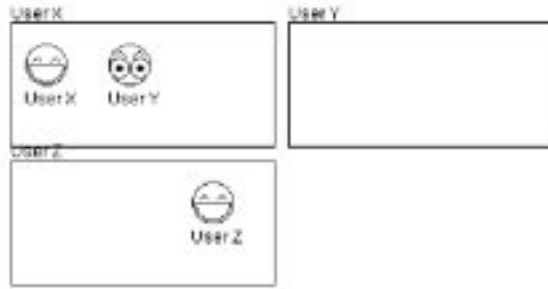
For example, Figure 9 shows the configuration where a buyer’s evaluation is assigned to the x-axis and an adviser’s evaluation is assigned to the y-axis. In this way, users can easily recognize agreements or disagreements between the two people.

### 4.4. Awareness

Awareness means understanding status of other users. It is very important for cooperative users to recognize status of them in order to cooperate smoothly. We support the awareness as follows.

A user’s state changes dynamically as described in section 3. It is necessary for a user to keep the state of his/her shopping activity to resume it whenever coming back to his/her individual environment.

Figure 10 shows a window for awareness information of users in cooperation. One environment (room) is assigned



**Figure 10. Awareness information of user states**

to one user and displayed as a user-specific colored rectangle. Each user is displayed as an image icon with specific expression according to the user's state.

User Z is in the independent state and can independently retrieve products and check the coordination with suits and shirts. User Y is in user X's environment and user Y's icon means the user's state is the observing one. Each user looks at the same screen. User Y has no rights to issue commands. User X can change user Y's rights into the same as user X, then each user's operations in the user interface are synchronized.

When a user moves into other user's environment, his/her state becomes the observing state and is restricted to only observing the partner's screen. In an environment who has the strongest right is the owner of it. The owner can change the state of users in his/her environment.

## 5. Implementation



**Figure 11. Implementation of this system**

We have developed a cooperative shopping system taking the case of the neckties provided by Nishijin Textile

Industrial Association[4]. The system has been developed with JDK1.1, and it works on any Web browser supporting JDK1.1. The system adopts three layer client-server architecture: Sybase SQL Anywhere is used as a database for managing data of neckties, users, and evaluation, and Symantec dbANYWHERE Server is used as a middleware server between the server and the database.

Figure 11 shows the screen of the cooperative shopping system. At the client side, the following components for shopping are provided except the shared discussion space.

- Retrieval by keywords (price, color, brand)
- Checking the coordination with suits/shirts
- Providing detailed information about neckties

## 6. Conclusion

In this paper we have proposed an environment for customers of on-line apparel markets, which offers a shared discussion space for products comparison and cooperation among buyers, advisers, and salespersons. It can give many different viewpoints to examine the candidate products to buy.

In this environment, people have two modes of shopping activities, the independent modes to select items by themselves, and the cooperative mode to communicate with each other. Users can change these modes dynamically. Buyers and advisers can also get help from salespersons if they need.

With this cooperative environment, the difficulty in discussing products with personal advisers and shop assistants, which has been prevented apparel products from the on-line markets, would be removed.

In future, we need experiments on this system to analyze users' behavior at shopping and the effect of cooperation.

## References

- [1] M. Kobayashi, et al.: Collaborative Customer Services Using Synchronous Web Browser Sharing, *Proc. CSCW'98*, ACM, pp.99-108 (1998)
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- [3] R. Rosenthal and R. Rosnow, *Essentials of Behavioral Research: Methods and Data and Analysis*, McGraw Hill, second edition (1991)
- [4] Nishijin Textile Industrial Association, <http://www.nishijin.or.jp>