S-Conart: Concept Articulator for Shoppers

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Abstract

This study considered the information presentation method to help the customers make a concept-articulation type of purchase. When customers follow the concept-articulation type of thinking, they only have vague requirements, and try to make a gradual clarification of what they want through the interaction with salesclerks and so forth. We constructed a system called S-Conart (Concept Articulator for Shoppers) to support the concept-articulation type of purchase based on the observations from an analysis of human behavior in actual purchase activities. The user study conducted using S-Conart suggests that changing the contents and/or the method of presenting information can bring a change to the human mental world, which is also observed when sales-clerk appropriately reacts to the customer in a real-life shopping situation, although in a different form. The result of this user study suggests the possibility of a chance discovery by the customers themselves, which is expected to be useful for building the support system for concept-articulation type of shoppers.

Introduction

Purchasing is a very everyday act, which everyone experiences in his/her daily life. Although each purchasing is merely a little decision-making, it provides us with serious mental activities of great interest. Purchasing is usually assumed to be buying what we want. However, as Underhill pointed out in his book (Underhill 1999), our wants are often not determined until we actually shop around.

When observing human behavior in the actual purchase activities, the underlying mental process may be roughly categorized into the following two types: *problem-solving* and *concept-articulation*. When customers follow the problem-solving type of mental process, they have a clear image and functional requirements on desired products, and perform problem-solving where they look for the products which meet their requirements. When they follow the concept-articulation type, on the other hand, they only have vague requirements about their needs, and try to make a gradual clarification and/or refinement of their requirements through the interaction with salesclerks and so forth.

Most of existing online shopping sites assume that customers' requirements have been already determined (Pu and Faltings 2000). That is, they only target the problem-solving type of purchase. This study aims at developing online shopping systems, which can help the customers make a concept-articulation type of purchase. Specifically, its purpose is to establish information presentation methods to effectively support the customer's concept articulation process, and to build the design methodology for Human-Computer Interaction (HCI) to realize them.

This study started with observing human behavior in the actual purchase activities. Then, the protocol analysis of actual conversation between the customer and salesclerk revealed that appropriate information given by the clerk in a timely manner often causes the customer's focus to be changed, which in turn lead to the change of their search goal itself in their decision-making process when shopping. It was also found that such interaction is effective in decision-making for the concept-articulation type of purchase.

Based on these knowledge acquired from the analysis of human behavior in the actual purchase activities, we have built a system, called S-Conart (CONcept ARTiculator for Shoppers), to support the concept-articulation type of purchase. The authors are developing a system, which puts special emphasis on the appropriate information presentation to support the customer's concept articulation instead of replacing human communication with HCI as it is. This paper describes the system overview of S-Conart, and presents the result of the user study conducted with S-Conart. Through this user study, the authors argue that changing the content and/or presentation method of information provided by the system can bring an equivalent change to the human mental world, although it is in the different form from the human interaction.

Our study shows that creative thinking process is

observed in everyday behavior as well as in professional creative activities. Although such “creativity in real life” is a small one compared to those in scientific inventions or discoveries, it is more frequent because of its everyday nature. If you are good at exerting small creativity, or helping others small creativity, you can gain an advantage in business. For example, a competent salesclerk can help her customers to articulate their concept, which leads to good sales performance. In this sense, creativity in real life, or concept articulation, is a kind of *chance discovery*. Therefore, in this paper, we define chance discovery as: to promote shifting the context towards articulation of the customer's concept of what he/she wants. In the example from real life shopping behavior, the salesclerk plays a primary role in chance discovery. The online shopping experiment with S-Conart suggests the potential that the customer can discover a chance by him/herself.

Interaction Patterns in Actual Purchase Activities

This study first made an examination of human behavior in the actual purchase activities (Shoji and Hori 2001a). Specifically, protocol data for customers' behavior in actual apparel shops were collected to be used as a clue to the decision-making process of customers. The authors recruited sixteen subjects for the data collection and had them carry a tape-recorded when they go shopping to record the conversation with salesclerks in the shops. Among 107 pieces of purchasing protocol data collected, 51 cases were analysed excluding remaining 56 cases because of difficulties in data analysis from inaudibility of voices recorded, use of demonstrative words such as “this” and “that”, and so forth.

Two Types of Purchasing

A detailed observation of actual purchase activities has shown that purchasing can be roughly divided into a problem-solving type and a concept-articulation type.

Purchasing as problem solving: With purchasing as problem solving, the customer initially has a clear idea of what desired product is like and/or what functionality it requires, and searches for the items which meet his/her requirements. That is, purchasing as problem solving means that the customer has previously determined what to buy. The customer who follows purchasing as problem solving searches for the products meeting his/her requirements to discover solution candidates, balances between them (if there are more than one), evaluates them, and then decides whether to buy them.

Purchasing as concept articulation: With purchasing as concept articulation, on the other hand, the customer initially is unclear about his/her requirements and gradually builds up a concrete image of target products through the interaction with a salesclerk. That is, purchasing as concept articulation means that the customer determines what to buy after due consideration in the shop. Customers who follow purchasing as concept articulation start with vague requirements of their own, become aware of their underlying requirements with a trigger of some information provided while looking around various products, understand what their true requirements are, convince themselves of the conformance of some of the products to the requirements, and then make a decision on whether to buy those products. They don't conceive their true requirements until they actually look at products.

The actual purchase activities use either problem-solving or concept-articulation types according to circumstances. Also, it is sometimes observed that both of them are mixed in each purchasing. The purpose of this study is to propose a framework, which effectively facilitates this type of purchasing whether actual or virtual (i.e., online shopping).

Role of Communication

This study considers the information presentation to effectively support purchasing as concept articulation, which provides gradual clarification of the customer's requirements of initial vagueness, and aims to apply it to online shopping systems. In order to serve as a reference to this human-computer interaction design, the authors have observed the communication between the customer and salesclerk in actual purchase activities, and investigated the change in the customer's mental world caused by the communication with the salesclerk.

The analysis showed salesclerks' interaction patterns could be classified into two types, that is, *expected reaction* and *unexpected reaction*.

Expected reaction: In a regular purchasing, a customer reaches more satisfactory solution or product, through the conversation with a salesclerk. In such a situation, the salesclerk provides the customer with another solution or product that better fits his/her requirements. Salesclerk's role is considered to be presenting the solutions (products) to meet the customer's requirements. The reaction to fill this role is called expected reaction. This kind of reactions from the salesclerk confirms the customer’s requirements or thinking, and present candidates that better fits the requirements. It is often useful for purchasing as problem solving.

Unexpected reaction: On the other hand, the authors observed reactions that promoted customers’ decision-making by saying opinions that provided customers with a different viewpoint. The reaction which presents information from a different viewpoint than the customer's current thought is called unexpected reaction. This kind of reactions from a salesclerk are unexpected, in the sense that it divert from the usual reaction, which present

solutions that better fit the requirements of customers. It is often useful for purchasing as concept articulation. This is because a new viewpoint presented by unexpected reaction in a timely manner causes the search goal itself to change to be more suited for the customer's potential requirements, and allows the customer to have a clearer image of his/her own requirements.

Which of expected and unexpected reactions is an appropriate interaction depends on the current context. Our analysis also shows that capable salesclerks can successfully grasp values and potential wishes of customers to use an appropriate interaction pattern for the occasion, whereas less capable salesclerks tend to adopt an inappropriate pattern. In other words, skillful salesclerks can communicate with their customers appropriately to *discover a chance* of the customers' concept articulation, which often leads to a successful sale.

Typical examples are shown below. Among different purchasing cases of different subjects, five cases happened to have the same situation where they mind that the jacket under consideration is short. Below is an example of unsuccessful conversation, which didn't lead to the purchase. The salesclerk's reaction in this case was an expected one.

[Customer] I want a little longer one. This (candidate A) is a bit too short. I want to hide as much of my waist as possible.
[Salesclerk] (After considering for a while) If so, how about this one (candidate B)? This is tucked in the waist and designed to have a long hem.
[Customer] Well, let me see... I'm afraid this is not my taste.

Shown next is an example of successful conversation which led to the purchase. The salesclerk's reaction in this case was unexpected one.

[Customer] This (candidate B) is a little short, isn't it?
[Salesclerk] Such a design is popular this year. Almost every shop deals with short ones. Do you prefer longer one?
[Customer] Too short to cover my waist...
[Salesclerk] It depends on the balance with your skirt or pants. 'cause you're now wearing shorter tight skirt, you think that way, but if wearing a long skirt, you will feel better.

In the former case where the conversation didn't lead to the purchase, the salesclerk responded straightforward to the customer who was reluctant about the short jacket by presenting a longer one, whereas in the latter case where the conversation led to the purchase, the customer's mental world was changed from one where the relevant attribute was *length of jacket* to another where different attribute called *balance* was relevant. Through the conversation, the capable salesclerk shown in the latter case could grasp the customer's wish that she make herself look as good-shaped as possible, and induce the appropriate goal (short but well-balanced jacket) in accordance with it.

Trigger Information for Concept Articulation

The unexpected reaction is often useful for purchasing as concept articulation. How the interaction changes customer's mental world for unexpected reactions is summarized as follows: In case of the unexpected reaction (as shown above), a new focus (*balance*) presented by the salesclerk triggers the customer's mental leap, and her goal changes accordingly from *long jacket* to *short but well-balanced jacket*, resulting in the change of her evaluation of the current target item (candidate A) to promote her decision-making.

The unexpected reaction is useful as a trigger to the concept articulation, meaning that it is useful for helping the customer in purchasing as concept articulation. There are two main features useful for facilitating the concept articulation, as follows:

Support for conception: The unexpected reaction sometimes causes the change of the customer's viewpoint, which in turn triggers the change of the search goal itself, resulting in the promotion of his/her decision-making. Skillful salesclerks can use the unexpected reaction appropriately to facilitate the customer's conception.
Support for conviction: The customer who has become aware of a new viewpoint needs conviction in order to accept the viewpoint smoothly. Skillful salesclerks can facilitate the customer's conviction through their good demonstration of concrete use scenes and/or usage of possible products, and others.

Approach to S-Conart

Based on the observations from an analysis of human behavior in actual purchase activities, the authors have built a system called S-Conart (CONcept ARTiculator for Shoppers) which facilitates purchasing as concept articulation.

Capable salesclerks combine various knowledge, appropriately using meta-level strategic knowledge to provide suitable information for the context. Can the human-computer interaction be expected to have such richness of the human interaction? An approach immediately thought of is to build capable software agents equivalent to capable salesclerks. However, it is yet to be solved well what strategic knowledge capable salesclerks have and how they make use of it.

As such, the authors take a different approach to the design interaction. That is, we are developing a system which puts special emphasis on the appropriate information presentation for facilitating the customer's concept articulation instead of replacing human

Figure 1: Spatial-arrangement style interface of S-Conart.

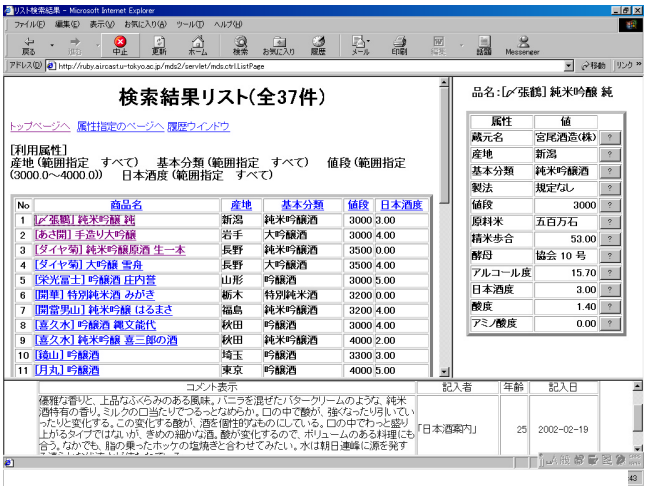

Figure 2: Listing style interface of S-Conart.

communication with HCI as it is. This approach is based on the idea that changing a representation system for information presentation by computer to human being has the same effect (in a sense that user's mental world is changed) as that for applying different strategic knowledge to control the interaction.

In order to consider what system providing what information should be implemented with this approach, it is necessary to organize what kind of information presentation is useful in changing customer's mental world in the human interaction. An examination of information provided by salesclerks indicates that the following two types of information are useful for helping customers in their purchasing as concept articulation with the unexpected reaction:

- Well-arranged relevant information that prompts the user to conceive a new viewpoint.
- Information that allows the user to accept the new viewpoint smoothly.

As previously mentioned, the analysis of human behavior in actual purchase activities has shown that the support for conception and conviction are both important to help the customer in purchasing as concept articulation. Capable salesclerks can use meta-level strategic knowledge to combine these two types of information appropriately for use. These kinds of information presentation can also be realized well with computer support. S-Conart attempts to achieve these two types of support using the following approach.

Support for conception with spatial-arrangement style of information presentation: The findings from the study of creativity support suggest that the spatial-arrangement style of information presentation is useful for facilitating the customer's conception (Hori 1997; Sugimoto, Hori, and Ohsuga 1994). Therefore, S-Conart implements the support for the customer's conception using spatial-arrangement style of information presentation based on the Multi-Dimensional Scaling Method (Figure 1).

Support for conviction using scene information: The information on image and/or use scenes of products (herein called scene information) has proven to be effective in the concept articulation process (Ishino, Hori, and Nakasuka 2000). Therefore, S-Conart implements the two functions shown below, presenting scene information suited for the user's current thought to facilitate his/her concept articulation. (1) Facilitates the user's conviction by allowing for browsing the comments which contain scene information on the products (Figure 1, Figure 2). (2) Facilitates the user's concept articulation with both graph and tree styles of presentation of words extracted from the comments on all the products (Figure 3).

System Overview of S-Conart

S-Conart is implemented as a Web application and consists of product information database, spatial-arrangement and listing representation subsystems, words presentation subsystem, and so forth. This system only deals with Japanese sake (rice wine) as product items. The product information database uses PostgreSQL as an underlying DBMS, and stores sake data with 12 attributes and of 193 kinds as product data. Each subsystem is implemented with servlets and Java Server Pages (JSPs). In addition to them, the spatial-arrangement representation and phrase presentation subsystems also include an engine for calculating coordinates of product items or words as well as an applet for the spatial-arrangement style of presentation in the Web browser. Major features of S-Conart system are as follows:

Displaying products in spatial-arrangement style: Allows the user to select desired attributes of products

in the database, and displays products in spatial-arrangement representation based on the selected attributes (Figure 1). Clicking on a product node in the space causes the detailed information on the product to be displayed. It also includes a function to display products matching specified conditions in a different color from that for other products. This feature is designed to arrange product items on the two-dimensional space to indirectly present the relationship between them. The authors expect that this spatial-arrangement style of information presentation can prompt the user's mental process to change their mental world, and consequently help them in their purchasing as concept articulation.

Displaying products in listing style of presentation: Allows the user to select desired attributes of products in the database and their value ranges, and displays the products matching these conditions in listing representation (Figure 2). Clicking on a product name in the list causes the detailed information on the product to be displayed. This feature is designed primarily to make a comparative experiment with the spatial-arrangement presentation.

Entering and viewing comments: Allows the user to enter and browse their comments freely for each product item. This feature is designed primarily to collect the materials to be used for spatial presentation of words. The authors expect that browsing others' comments on the products can affect the user's mental process. Comments, in a sense, can be information which provides different viewpoints directly. However, it differs from salesclerk's reaction in actual purchase activities in that the user will need to make a conscious browse.

Displaying words window in spatial presentation: Displays a network of words based on co-occurrence between words extracted from collected comments (Figure 3). Both graph and tree views are available on the screen.

- **Graph view:** Graphs the global structure of words extracted from comments. It arranges the words in a two-dimensional space and draws each link between words as a line whose width is determined by co-occurrence between them.
- **Tree view:** Represents as a tree a local structure around a word in the graph view. Allows the user to trace links from a selected word to other related words sequentially.

The Graph view and Tree view are designed to provide appropriate scene information for the current user's mental process to help the user try the context expansion and therefore concept articulation. Because the tree view in particular allows the user to trace the tree to expand the desired context, unexpected relations may also be found quickly. The authors think that the language controls major portion of the human mental activity and therefore plays an important role in articulating an image as a scene information.

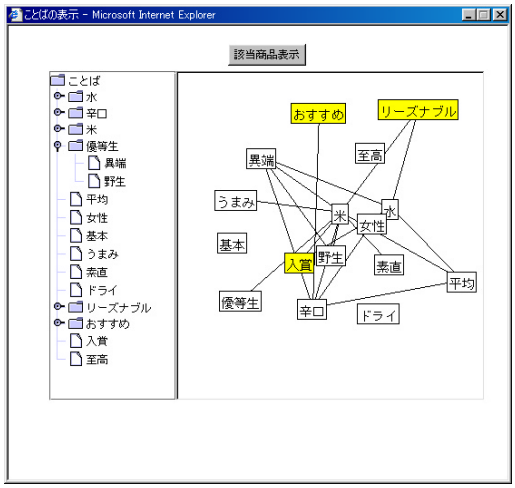

Figure 3: Displaying scene information window in spatial presentation.

Purchasing Experiment with S-Conart

The authors first conducted an experiment to examine the effect of spatial-arrangement style of information presentation. This section describes the content and result of the experiment. The effect of verbal presentation of scene information is currently under consideration, and will be reported as soon as it is concluded in the future.

Experiment Overview

A comparative experiment on eight subjects with a product selection assignment was conducted to examine the difference in human cognitive process between when using spatial-arrangement style interface to indirectly present the relationship between the product items and when using listing style interface to present the product items in the list (Shoji and Hori 2001b).

The subjects were given a document describing the content of the experiment and assignment and then performed their experiment following the given procedure. Two kinds of assignments were prepared, and each subject did one assignment using listing style interface and the other using spatial-arrangement style interface. What was happening during doing assignments was shot with a video camera. When the subjects have an interview regarding their assignments, watching this video and their operation history stored in the system, they were asked for preferably detailed explanation about why they performed each operation and what they had in their mind at that time. What they said was recorded and used for the protocol analysis.

Interaction Patterns in Online Purchasing

The findings from the protocol analysis are summarized as follows: The user trying to select desired product items

usually first make a plan for what items should be selected in what policy. When the requirements are clear, a clear plan will be easily determined, however, in many cases the plan will be revised in trial and error basis through the interaction with the system. When a clear plan cannot be made, a tentative plan will be made and used for the search, then revised based on the search result. Therefore, the user's decision-making process as a whole often repeats a cycle consisting of planning, action, evaluation, determination, reconsideration, and so forth to gradually approach more satisfactory candidate (product item). A number of problem-solving type of purchase processes realized by the iteration of *expected reactions* and their corresponding revision requests were observed in human behavior in the actual purchase activities. It is interesting that similar characteristics were also found in our online shopping experiment.

On the other hand, the phenomena similar to the concept-articulation type of purchase realized by *unexpected reactions* observed in the human behavior in the actual purchase activities were also observed in the decision-making process analyzed from the experiment result. For example, in the experiment conducted by one of subjects using spatial-arrangement style interface, he/she originally tried to make a search with a goal of “Ginjo-shu” from northern regions at a reasonable price". He/she used the focusing functionality to balance matching product data with each other. If it were an expected reaction, this balancing would result in narrowing down candidates or relaxing conditions. According to this subject's remarks, however, while looking at items colored orange in the focused view, an item (colored blue) not corresponding to the current view caught his/her attention. Clicking it to view the data, the product turned out to be “Junmai-shu”, which he/she became inclined toward, and then, he/she chose to try another focused view for Junmai-shu. That is, something that caught the subject’s attention affected his/her mental process to cause the plan to be changed. And, an examination of protocol data for all the eight subjects revealed that this kind of plan change triggered by *another item catching the subject's attention* occurred frequently only when using spatial-arrangement style interface. The detailed analysis of this result is given in our paper appeared in *Strategic Knowledge and Concept Formation III* in 2001 (Shoji, and Hori 2001b).

Toward Facilitating Concept Articulation as Chance Discovery

The result of the user study verifies that spatial-arrangement style of information presentation is useful as a trigger to change the user's mental world. Further, this result suggests that changing the content and/or presentation method of information provided by the system can bring an equivalent change to the human mental world, although it is in the different form from the human interaction.

The mental leap caused by “something that happens to catch our eyes” may seems to be an accidental phenomenon. However, it does not always occur by chance. Everything which comes to our eyes is not visible, that is, none of the things are truly visible until the customer's underlying consciousness is activated. It is similar to the fact that the customer's mental leap does not occur without appropriate information provided by salesclerks in a timely manner even when they make an unexpected reaction to their customer in the actual purchase scenes. This unexpected reaction is a chance discovery by the salesclerks (that is, to find an opportunity for selling), whereas the effect of “something which happens to catch our eyes” in the spatial-arrangement style interface suggests the possibility of a *chance discovery by the customers themselves*, which is expected to be useful for building the support system for concept-formation type of shoppers.

The authors think that in the future we need to make further more detailed analysis of what characteristics of the spatial representation caused the user's mental world to be changed in what way. Making various devices to the listing representation as well as the spatial representation is expected to cause the user's mental world to be effectively changed. This point also needs to be examined. As to how changing the information representation can change human mental world, not enough analysis has been made. Knowledge about this problem is being gradually accumulated from the studies by various researchers including us. The goal of our study is not to build the current S-Conart system but to use it examine human mental process and continue to make improvements to the system that reflect the result from the examination. We ourselves would like to explore the interaction design desirable in terms of concept articulation through iteration.

Conclusion

This study has considered the information presentation method to help the customers make a concept-articulation type of purchase when they only have a vague image of what they want, and created S-Conart as one of its enabling systems.

We started with observing human behavior in the actual purchase activities and found that appropriate information given by the salesclerk in a timely manner often causes the customer's focus to be changed, which in turn leads to the change of their search goal itself. The observation showed that this kind of interaction proved to be effective in decision-making for the concept-articulation type of purchase.

Then, we built a system called S-Conart to support the concept-articulation type of purchase based on these knowledge acquired from the analysis of human behavior in the actual purchase activities. This paper described the system configuration and interaction design of S-Conart, and introduced the result of the user study conducted using S-Conart. The result of the user study verifies that spatial-arrangement style of information presentation is useful as a trigger to change the user's mental world.

Further, this result suggests that changing the content and/or presentation method of information provided by the system can bring an equivalent change to the human mental world, although it is in the different form from the human interaction. The result of this user study suggests the possibility of a chance discovery by the customers themselves, which is expected to be useful for building the support system for concept-articulation type of shoppers.

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