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A CASE STUDY OF REPRESENTATIONAL ACTIVITY AT A CUSTOMER-CENTERED BUSINESS

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Abstract

It is not clear what kinds of content—information and interactive mechanisms—businesses should put into their online sites. The content of existing online businesses is driven by metaphors of the Web as either “online catalog” or “electronic paper.” Such content clearly underutilizes the interactive capabilities of online technologies. In this paper, it is argued that *successful businesses have evolved “offline” practices* that can beneficially be translated online. The paper shows how such practices can be uncovered by observing *business representational activity* and coding these observations in terms of the movement of information across media, enabling the systematic exploration of the space of potential interactive mechanisms. Specifically, *a method for analyzing business representational activity* is introduced. The method is demonstrated on a successful small business that at first might not appear to benefit from online content beyond that provided by the catalog metaphor. However, the analysis reveals several interactive mechanisms, including a *product expert* that personalizes a combination of products based on customer-specified problems and a *mechanism that automatically calculates product consumption rates*, sending customers e-mail reminders to repurchase near the end of a product’s life span.

Keywords: Information technology, observational methods, distributed cognition.

1. INTRODUCTION

The growing number of online consumers suggests that businesses should focus their efforts on developing online mechanisms that improve business/customer interactions. Businesses, however, do not seem to understand how to exploit fully the interactive capabilities of online technologies.¹ For example, in a survey conducted for this research of a large Web shopping mall, 88% of the businesses used the Web for advertising or eliciting e-mail feedback on products (see Figure 1). Although highly interactive online businesses do exist, they are the exception rather than the rule. The predominant metaphors driving online content today are that of the Web as “electronic paper” and “online catalog.” Such metaphors clearly underutilize the interactive capabilities of online technologies. A mail-order catalog is a passive tool with a detached and delayed link between a customer and a business, whereas online technologies are capable of providing customers dynamic content and more immediate links with businesses.

¹The term *online technology* is used in this paper to denote the set of networking technologies available to businesses, such as web servers, browsers, e-mail, ftp, chat rooms, and collaboration tools.

Unfortunately, for businesses that want to use online technologies in new ways, strategies for how to exploit the interactive capabilities of online technologies are woefully underdeveloped.

The strategy advocated by this paper is based on the fact that *reality is a far more complex multimedia environment than the best web site*. Thus, if businesses want to discover innovative ways of using online technologies to service customers, they should focus on their “offline,” real-world customer service activities, rather than those that currently exist in other “cyber” businesses. Successful businesses already have good customer-service activities in place; these mechanisms may be suitable for online implementation. At issue is how to characterize a business’s existing offline customer service activities in a manner that facilitates translation of these activities to an online environment. The approach used here is first to analyze a business’s representational activities and then to put online those activities that have a beneficial effect for the business.

To illustrate this approach, a case study is presented of how a small business interacts with its customers. Since the survival of small businesses typically depends on the high quality of their customer service, they provide a good context for studying customer service activities. The particular business studied—a local hair salon called Hair Crafters²—provides an interesting case for studying business/customer interactions because it is simultaneously a service provider (cutting hair) and a goods provider (manufacturing its own line of hair care products). Based on the physical nature of its goods and services, at first it does not appear that Hair Crafters has any useful business/customer activities that can be translated online. However, through detailed analysis of the representational activity³ surrounding a customer as he or she interacts with employees and other resources in the business, the case study shows that there are representations and representational activities that can be beneficially placed online.

The paper begins by outlining the theoretical framework underlying the approach to studying representational activities in businesses. The case study is then organized around the steps a researcher would take to follow this approach. Each step is a separate section in which the description and rationale behind the step are given. The analysis of Hair Crafters revealed several interactive mechanisms not suggested by current Web metaphors, including a *product expert* that personalizes a combination of products based on customer-specified problems and a *mechanism that automatically calculates product consumption rates*, sending customers e-mail reminders to repurchase a product near the end of its life span.

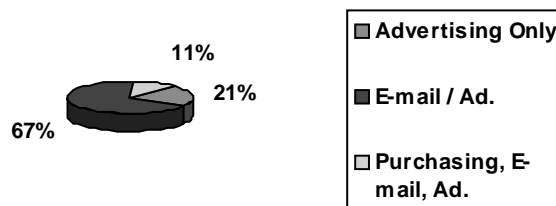


Figure 1. Distribution of Interactive Capabilities at an Online Shopping Mall
(Survey conducted December, 1996). Data represent responses from 70 businesses.

²Fictitious name.

³Defined, for now, as any work in which individuals/groups store, process, or distribute information.

2. THEORETICAL FRAMEWORK

The approach to studying business representational activity used in this paper is based on the theoretical framework of distributed cognition (Hutchins 1995). Under this framework, a business is viewed as a large-scale intelligent system. Like any intelligent system, the business is constantly storing, manipulating, and propagating representations during the course of its operations. However, unlike a person's representations, which are hidden, many of the key representations and representational activities of a business are *observable*. Memos, employee instruction manuals, talk, post-it notes, and information on computer screens are all examples of observable representations. The distributed cognition framework defines a representation as consisting of two parts: *medium* and *representational state* ("state," for short). For example, a chalkboard is a medium, and chalk marks on the chalkboard constitute its state. Together, the chalkboard and chalk marks constitute a representation.

These definitions are extended in this paper to define *representational activity* as individual or group work that results in changes to the state of task-relevant media. *Business* representational activity is, therefore, representational activity within a business. Examples of business representational activity include an employee (individual) filling out (changing the state of) a purchase requisition form (a medium), or simply two people (group) talking (the medium is air).

Because *any* physical structure can qualify as a representation, distributed cognition researchers focus mainly on *task-relevant* representational activities, where a task-relevant representation is any representation whose state either appears in the final product or is part of the activities that construct the product. For example, if a researcher is studying "computer programmers writing sorting algorithms" and he or she observes a programmer copying a sorting algorithm off a page in a book, then that page is a task-relevant representation. A cooking recipe is a task-relevant representation that does not appear in the final product (the cooked food), but is used in activities that create the product.

Studying representational activity in businesses requires analyzing the movement of information (state) across the various actors (e.g., employers, managers, customers) and artifacts (e.g., paper, computers) in the business. Both actors and artifacts are kinds of *media* in the distributed cognition framework. The classic example of such an analysis is Hutchins' (1991) study of the representations used during large ship navigation (see Figure 2).

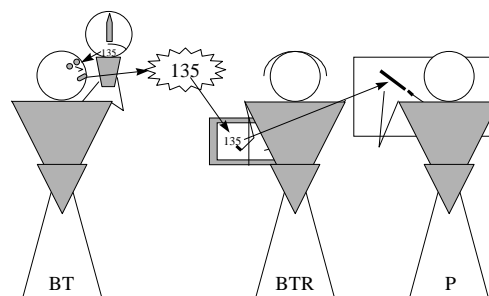


Figure 2. Movement of a Landmark Bearing Across Different Media

The bearing taker (BT) uses the alidade to get a landmark direction. This direction is verbally relayed to the bearing timer record (BTR) who writes the number into a log. The plotter (P) then takes this number and plots it on the map as a line.

The case research in this study follows a deductive approach, similar to that described by Lee (1989). Here, the researcher does not create a theory, but starts with an already existing theory; in this study, the theory is the distributed cognition framework (Hutchins 1995). When taking a deductive approach, a researcher uses the general categories, concepts, or constructs in an existing theory as a guide to collecting data. Just as Markus (1983) began with the frameworks of three theories and then sought data to populate the variables and constructs of those theories, this study proceeds similarly. Case studies that take an inductive approach build theories. Case studies that take a deductive approach tend either to test existing theory or to apply and illustrate existing theory. The case research presented in this paper applies an existing theoretical framework to the problem of discovering novel online content (content not suggested by metaphors of the Web as online paper or electronic catalog). The following section outlines the steps a distributed cognition researcher would take to study representational activity in a business. For ease of exposition, both data and analysis are incorporated into the description of each method step.

3. STEP 1: COLLECT REPRESENTATIONS/FORM BUSINESS OVERVIEW

As a precursor to active observation, the researcher should collect as many static representations as possible. These include product advertisements, promotional flyers, customer forms, business plan, and employee manuals. The aim is to form an overview of the business’s goals and general operational activities prior to observation. The researcher can then use this overview to suggest likely situations to observe.

3.1 Business Overview

Hair Crafters is a chain of eight salons in Western Pennsylvania, the largest salon chain in that region. Each salon houses as many as 20 stylists who cut hair. In addition to haircuts, Hair Crafters manufactures its own hair and body care product line, consisting of 35 products, ranging from cleansing shampoos and conditioners to special effects and styling aids. The stylists attend a mandatory one-day training session to learn how to sell these products to customers.

3.2 The Typical Operation

Hair Crafter customers can make appointments ahead of time over the phone or in person. One of the employees—the receptionist—is assigned to the front desk and negotiates a time, place, and stylist for the customer. The customer (henceforth, C) arrives on the day of the appointment and checks in with the receptionist (R) at the reception desk. The following is an excerpt of the typical conversation that follows:

Customer	I have an 8:00 appointment with Paula.
Receptionist	(looks in appointment book) You’re (reads the name in the appointment book associated with Paula at 8:00) Fred?
Customer	Yes.
Receptionist	Okay, have a seat and she’ll call you when she’s ready.

As shown, after verifying the appointment, R tells C to wait until the stylist (S) is available and calls for C. Upon being called, C sits in a chair and discusses with S the kind of haircut he or she wants. After a short discussion, S takes C to the shampoo area and washes C’s hair. After shampooing, S returns C to the chair and the haircut is given. Once completed, S and C walk over to the reception desk and S asks if C would like to purchase any hair care products. C then pays for the haircut and any hair care products at the front desk. Afterward, S works with R to schedule a return visit for C. The movement of the customer through the various stations is depicted in Figure 3.

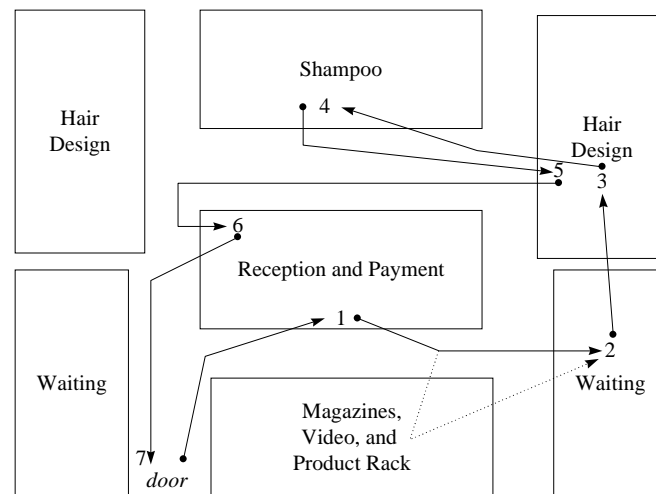


Figure 3. Layout of the Hair Crafters Salon Station

Numbered arrows represent the typical sequence of stations a customer moves through.

4. STEP 2: IDENTIFY PRODUCTS

Armed with a general understanding of Hair Crafters' operational activities, the research next determines what Hair Crafters' products are. The notion of a product can be operationalized as follows: a product is anything customers leave the business with that they did not enter with. This includes any knowledge customers acquire as a consequence of interacting with employees, tools, or other artifacts within the business. Repeated observations of what customers take away from the business will usually reveal all products except for the knowledge ones.

4.1 Product Analysis

Observing customers before and after they leave the salon suggests four products. In addition to having their *hair cut*, customers typically leave with a *reminder card* (see Figure 4) for a return visit. In addition, some customers leave with *hair care products*. Finally, if the customers pay by credit card they leave with a *receipt*. This paper will focus on analyzing the representational activities surrounding the first three products, as the last gets into online payment issues, which is already the subject of much existing research.

5. STEP 3: CHARACTERIZE PRODUCT REPRESENTATIONS AND REPRESENTATIONAL ACTIVITIES

Once the products are known, the researcher should characterize how the products are created, particularly the representations and representational activities that constitute or support the products. This characterization can be thought of as a kind of *business process analysis*. Information systems researchers typically define a business process as (Alter 1996; c.f., Davenport 1993; Harrington 1991): "A related group of steps or activities that use people, information, and other resources to create value for internal or external resources."

One problem with this definition is its vagueness. What constitutes a step? What are these other/internal/external resources? What is value? However, the definition's vagueness permits many different theoretical frameworks to



Figure 4. Hair Crafters Reminder Card—Front View

Stylist (e.g., Darby) writes down name, time of the appointment (e.g., 1:30) and day of appointment (e.g., Apr.20).

be used to study business processes. For a distributed cognition researcher, the terms “business process” and “business representational activity” are equivalent. The latter is a more specific description of what distributed cognition researchers focus on. Instead of studying the steps a business takes to create “value” and the movement of value across the business, this paper is interested in steps a business takes to create representations and the movement of these representations across the media (which includes people, information, and other resources) in the business. Value *assignment*, if done at all, comes after a characterization of the representational activity.

The descriptions that result from observations provide one form of process model. However, descriptive models typically do not make explicit how technology can be used to support or augment existing activities. The following section explores a complementary way of modeling representational activity that permits managers or designers to systematically explore the space of possible uses of online technologies. This model is then used to uncover novel online technologies.

5.1 Media Constellation Diagrams

Media constellation diagrams (Flor 1995) embody the distributed cognition maxim that computational work is accomplished by “propagating representational state across external media” (Hutchins 1990). Media are depicted as symbols with arrows between them. The arrow labels denote the content of the information that moves between the media (see Figure 5). When the medium itself is composed of multiple media (such as a person or computer), the base of the arrow is adorned with target medium (for a person, this medium is a sensory modality; for a computer, it can be a microphone or a keyboard).

The diagrams can be used to depict a snapshot of representational activity or a composite of representational activity. Note that these diagrams are not data flow diagrams. Data flow diagrams depict the movement of information between processes, not between media. However, data flow diagrams can be derived from media constellation diagrams; in a media constellation diagram, *collections of media and information movement constitute a process*. Media constellation diagrams provide a level of abstraction that makes explicit the information manager’s need to make decisions about what should be moved online, as well as the effort it will take to move those items online. As will be demonstrated, these diagrams allow researchers to better visualize relationships between representations (not processes, as in a data flow diagram), which is invaluable when building theories about representational activity or when trying to identify ways to use online technologies to substitute for or augment representational activities.

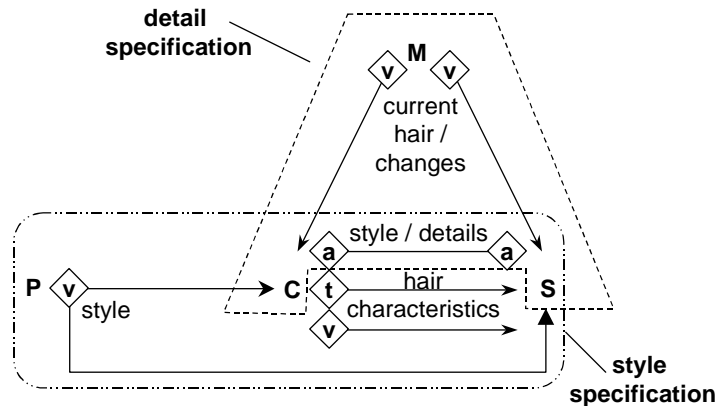


Figure 5. Media Constellation Diagram for the Haircut Specification Activity

This activity is divided into detail and style specification. The customer sees (v, visual system) a picture (P) of the style he or she likes, and tells (a, auditory system) the stylist about it or shows the stylist a picture. Stylist (S) and customer (C) discuss details in front of a mirror (M). The mirror provides a common context for discussing (a) style details. The stylist also uses the visual (v) and tactile (t) modalities to determine the customer's hair characteristics.

The following analyses are the result of eight observations, each at least two hours long, twice a week, conducted over the course of a month.

5.2 Haircut: Representations and Representational Activities

Although getting a haircut may be seen primarily as a physical activity, there is plenty of representational activity that might be translated online. For example, to get a haircut, customers needed to specify their desired style to their stylists. But specifying a hairstyle was not a mere matter of customers telling stylists how they wanted their haircut. First, how the customer described the style may not fit how the stylist would have described the style. To solve this problem, some customers were observed bringing magazines to the salon or using pictures out of magazines in the salon's waiting area to show the stylist how they wanted their hair cut. Second, the customer's desired hairstyle may not be appropriate for his or her *type* of hair, requiring both parties to negotiate a similar hairstyle that would be appropriate. As one stylist put it:

"Everybody's hair grows differently...not all styles will fit everyone's head, it depends on how the hair grows, how thick the hair is, cowlicks...everyone's hair is different...a style that looks good on one head can't work on someone else's."

Discussion between stylist and customer also occurred as a consequence of the ambiguous nature of the terms used to specify the style, as the following example illustrates:

- C** Take an inch or so off the front.
- S** (grabs a bunch of hair between the index and middle) This much?
- C** A little more.
- S** (slides fingers down the hair) How about this?
- C** Yeah, that's fine.

Discussion between customer and stylist did not only occur prior to the haircut. The customer and stylist were also observed having (haircut related) discussions during and after the haircut.

In all cases, a byproduct of the discussions was a shared understanding of the final product, i.e., the customer's desired hairstyle. The organization of artifacts in the salon played an important role in constructing this shared understanding. Discussion took place in the context of the customer in front of a mirror (see Figure 5). The mirror provided a common view of the customer's hair when discussing styles and hair lengths. As such, it was an important medium for constructing a shared understanding of the desired hairstyle.

In summary, a precondition to the haircut (the physical product) is a common understanding of the customer's desired hairstyle (a knowledge byproduct), as well as a common understanding of haircut details, such as length.

5.3 Hair Care Products: Representations and Representational Activities

All stations in the salon that the customer visits have the potential for priming the customer to buy Hair Crafters' products. Customers first see bottles of all Hair Crafters products on the rack, which is in plain view in the waiting area. Additional product information can be found in pamphlets scattered on the waiting area benches or stacked on the reception desk. The physical organization of products and product information around the salon provide a passive opportunity for the customer to acquire information about products. Additionally, the business takes an even more active role in trying to get customers to buy products, defining situations where the stylist can educate the customer about Hair Crafters' products and specifying a script for selling products. The stylists learn about these sales skills during their mandatory all-day training session.

The stylist's educational activities are designed to provide customers an understanding of (1) which products are suitable for the customer's hair type, (2) the proper application of these products, and (3) the benefits of the products. Hopefully, the customer will then be primed to purchase the products. The opportunity for stylists to use their training arises at every stage of the customer's visit. For example, during hair washing, as the stylists apply shampoo or conditioner, they are supposed to explain why they are using that particular product and how the product is suited for the customer's hair. The stylists are trained to sell a complete set of hair care products, not just a single shampoo or conditioner. The customer's knowledge of the hair care products is an important *representational byproduct* of these educational activities.

Unfortunately in practice, stylists rarely educated customers about the products being used. In fact, Hair Crafters' marketing manager told us that she would have liked stylists to sell more hair care products. It was only during *checkout* that stylists asked their customers if the latter wanted to buy any products. Four stylists were asked why they did not educate customers about products. All referred to this activity as "pushing products" and felt uncomfortable doing so. As one stylist put it:

"I don't feel comfortable pushing products on my customers. If they want to buy something, they'll just tell me."

Their reluctance can be explained as a conflict between two goals: the institutional goal of selling products and the individual goal of retaining clients. By pushing products, stylists run the risk of angering and losing customers.

In summary, to accomplish the goal of selling products, the salon has evolved a spatial organization of products and product information, along with a set of institutionalized practices for educating the customer about the benefits of Hair Crafters' products. The knowledge that customers acquire during these educational situations, concerning which products match their particular hair type and hair problems, is an important representational byproduct.

5.4 The Reminder Card: Representations and Representational Activities

The final activity is to schedule a return visit for the customer; in cognitive terms, the business constructs an external memory for the customer. The structure that serves as this memory is the reminder card (see Figure 4). The receptionist or stylist triggers the construction of the reminder card by asking the customer

“Do you want to schedule your next appointment now?”

If the customer says “yes,” the reminder card serves as a reminder of the date, the time of the appointment, and the name of the stylist. The information on the reminder card results from the following activities: S firsts asks C when he or she would like the next haircut. C either asks S for an opinion or C gives an answer, typically in terms of weeks. R then looks at the appointment book and gives a list of dates and times that S is free for that week. C gives a day, and then R provides a description of the times that are available. C picks a time and R pencils that time into the appointment book along with the C’s phone number and the service C will receive (see Figure 6). Simultaneously, S writes down the date, time and S’s name on the front of the card (see Figure 4). On the back of the card, S circles the day of the return visit, the name of the salon, and the salon’s phone number (see Figure 7). The card is then given to C (see Figure 8).

<i>April 10, 1996</i>							
<i>Paula</i>		<i>Darcy</i>		<i>Zoe</i>		<i>Dave</i>	
<i>08:00</i>	Fred 555- 1234 haircut	<i>08:00</i>	X	<i>08:00</i>	X	<i>08:00</i>	
<i>09:00</i>	X	<i>09:00</i>	X	<i>09:00</i>	X	<i>09:00</i>	
<i>10:00</i>	X	<i>10:00</i>	George	<i>10:00</i>		<i>10:00</i>	Homer
<i>11:00</i>	Wilma	<i>11:00</i>	Elroy	<i>11:00</i>		<i>11:00</i>	Maggie
<i>12:00</i>	X	<i>12:00</i>	Judy	<i>12:00</i>	Ward	<i>12:00</i>	Marge
<i>13:00</i>	X	<i>13:00</i>	Jane	<i>13:00</i>		<i>13:00</i>	
<i>14:00</i>		<i>14:00</i>	X	<i>14:00</i>		<i>14:00</i>	Lisa
<i>15:00</i>	Barney	<i>15:00</i>		<i>15:00</i>	Beaver	<i>15:00</i>	
<i>16:00</i>	X	<i>16:00</i>		<i>16:00</i>	Wally	<i>16:00</i>	Bart
<i>17:00</i>	Betty	<i>17:00</i>		<i>17:00</i>		<i>17:00</i>	
<i>18:00</i>	X	<i>18:00</i>		<i>18:00</i>	June	<i>18:00</i>	
<i>19:00</i>		<i>19:00</i>		<i>19:00</i>		<i>19:00</i>	
<i>20:00</i>		<i>20:00</i>		<i>20:00</i>		<i>20:00</i>	

Figure 6. Graphical Representation of the Appointment Book

A hair cutting session is denoted by the name of a customer followed by X’s blocking out the time needed to cut the hair. Free slots are indicated by open spaces. Also included are the customer’s phone number and the type of service.

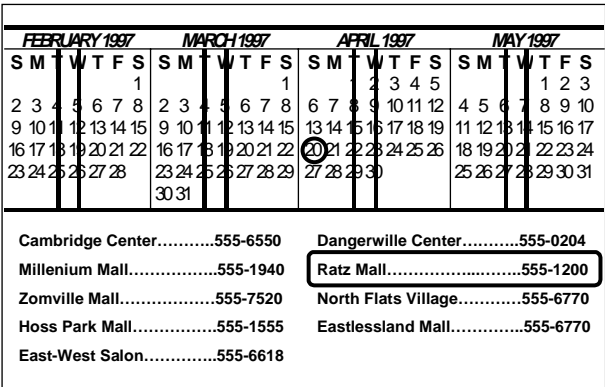


Figure 7. Hair Crafters Reminder Card—Back View

Stylist crosses out his or her days off (e.g., Tuesday and Wednesday) and circles both the day of the appointment (e.g., April 20) and the name and phone number of the salon (e.g., Ratz Mall, 555-1200).

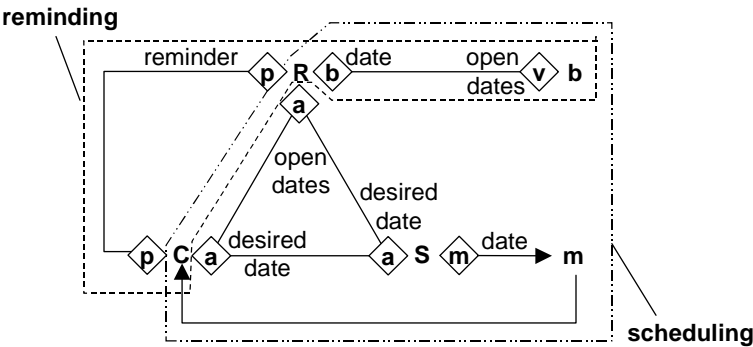


Figure 8. Media Constellation Diagram for Constructing a Reminder

The customer (C) tells stylist (S) and receptionist (R) a desired return date. R looks at the appointment book (b) and gives C a list of open days/times. C picks one, S writes the date and time on the reminder card (m) and gives the card to C. The day before the appointment, R telephones (p) C with a reminder.

In summary, constructing the reminder involved a complex coordination of date/time and stylist information between several individuals (customer, stylist, receptionist) and across different static media (appointment book, reminder card).

6. STEP 4: DIAGNOSE REPRESENTATIONAL ACTIVITIES

For distributed cognition researchers, the representational analysis (step 3) is typically used to test theoretical models (e.g., Hutchins 1991). Information systems researchers, however, can more aptly use the representational analysis to uncover new ways of using technology in the business. Thus, the final step is to diagnose the business's represen-

tational activities and identify which activities can be handled by technology. In particular, the interest here is in identifying offline activities that can be moved online.

The previous section showed that despite the physical nature of Hair Crafters' products, significant representational activity underlies their creation. These representations and activities are potential candidates for online implementation. The *capabilities* of online technologies play a key role in determining what representations and representational activities can be moved online. Online technologies are fundamentally representation manipulators. As such, their roles are either to *substitute for* or to *augment* existing representational activities. However, online technologies cannot operate in isolation; they are part of larger systems of activity consisting of other people and other technology. In specifying this larger system, more constrained roles for the technology can be identified. For the purposes of this paper, the larger system is the customer-online technology interaction.

The typical customer-online technology system can be depicted as a two-medium constellation (see Figure 9). As shown, one arrow connects customer to technology, denoting the information the customer provides the technology (e.g., typing on the computer). Two arrows connect the technology to the customer, one representing audio-information and the other, video-information. As voice inputs become more common, a third information path might be added from the customer to the technology. In this paper, however, it is assumed that the customer only provides information to the technology by typing. When combined with the media constellation diagrams from the analysis (see Figure 5, Figure 8, and Figure 10), this simple diagram can be used to identify offline situations that are suitable for online implementation.

6.1 How to Put the Haircut Online

As mentioned, prior to getting a haircut, customers and stylists engage in discussions about the desired hairstyle and hair lengths. Customers used many different representations during these discussions, e.g., bringing a picture of a desired hairstyle, saying the name of the hairstyle, visual/manual indications of length. However, the end results were always the same: a common understanding between stylist and customer about (1) desired hairstyles and (2) style details such as length. These two common understandings are necessary, and hence, *invariant representational byproducts* of the physical activity of cutting hair. Although the physical product (haircut) cannot be accomplished online, online technology can support these representational byproducts by substituting for the various media used in creating them. Three kinds of substitutions are possible:

- (1) single medium, e.g., the picture (P);
- (2) complex medium, e.g., the stylist (S); or
- (3) several media, e.g., the stylist (S) and picture (P).

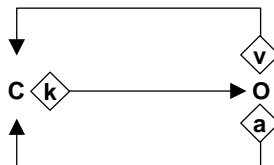


Figure 9. Composite Media Constellation Diagram Representing the Relationship Between a Customer (C) and Online Technology (O)

C provides information O over a keyboard. O provides visual and auditory information to C.

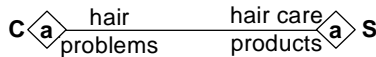


Figure 10. Media Constellation Diagram for Hair Care Product Discussions

Only the auditory modalities are used (note: the “a” adornments at both line ends indicate two-way communication).

By comparing the online technology’s media constellation diagram (see Figure 9) with the offline activity’s diagram (see Figure 5), the online requirements and feasibility of such substitutions can be uncovered. Each substitution is examined in turn.

The picture (P) conveys style information across the visual channel. Because online technology supports the visual channel, it can be used as a substitute. For example, pictures of different hairstyles can be placed on the Web, customers can browse them, note ones they like, and tell the stylist. This is a straightforward substitution, which does not require any complex processing or rerepresentation of information on the part of online technology.

However, merely placing pictures of styles along with their labels is problematic because customers may select styles that are incompatible with their hair types. The stylist plays an important role in determining the suitability of hairstyles for customers. Online technology can be used to *substitute for a complex medium* like the stylist. Unfortunately, although the customer can easily communicate style via the keyboard—by typing the style name—the computer cannot easily acquire information such as hair characteristics. In the salon, the stylist actively acquires this information (over visual and tactile channels) in response to style information from the customer. Because online technology cannot easily acquire this information over the same channels, the customer becomes responsible for providing it; e.g., customers must know their hair characteristics and type them in using the keyboard. One way to accomplish this is to have stylists educate customers about their hair characteristics. In this way, it is possible for online technology to substitute for a complex medium like the stylist, but it may require the business creating new offline representational activities.

Finally, by implementing both of the substitutions above creates an *online technology that substitutes for multiple media*, the pictures and stylist. In any event, the process to discover substitutions for a single, complex medium, or for multiple media, is the same: compare the channels used in existing offline activities with those online technology makes available and note the state that gets exchanged to discover the representational requirements.

6.2 How to Put the Hair Care Products Online

A similar approach can be used to determine how to put hair care products online. The invariant representational byproduct of the hair care product discussions between stylist and customer is knowledge about which hair care products (e.g., shampoos) solve the customer’s hair problems (e.g., oily hair). The media constellation diagram shows a less complicated media organization (Figure 10) than that involved in haircut specification (Figure 5). All information is exchanged *verbally*: the customer tells the stylist his or her problems, and the stylist uses this information to recommend hair care products. More importantly, these exchanges have been largely institutionalized; the all-day training stylists receive trains them on common customer problems and provides solutions in terms of specific hair care products.

The explicitness of product information makes the process a candidate for substitution by online technology. For instance, one way to implement this representational activity is to build an expert system that substitutes for the

stylist. Customers can enter their problems via the keyboard and the expert system recommends products that solve them (see Figure 11). Moreover, there are institutional reasons for placing this activity online. As described, a conflict was found between the organizational goal of selling products (having stylists “push” products) and the employee goal of retaining customers. In this case, implementing the activity online eliminates the conflict.

6.3 How to Put Reminders Online

Two invariant representational byproducts arise during the construction of the reminder card: (1) the customers name, return date, phone number, and type of service are written in the appointment book and (2) the customer’s name, return date, and stylist’s name are written on the card. Because the reminder card is already an informational product, online technology can directly substitute for the reminder card; for instance, the customer’s appointment information can be placed online as a static representation. However, the media constellation diagram (Figure 8) shows that the construction of the reminder card involves coordination among several media (R, S, b, and m).



Figure 11. Product Expert Page for Hair Crafters (<http://cybernik.com/haircrafters>)
Customer clicks on hair problems (top right frame), and program automatically displays what products the customer should order (bottom right frame).

Substituting online technology for the reminder card requires that the business build bridges between offline media and online technologies. If the receptionist enters date and time information in both the appointment book (b) and in the online technology, a representational redundancy is created; the same state is moved onto two different media. Creating redundant states makes more work for the business, leading us to believe that either one or the other medium should be used exclusively. If a decision is made to go exclusively with online technology, then, to minimize other changes, the business should try to build the useful properties of the appointment book, such as its shareability, into the online technology.

In any event, the reminder card is part of the larger activity that convinces the customer to return. Perhaps the reminder card does not actually remind at all. The actual reminding may happen the day before the appointment when the receptionist calls the customer. In this case, reminding can be distributed to the online technology, for instance, by sending a reminder over electronic mail instead of over the phone. In this manner, the technology substitutes for the representational state movement typically performed by the receptionist.

The screenshot shows a web browser window titled 'jp-ecpt.asp at 128.2.236.00 - Microsoft Internet Explorer'. The address bar shows 'http://128.2.236.00/jp-ecpt.asp'. The main content area is titled 'System Ordering Confirmation'. Below this, it says 'You have ordered:' followed by a table of products.

Qty	Product	Each at	Sub Total
1	La Creme	\$8.30	\$8.30
1	Melissam Herbal	\$9.30	\$9.30
1	CHOC Deep	\$23.85	\$23.85
1	Moistening	\$8.30	\$8.30
1	CHOC Daily Moist	\$9.85	\$9.85
1	SEOC Plant Spray	\$4.30	\$4.30
1	SEOC Sun Protection	\$23.85	\$23.85
1	Crystal Clear	\$17.85	\$17.85
Total			\$187.30
Shipping & Handling (within U.S.)			\$7.00
7% Sales Tax (PA residents)			\$7.20
GRAND TOTAL			\$122.35

Below the table, it says 'Payment Option (select one of the following)'. There are several radio buttons and input fields for different payment methods: 'Mail in payment', 'Mastercard', 'Visa', 'American Express', 'Discover', and 'Phone in credit card'. Each method has fields for 'Account #' and 'Exp. Date'. At the bottom, there is a 'Process Order' button and a field for 'Enter your password'.

Figure 12. Hair Crafters and Managing Product Life Spans

When the customer clicks on the “done” button, in addition to sending the order to Hair Crafters, the transaction script stores the purchasing information in a database. This information is used by another script that calculates the average time between customer purchases for *each* product. This time can be thought of as either the consumer’s *product consumption rate* or the product’s *life span*. The Hair Crafters web site can be set up to automatically send an e-mail repurchase reminder to the customer near the end of a product’s life span.

Reminding customers to return can be understood as an instance of the more general activity of managing a product's life span. For a haircut, this span is on the order of weeks. For hair care products, the life span is on the order of months. Although Hair Crafters does a good job of managing the life span of a haircut, they do not manage the life span of their hair care products. This is understandable because determining product life span information, can be difficult. However, if products are bought online, the average frequency of purchase can be calculated and used as a product's life span. The online technologies can use this life span information along with information about the date of a consumer's last purchase, to automatically send an e-mail reminder to purchase more products (see Figure 12).

7. DISCUSSION AND SUMMARY: BEYOND ONLINE CATALOGS

Mail-order catalogs evolved to handle the subset of business/customer interactions that were appropriate *for a static medium* like paper: providing product information and enabling purchasing. However, a *dynamic, interactive medium* like the Web and similar online technologies can handle more sophisticated kinds of interactions. Businesses need to discover what these new kinds of interactions are. One approach is to simply copy the appropriate online customer-interaction mechanisms invented by other businesses. However, a more proactive approach is argued in which businesses use their own business processes—or the processes of similar types of businesses—to determine what business/customer interactions should be put online.

Analyzing a business's processes *qua* representational activities is one way to identify such interactions. The theoretical framework of distributed cognition (Hutchins 1995) developed in this paper was used to guide the analysis of representational activity. In this framework, studying business representational activity amounts to observing and characterizing *the movement of representational states across the various media* in a business. This framework was applied to analyze a small business, a hair salon, which due to the physical nature of its products did not appear to benefit from being online.

PRODUCTS	CATALOG METAPHOR	REPRESENTATIONAL APPROACH
Hair cut	<ol style="list-style-type: none"> 1. Picture and description of styles of haircuts performed 2. Haircut prices 	Mechanism for determining the suitability of a customer's hair to his or her desired hair style
Hair care products	<ol style="list-style-type: none"> 1. Pictures and descriptions of hair care products 2. Prices 3. Mechanism for online purchasing 	Mechanism for determining which products solve the customer's hair problems
Reminder card	N/A (not a product under the catalog metaphor)	E-mail reminders Online appointments

Figure 13. Comparison of the Representational Approach and the Catalog Metaphor

The representational approach includes the items suggested by the catalog metaphor *in addition to* interactive mechanisms.

In fact, through the representational analysis we found business/customer interactions were found that could be handled online, which included and went beyond what the “Web as catalog” metaphor suggested (see Figure 13). For example, stylist-customer interactions were found that could be implemented as an online product expert and receptionist-customer interactions were found that could be implemented as an online consumption-rate calculator and reminder. Such online mechanisms are not specific to hair salon businesses. They can be used by any business that has multiple products with finite life spans. More importantly, however, *the distributed cognition approach to analyzing representational activity can be used by any business*. Furthermore, since all information technologies are representational manipulators, we believe the approach can be used to identify business representational activities that can be handled by information technology *in general*, not just by online technologies.

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