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Chapter 9

An Analysis by Means of Naturalistic Approaches of Two Complex Behaviors

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Abstract

This paper describes two studies in which naturalistic approaches were used to investigate complex human behaviors. The first study is a description of the way in which people organize documents in their own offices; the second study aims for a functional description of the behavior known as "browsing." Both studies use thinking-out-loud protocols, observation, and interviews in the setting in which the behavior takes place. The rationale for the choice of techniques is presented along with a discussion of advantages and difficulties.

9.1 Background

One obstacle to making observations about human behavior is that it cannot be described by only one set of organizing principles [Tyler, 1969]. These principles vary not only from person to person, but also from one situation to another. Tyler [1969], in writing about the methods of inquiry formerly typical of cultural anthropology, states that, for the most part, researchers conducted studies which were "attempts to construct monolithic, unitary systems which purported to either explain cultures or their development." "The atypical," he states, "especially as expressed in patterns of variation, were either dismissed or artificially worked into the scheme as indices of change, diffusion, abnormality, cultural disintegration, opportunities for the exercise of social control and the like [p.3]."

In the field of information systems, we refer to atypical uses and users as "barriers" to information-system functioning. We attribute such variation (in the best of situations) to system-user mismatch or (as is more common) to insufficient or improper user training or

intermediary functioning. The usual solution is to look for users who fit the system or ways (tools) of breaking down the barriers [Dervin, 1983].

By contrast, this research aims for providing a description of what people actually do when they engage in information-related behaviors such as organizing their own documents or browsing, but not a description seen in terms of the researcher's constructs in which assumptions are made about the important components of the behavior, and to a large extent, about the range of relationships permissible among the components. Instead, our goal is a description of the behavior in the participants's own words, with data collected in an environment that is as close as possible to that in which the behavior usually takes place.

9.1.1 Context

Central to this approach is the idea that people do things (i.e., move through life) for a reason. They have a purpose for their behavior, even if the purpose is sometimes obscure illogical, or seems to contradict good sense. Such purposes include attempts to understand a situation and to resolve anomalies and contradictions.

Furthermore, behavior never occurs in a vacuum. Past experiences and future expectations form the horizons of any situation, any point in time. To this the person also brings individual perceptions and purposes. For this reason it is very important, in studying behavior, for the researcher to deal with the notion of context—that part of the stream of experience which envelops a person and which we call that person's situation. It includes the person's self, the things in the environment, and the factors which provide the background against which that person creates meaning for him or herself.

When we say research must take into account the person doing the acting, we do not mean only an enumeration of objective data about that person, such as age, race, and index of cognitive style, and so forth. Rather, the notion of "person" is that of a "center of coordination" [Schutz & Luckmann, 1973], a person situated in a context, which changes constantly. In other words, a person perceives the material world from the perspective of him or herself and a locus in time and space. Brookes [1980], writing about personal maps and landscapes, underlines the importance of perspective: "I see myself occupying the pole of a system of polar coordinates and only radial lines of sight to the salient features I observe. The only secure point of reference in the view is myself (p.270)." Each situation has an above, below, right, left, behind and in front of [Schutz & Luckmann, 1973]. This is the reason for studying behavior in context. It allows a description of how in a given situation, for a given person, things "go" with respect to each other.

9.1.2 Verbal Reports as Data

When we collect data from participants in naturalistic settings we can observe the participants, and we can collect verbal reports from them. The problem is that through observation alone we are unable to have access to the reasons behind the behavior. Verbal reports, however, have been criticized as being unreliable data on a number of counts. Nisbett and Wilson [1977] in a review of the literature, maintain that verbal reports are particularly inappropriate for reporting cognitive processes because: subjects are sometimes unaware of the existence of a stimulus that importantly influenced a response, are unaware of the existence of the response, or are unaware that the stimulus has affected the response.

Another objection is that most people have difficulty articulating how they "do things in general." For instance, a person might be able to specify the reasons for buying a car, but is unable to use abstract terms for how this occurs generally [Simon & Burstein, 1985]. Conversely, when probed about a number of trials, or for information that is inaccessible

from long-term memory, subjects use intermediate processes to infer missing information and fill out and generalize incomplete memories before responding [Ericsson & Simon, 1980].

Ericsson and Simon [1980] argue, however, that verbal reports are as reliable as other data if they are collected carefully and interpreted with full understanding of the circumstances under which they were obtained. In addition, researchers can decide in advance whether the data collection techniques will yield data that are at a fine enough level of granularity for the purposes at hand.

There are also advantages and disadvantages to the various methods of collecting verbal data. Data that is collected concurrently with the task is likely to more accurately reflect cognitive processes, but is difficult and costly to obtain. When subjects are asked to verbalize retrospectively, the data collection can be more comfortably managed by the researcher, who need not be present while the activity is actually going on, but the resulting data are influenced by a number of intermediate interpretive processes that intervene between the internal representation of information and its verbalization. Furthermore, either method may yield incomplete data. In general, the worst results are obtained when subjects are forced to respond to a fixed set of alternatives in a specified form and at a specified level of completeness.

In an effort to overcome the biases and disadvantages of any one method, in the studies described here we employed a mix of methods: observation and the collection of verbal data. Further, in the collection of verbal data, both concurrent and retrospective methods were used.

9.2 A Study Of Classificatory Decisions

The following sections describe two studies in which data were collected in as natural a setting as possible, using observation and the respondents' own words in order to obtain an overall description of the behaviors under investigation. The purpose of the first study was to investigate and describe the influence of context on the process by which people organize and classify their documents in their own personal information space [Kwasnik, 1989]. The research problem of this study was to:

1. elicit a description of context;
2. identify what material phenomena (documents) were significant in this context;
3. observe and describe how and under what circumstances the documents were differentiated, classed, and integrated into a meaningful whole;
4. isolate from this process those dimensions of the person's context and features of documents that were salient for the person; and
5. identify patterns, or "enduring reciprocities" (Mischler, 1979, p.11), of this behavior.

9.2.1 Procedures

The study consisted of several stages of data collection and analysis. The participants for eight case studies were recruited from University faculty. An effort was made to represent a reasonably broad range of possible factors with regard to classificatory behavior. The sample was selected to include as even a distribution as possible along the following criteria: academic discipline, sex, length of time in the university and a variety of working environments.

The interview sessions were scheduled in the following way:

Session 1 On the first visit, the participant was asked to provide a "guided tour" of the office or of any other space in which materials were stored and used, describing the various piles, drawers, shelves, desktop, and so on. This procedure was repeated until all materials were covered.

Session 2 The participant was asked to sort a day's mail following the usual procedure as closely as possible. He or she was asked to "think out loud" while sorting the mail, describing each piece and specifying what would be done with it. The protocols from sessions 1 and 2 were recorded and transcribed.

Session 3 Each of the eight subjects was asked to save a few days' worth of mail and a few days' worth of documents that had been used recently. These items were to be placed on a pile and not disposed of as they might be under usual circumstances. The researcher then attempted to sort the pile of documents in the same way the subject might have done so, using the descriptions and rules generated by the data analysis as a guide. The subject was then asked to comment on the accuracy of the decisions, and if they were wrong, to comment on the reason for the error. These interviews were tape-recorded but not transcribed.

9.2.2 Results and Discussion

The analysis of the data showed that documents are identified and classification choices are made in situations that can be described by a variety of dimensions. The labels and names for documents were used as a focus point for further analysis. Documents were often defined and described by the respondent by means of modifying phrases. These modifiers were summarized by brief terms or labels, defined into coding categories, and then used to describe other instances in which such a description might apply. Each coding category represents a dimension along which classificatory decisions were made.

For example, the following two instances of classificatory decisions:

On the top shelf are
books that are very
seldom used.

Correspondence I must deal
with immediately goes into
my briefcase.

can be described by the same set of coding categories:

on the top shelf —LOCATION—into my briefcase
books—FORM—correspondence
very seldom—TIME—immediately
used—USE—deal with.

All the cases were analyzed in this way, that is, starting with the identification of each document and proceeding to an identification of the dimensions along which classificatory decisions pertaining to this document were made. This analysis yielded an inventory of dimensions and an indication of how frequently each dimension was invoked with respect to the classification of documents.

Once the entire corpus had been coded, it was possible to merge and rearrange the categories so that extremely fine levels of distinction that accounted for a very small proportion of the data were collapsed into more inclusive categories. This yielded 34 categories which could then be arranged into seven even broader groups: Situation Attributes, Document Attributes, Disposition, Order/Scheme, Time, Value, and Cognitive State. Fig. 1 shows these 34 dimensions of classificatory decisions arranged into the seven broader categories.

Analysis showed that dimensions describing situation attributes account for the largest percentage of descriptive dimensions, followed by dimensions describing document attributes,

Figure 9.1: Descriptive Coding Categories That Represent Dimensions Used In Making Classificatory Decisions

SITUATION ATTRIBUTES	ORDER/SCHEME
Access	Accumulation
Circumstance	Arrangement
Need/Requirement	Group
Ownership of the document	Separate
Related to me	Unfinished arrangement
Room/Space	
Source	TIME
Use/Purpose	
DOCUMENT ATTRIBUTES	VALUE
Author	Important
Form	Interesting
Topic	Needs improvement
Title	Not valuable
Physical Attributes	Secret/Confidential
	Unspecified value
	Works for me
DISPOSITION	COGNITIVE STATE
Change	Don't know
Discard	Want to remember
Keep	
Locate "Just know"	
Postpone	

followed by those describing how a document will be disposed of. If frequency alone is considered, a document's form, use, topic, location, the circumstance of the decision, and factors of time are among the most important criteria to consider.

Despite the variety of specific circumstances, uses, forms, and topics identified by the participants, it was possible to identify certain common features and co-occurrences of dimensions. Use and topic occur together very frequently, for instance, as do use and time.

9.2.3 Rules

Each identified classificatory decision in all the cases was further analyzed to discover and describe not only the frequency of classificatory dimensions but also the order in which they are invoked. Each classificatory decision was rephrased by the researcher as a rule. Whereas the analysis of naming addressed labels of documents as evidence of the cognitive process of classifying them, the rules addressed the physical disposition of the documents—the actual placement of documents in physical containers or locations—also signifying a classificatory decision.

Each rule is composed of two parts. The first part, the IF statement, sets out the conditions for the classificatory decision. The second part, the THEN part, sets out the disposition of the documents when those conditions are present. For example, the following excerpt of text (representing classificatory decisions made by one of the subjects) was reformulated into the rule that follows it. Creating a rule involves two steps: 1. analyzing the text into its com-

ponents, and 2. formulating these components into IF-THEN statements. In addition, each component is then described by a label representing a descriptive dimension of classificatory decisions.

THE TEXT:

On the right hand side of the desk are file folders that are courses taught last year and not yet refiled. And also examinations from the last semester. So in other words all that stuff is nothing that's used on a daily basis or even a monthly basis.

THE RULE GENERATED BY THIS TEXT:

IF:	file folders	FORM
	for courses	TOPIC
	taught	USE
	last year	TIME (TENSE)
	not refiled	UNFINISHED
	yet	TIME
OR		
IF:	examinations	FORM
	from last semester	TIME (AGE)
AND		
IF:	not used	USE
	daily or even monthly	TIME (FREQUENCY)
THEN:		
	place	LOCATE
	on right side of	CONTAINER
	desk	
	in a pile	ORDER

Each rule can be seen as an intersection of optional or necessary conditions for a certain classificatory decision.

What we really want to know as observers of another person's cognitive process is "Is this the way you think under these circumstances?" Towards this end, a final session was conducted with four of the eight subjects to see if the descriptions and rules generated through the data analysis would hold up reasonably well in a situation similar to the one originally observed in Sessions 1 and 2. Each subject saved a few days' worth of mail and documents and the researcher attempted to sort them in the same way the person might.

Possible outcomes of the task attempted by the researcher in Session 3 were as follows:

- the classification was correct
 1. based on an exact match with previously provided information,
 2. based on the application of general rules
- the classification was partially correct and partially incorrect
- the classification was incorrect
 1. due to the failure of the rules, i.e., a failure of the analysis
 2. due to insufficient or incorrect information; i.e., a failure of the data-collection.

In all, 106 attempts at classifying the subjects' mail were made. Almost two-thirds of the predictions were correct, and almost half were correct based on the appropriate application of a general rule. The results suggest that the description of people's classificatory behavior was capable of predicting behavior, and that even when it did not, it was not because the description was incorrect but only that it was incomplete.

The findings of this study were based on only eight cases, and the classificatory decisions were explored at only one or two points in time. For this reason it is not possible to generalize the findings beyond the participants of this study. Nevertheless, the data strongly suggest that context, and not only the nature of the objects being classified, play a part in classificatory decisions. Another finding is that, in this study, the relationship of context to behavior remained relatively stable, that is, despite the variety of human behavior, it was possible to describe patterns of those dimensions that play a part in classificatory decisions.

In the past, system designs depending exclusively on document characteristics have been defended by the argument that it is not possible to incorporate situational attributes into these systems because

1. situational attributes are not easily defined, and
2. situational attributes differ too greatly from one person to another and from one situation to another.

The findings of this study suggest that situational attributes can, in fact, be described from what people tell us, that on a general level they remain fairly stable across situations, and most important, they are extremely important to individuals when they classify documents for themselves.

9.3 A Study Of Browsing

The study of browsing described in this section is part of a larger research project [Kwasnik; Liddy; Myaeng, 1989] in which we aim to design an explorable vocabulary in the form of conceptual graphs which we will generate automatically from a machine-readable dictionary. This research is in its preliminary stages and what we describe here is a design study for a future investigation of human browsing behavior. Specifically, we wished:

- to test our data-collection techniques;
- to evaluate the amount, quality, and completeness of data;
- to make a first assessment of whether the data lend themselves to analysis; and
- to develop preliminary techniques for data reduction and summary.

Browsing is variously defined in the literature as searching, scanning, navigating, skimming, sampling, and exploring. Several authors have attempted to establish typologies of browsing [e.g., Apted, 1971; Herner, 1979; Hildreth, 1982], distinguishing one kind of browsing from another by the presence or absence of a goal or purpose or the activity's "seriousness" or formality. Cove and Walsh [1988], among others, have attempted to isolate features of browsing: structure, navigation, and semantics. We have chosen to adapt Palay and Fox's [1981] definition of browsing: "a heuristic search in a well-connected space of things." This definition emphasizes the dynamic nature of the process, the fact that the behavior is a kind of search or exploration, and that it evolves heuristically rather than analogically.

9.3.1 Procedures

We collected data on people engaged in browsing. Whereas most automated information provision mechanisms require people to browse among representations of concepts and things (usually words), we widened the scope to a general context and collected data on people browsing among physical objects, pictures, numbers, as well as words. By looking at browsing in a variety of situations, we hoped to isolate and describe any special movement or pattern across the diverse situations.

Browsing Environments

In choosing browsing situations to observe, we tentatively identified three dimensions of such situations:

1. whether the browsing is purposive or non-purposive;
2. whether the content of the browsing environment consists of objects or representations of objects; and
3. whether the browsing environment is highly structured or unstructured.

We describe two such browsing environments. The first was a farmers' market. The Regional Market in Syracuse consists of a large, warehouse-like structure in which farmers and other vendors can display produce, crafts, baked goods, plants, and so on in stalls they rent for this purpose. The stalls are arranged adjacent to each other in three long rows: two against the long walls on either side, and one double row running down the middle with occasional breaks for cross-overs.

The other browsing environment was the "Lillian Vernon" gift catalog, which is mailed to many homes as a direct selling device. The one we used is approximately 7 by 8 inches and 95 pages long. It consists of photographs of a variety of household, ornamental, and "gadgets" items. Each photograph is accompanied by a short (30- to 50-word) amount of copy consisting of a label, a description, another label, and a price, in that order. The photographs and copy are arranged in a variety of ways, approximately 10 per two-paged spread. There is no index.

Data Collection

A pilot was conducted on two participants. Results from the pilot generally supported the feasibility of the study. Next, we collected data from four participants (two men, two women, faculty and graduate student volunteers from the Syracuse University School of Information Studies).

Two participants were asked to browse at the farmers' market with "no particular purpose in mind;" the other two were asked to browse through the gift catalog with the general purpose of "choosing a gift for a friend." All four were asked to think out loud as they browsed, following their inclinations (including buying something) and to signal when they were finished. These protocols were recorded by means of a lapel mike and a small battery-operated tape recorder, carried by the participant in a shoulder bag (at the farmers' market) and placed on the table for the catalog.

In the case of the farmers' market, two observers accompanied each participant. One prompted him or her to verbalize or to offer explanations. The other observer made notes, on a previously drawn map, of the path followed and the "stops" made. In the case of the catalog, one observer both offered the prompts and observed the behavior. The catalog itself served as its own map. The protocols were transcribed.

9.3.2 Analysis

Our analysis of the protocols and observations is preliminary. As a first step, we wished to develop a vocabulary with which to describe and summarize the data. Then, we wanted to see if there were any general patterns. The following sections provide our initial attempts at definitions of important components of browsing situations and behavior.

Nodes and Views

In our analysis we focussed on the movement of people's attention from item to item or from representation to representation. Movement was signalled by physical movement (walking, page-turning, finger-pointing, and so forth) and verbalizations that showed evidence of a shift in focus. The definition of a unit of analysis remains, at least in part, an unresolved problem. When a person browses in a library, for example, we think of the individual book as a node in the browsing environment. These books are connected by proximity to adjacent books. Similarly, in searching through a database, we can consider individual citations or words as nodes. In the browsing environments we observed, it was difficult to define a node operationally.

Prior to analyzing the data, we envisioned the nodes at the farmers' market as the individual vendors' stalls, with the browser moving from one stall to another. In fact, browsers distinguished objects in a variety of ways: individual items (e.g., "a primrose"); groups of items within one stall (e.g., "apples"; "pears"); and the entire stall or even series of connected stalls (e.g., "crafts," "fruits," "the far end of the building"). The difficulty is not in the fact that browsers grouped things, but that they acted upon different aggregates of objects as if they were one unit. That is, "nodes" were not all of uniform scale.

In the gift catalog, we had thought that the photograph-plus-copy of a particular item would constitute a node, and we could observe how people navigated among them. In fact, the participants often treated the two-page spread as a single entity (e.g., "Pink things"). Did this, then, make the two-page layout a node?

This basic difficulty suggests that a linear item-to-item description of human browsing behavior will probably be very inadequate. We then developed the notion of a view. A view is what a person articulates as seeing at one time, that is, a span of attention. We have some good clues for operationally identifying views because the participants almost always labelled them.

The notion of a view also shifts the emphasis from physical movement to cognitive movement and allows us to account for changing focus. Thus, for instance, a person standing in front of a display of fruit says, "Citrus," and that identifies the view as a number of piles of different fruit. The person then focusses on a particular bag of oranges (the view is now the bag of oranges) and searches for the spoiled ones among them. People talk about views as if they were conceptual entities, and for this reason the view may prove to be a more workable unit of analysis.

Structured vs Unstructured Environment

As mentioned earlier, we envisioned the structure of the browsing environment as exerting an influence on browsing behavior. At this point, the data suggest that this is so, but we have yet to fully explore all the aspects of this influence. What we did find was that the notion of an unstructured environment is probably not a useful one and that selecting browsing environments a priori as structured or unstructured is probably not as important as observing what structures are perceived by the browser regardless of how the situation

seems to the researcher beforehand. People seemed to expend a considerable amount of effort in learning the inherent structure of the environment or creating one as they went along.

We would like to further investigate the effects of structure on browsing, especially in the way structure constrains or suggests movement (e.g., everyone at the market walked up one aisle and down the other as if there were one-way signs posted), or how structure brackets views (e.g., in the catalog a view is naturally constrained by the page format). Another area to investigate is whether the browser's relative ability to define a view without constraints affects browsing.

Purposeful vs Nonpurposeful Browsing

We asked two participants to browse with "no particular purpose" and the other two to "choose a gift." As far as the protocols show, these two instructions were promptly ignored by all four participants. Just as with structure, it seems that the notion of browsing without purpose is not very useful. All four brought purpose to the task, even when they knew they were "only looking." The protocols reveal that browsers are not just passively putting themselves in the way of stimuli, but rather are actively creating sensible interpretations of the situation and directly making connections with their own life situations.

On the other hand, people behaved differently once they were oriented, had identified the scope of the environment and were now prepared to go directly to a remembered place with the express purpose of purchasing something. One subject, early on, decided that he wanted to buy onions. The goal of buying onions evolved out of his inspection of the first few tables in the building, his evaluation at that early point of whether he needed onions, and the low prices of those onions (as compared to remembered supermarket prices). He then carried this purpose with him throughout the rest of the browsing—comparing prices and quality, and constantly informing his browsing with the purpose of returning eventually to purchase some onions, somewhere.

9.3.3 Functions

We define browsing as movement in a connected space. In order to achieve this movement, people undertake certain actions: they shift their gaze, they walk, they skip over things, they look at things briefly, from afar, or close up, they back up, and they pause or stop, then initiate a change. Groups of these activities can be thought of as browsing functions. Functions are the roles a set of behaviors plays in the overall process of browsing. We have tentatively identified a number of such functions that seem to recur in all four cases with some regularity. These are orientation, place-marking, identification, resolution of anomalies, and comparison.

Orientation

Orientation consists of learning the structure and content of the browsing environment. It does not occur once and for all at the outset, but develops and is modified as the activity progresses. All four of the subjects said they planned to use a general strategy of going through once quickly to "get a feel for what was there." In fact, not one of them did this entirely as initially planned. The quick once-over was prolonged by distractions and attractions, and the proposed strategy often changed, shifting back and forth between a quick look and a closer inspection.

Place-Marking

A related function is that of marking a view for a potential second consideration. One person put his finger in those pages of the catalog he thought might warrant more scrutiny. At the market, the participants took mental note of the position of vendors to whom they might want to return. The physical or mental place-markers are tentative and liable to change as new experiences restructure purposes and interests. We would like to investigate the number of place-markers that seem viable at one time and the role they play in structuring browsing behavior.

Identification

The process of browsing relies on the identification or recognition of potentially interesting or definitely not interesting items. The decision to proceed further or stop for more information depends on the person's ability to summarize the probable content of a view prior to making a careful inspection of every item. This is accomplished by identifying the view based on some readily discernible and salient characteristics. If the initial identification seems to be of something useful, needed, liked, attractive, and so on the person pauses and may take a closer look, evaluate, compare, or get additional necessary information. If the initial identification is of something not fulfilling these criteria, the person may move on.

Resolution of Anomalies

The exception to the "identify - accept/reject" pattern is when something is puzzling or not clear. Consistent with the notion that browsers create structure and orient themselves as they go along is their pronounced effort to resolve anomalies. Anomalies occur both in the structure and content of the browsing environment. For example, at one point in the catalog the browser noticed little numbers in the photograph area corresponding to a number identifying a description and price. This had not occurred previously on other pages. She spent some time trying to figure it out ("Why do they...?") and puzzled over it each time she encountered the same pattern. The views were not particularly interesting to her, but she nevertheless spent a considerable amount of time trying to resolve what to her was an anomaly in the structure. At the item level, browsers spent as much time trying to identify an item unfamiliar to them as they did for an item they might want to further investigate.

Something in the browsing environment might be anomalous because it does not fit the world knowledge of the browser. For example, both subjects browsing in the catalog were drawn to what seemed to be a picture of a computer and was really only a turntable for one. They didn't seem to think computers would be sold through such a catalog, but they checked it out in some detail nevertheless.

Comparison

Browsers make comparisons at all levels. These comparisons serve to orient, identify, and solidify purposes and aims. Browsers compare blemished cabbages at one vendor to unblemished ones at another; they compare the difference between the market in winter and in summer; the prices here and elsewhere; the structural features, and so on. We would like to investigate further the effects of structural constraints on making comparisons. For example, at the market it was almost impossible to run from one stall with cabbages to the other one because of the flow of traffic. In the catalog it is relatively easy to flip back a few pages.

9.4 Transitions

The movement from one view to another is a transition, and we expected that at these junctures we could learn about the underlying dynamics of browsing. We have distinguished two kinds of transitions so far. The first occurs as a movement towards something, a movement in anticipation of a goal. When someone takes a closer look at a view because of a bright color or unusual shape, or if one heads for a stall several stalls away because one sees flowers, these are transitions toward something.

The other kind of transition occurs as a movement away from something. When a view has been identified and rejected, or when the browser has sufficient information or has exhausted existing information, he or she moves on. The movement is not necessarily towards something else, but rather, away from where one is situated. Transitions are often made to physically adjacent views, the proximity suggesting a movement in that direction. Sometimes the structure of the environment exerts an influence, and sometimes the browser makes a transition to another non-adjacent view for some reason: to compare prices, for instance.

9.5 Discussion And Summary

The study of classificatory behavior was designed to show ranges of dimensions, to demonstrate that such dimensions could be identified using ethnomethodological techniques, and to suggest that patterns do exist. With a larger number of subjects and with a longer duration, the dynamic process of classification could be more completely described.

Although our study of browsing is preliminary, we have been able to identify some recurring components, functions, and patterns. We are confident that our data-collection techniques yield information that can be profitably analyzed for the purpose of a functional description of browsing.

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