

ADDRESSING MEANING: A FRAMEWORK FOR UNDERSTANDING
PRODUCT SEMIOTICS

by

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A Master's Degree Project submitted to
the Faculty of Environmental Design
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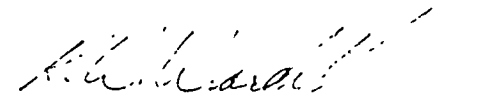
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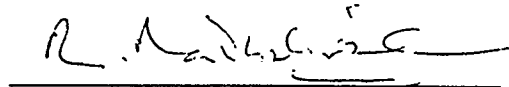
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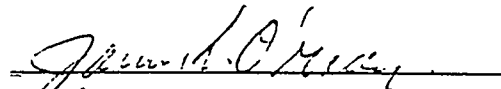
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Abstract

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The purpose of the MDP was to produce a framework for understanding product meaning.

By way of introduction, the contextual background for the framework and the current state of semiotics in industrial design are described. The linguistic origins of semiotic theory are explored and a rationale for using a semiotic model in a consideration of product meaning is put forward.

A conceptual model, or framework, is developed as a way of coming to an understanding of product meaning. The framework distinguishes between two main categories of meaning: functional meaning and emotional meaning. Each of these categories are more finely divided according to specific characteristics of the product meaning.

The framework is validated through a semiotic analysis of a consumer product, the Kyocera Samurai X3.0 35mm camera. Developing the methodology for the analysis, composed of product evaluation and user testing components, further adds to the value of the framework.

The MDP concludes that potential directions for the future of semiotics in industrial design are most likely to focus on
1) the methodology of implementing semiotics in industrial design, through design education and the design process, and
2) the integrative role that semiotics can play between industrial design and other professions involved in the process of product development, especially marketing.

KEYWORDS: industrial design, semiotics, product semantics, semiotic analysis, product evaluation, user testing, 35mm camera.

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...The objects beloved of man are objects that have a soul. They hold some sliver of mystery. This mystery is the consequence of those objects' independence of man. Even certain tools, whether primitive or technologically advanced, possess an extraordinary dignity, a nobility of presence, a formal rigour that goes beyond their function or the requirements of marketing. It is almost a form of animism, a complex identity that enriches the act of utilization...

Andrea Branzi, 1988.

ADDRESSING MEANING: A FRAMEWORK FOR UNDERSTANDING PRODUCT SEMIOTICS

1. An Introduction to Semiotics in Industrial Design

This Master's Degree Project begins by establishing the context within which the ensuing discussion of product semiotics takes place. In the first three sections of the Introduction, the relationship between industrial design, human factors, and semiotics is explained, the current state of semiotics in industrial design is described, and a rationale for using a semiotic model in an investigation of product meaning is put forward. Chapter 1.4 provides an overview of the document, providing a brief description of its organization, rather than a summary of its contents.

1.1 Bringing Together Industrial Design, Human Factors and Semiotics

At the core of industrial design, human factors, and semiotics is a common area of concern. Each is concerned with optimising some aspect of a system of interaction between people and products. Industrial design focuses on the product-side of the interaction, human factors on the people-side, and semiotics

with the interaction as a form of communication. Bringing all three together provides a way of learning about the interaction of people and products that is not possible when the view of each is considered separately. The goal of this MDP is to develop an understanding of product meaning. It will be reached through a collaborative approach, equally based in industrial design, human factors, and semiotics.

Within industrial design, human factors operates as a well-integrated discipline of specialization. The particular skills associated with human factors are recognized as valuable and appropriate to the realm of design by the industrial design profession, even if there is a discrepancy between the voiced appreciation of human factors and its utilization in actual design projects. Human factors contributes to industrial design the means for a thorough consideration of the interaction of people and products, especially with regard to ensuring that the operation of the product does not surpass the user's physical capabilities and the brain functions underlying such capabilities.

Human factors research and related natural science and social research, has extensively probed the boundaries of the physical human being. In doing so, some attention has also been paid to the co-ordination of the physical being within the brain. The early models of sensation and perception, such as information processing theory and signal detection theory, mark the beginning of a concern with the manner in which people interact with their

environment at a cognitive level (Kantowitz and Sorkin, 1983).

When human factors applies this vein of research within industrial design, the question arises of how people and products interact at a cognitive level, as opposed to at a physical level. Industrial designers likewise recognize the need for the products they design to meet more than the physical requirements of the product users. The architect Jerzy Soltan, (1980, p.58) commenting on the demise of Modernism asked, "...How long can concern for the environment be limited to its physical aspects?...the designer's concern has to concentrate not only on coping with man's physical needs but also on his spiritual growth." When this concern for or curiosity about cognitive-level interactions is paired with a desire on the part of industrial designers to have their products more broadly satisfy product users, the opportunity for investigation into the interaction of people and products is presented.

Product semantics, an area of inquiry within industrial design, is such investigation into the cognitive interaction of people and products. Product semantics, the study of the symbolic qualities of form, is conceived within this MDP as the application of semiotic theory to the products of industrial design. Semiotics offers a communication-based model for the interaction of people and products, focusing on the meaning of the product. According to a semiotic model of user-product interaction, the product designer communicates with the product user through the product. The designer encodes a message, or

meaning, into the product during its design, and later the product user decodes the meaning at the time of interaction with the product.

Semiotic theory is partly based on, and originated from, linguistics, but it is also partly based on communication theory, and partly on philosophy (Hervey, 1982). It has been used as a way of learning about a wide variety of human endeavors, from the fine arts to the layout of grocery stores (Blonsky, 1985), wherever the opportunity for deciphering indirect communication presents itself.

When applied to industrial design, semiotics provides a means of both producing and appreciating the communication that occurs through products. The influence of human factors on semiotics in industrial design lies in the emphasis on the end user of the product when the situation of the product's design and use is considered as part of a system of communication. Together, industrial design, human factors and semiotics introduce an exceptional position from which to approach cognitive interactions between people and products. It is hoped that a greater understanding of product meaning, and in application, a betterment of the interaction between people and products, is the result of the collaboration.

1.2 Product semantics (an area of applied semiotics)

The exploration of semiotics in industrial design has developed as designers have become interested in having their

products fill more than the physical needs of their users. In 1984, a publication by IDSA (Innovation 3(2), 1984) served to popularize the consideration of product meaning among industrial designers. From this publication arose the common acceptance of the term "product semantics" in reference to product meaning, along with a definition of the term. Product semantics was defined as the study of the symbolic properties of form (Carpenter, 1984, p.1). Two years later, a team of researchers at RichardsonSmith (Rheinfrank, Evenson, Kresge, and Sanders, 1986) provided an example of what product semantics could contribute to product design and showed the value of semiotics when thoughtfully applied to design problems through strategic design languages.

Product semantics has become a burgeoning area of discussion within industrial design. One result of all the activity is that there are several different approaches to product meaning, each of which can be considered as an aspect of "product semantics". Four different avenues of exploration within product semantics are evident from a review of design literature (Branzi, 1988; Bush, 1987; Giard, 1989; McCoy, 1984; Rams, 1984). These include product semantics based on:

- 1) metaphor,
- 2) self-evident operation/product identification,
- 3) the enhancement of user experience, and
- 4) the cultural context of product use.

Each of these approaches to product semantics will be described

as an introduction to the field and to provide a sense of the scope of investigation into product meaning. Developing and integrating these four areas will result in a well-articulated theory of product semiotics. This MDP is directed toward that goal.

1.2a Metaphor

Product semantics based on metaphor, characterized by the use of metaphor as a form-generator for products, has been championed by Michael McCoy at the Cranbrook Academy's Design Department. McCoy describes metaphor as:

...a powerful device for design (that) illuminates a new perspective by suggesting evocative connections between the subject and memories from experience (McCoy, 1984, p.16).

McCoy further describes the use of metaphor, which he calls the "working metaphor", as using a visual analogy that enhances the function of the design. He says that using metaphor is an intuitive process of creating forms that speak of visual and functional similarities between one object and another. This use of metaphor is deemed by McCoy to be especially appropriate in the design of products where the mechanical design or technology of the product give no clue to the object's meaning. In these cases, a working metaphor can be used to give the product a channel for practical and emotional communication, allowing users to view in a new way both the object itself and the thing to which it refers.

1.2b Self evident operation/product identification

Self-evident operation or product identification refer to a quality of a product through which simple observation of the product reveals what the product does and/or how the product works. The product can be identified because what it does or how it works is evident in the product's form. The meaning of a product is connected to the function of the product, according to this approach to product semantics. Obviously, this method of product identification is embedded in a particular cultural mode, and achieving cross-cultural or universal signification can be problematic for the product designer. See Chapter 1.2d for a discussion of cross-cultural aspects of product semantics.

Self-evident operation has been called the "self-sign" (Bush, 1987), with self-sign defined as that aspect of product semantics that explains a design's use in a non-verbal way. Bush sees self-evident operation to be especially important for products with a significant safety hazard, reducing the likelihood of incorrect use of the product. For Krippendorf and Butter (1984), self-evident operation is most important for innovative products, in which "semantic clues" could be employed to help communicate the use and function of the product. Put another way, the identity of the product is conveyed through its formal elements.

Perhaps the best-known proponent of this view of product semantics is Dieter Rams of Braun. In a paper in which he puts forward his philosophy of design, Rams gives the following as one

of his design principles:

...items should be designed in such a way that their function and attributes are directly understood (Rams, 1984, p.25).

Rams says it is the task of the designer to design objects that have an unconstricted, obvious functionalism, or as described here, to adopt self-evident operation as a goal of product semantics.

1.2c Enhancement of user experience

The approach to product semantics based in the enhancement of user experience is concerned with the emotional ties that are formed between a product and its user. According this approach, product semantics should be used in the design of a product to encourage an emotional response to the product. The aim is to promote positive feelings through interaction with the product, with the underlying goal of counteracting the sense of alienation that more commonly results from interactions with technology in contemporary society.

Bush (1990) offers the view that an approach to product semantics that focuses on the enhancement of user experience can help to humanize technology by facilitating "a closer physical and psychic symbiosis between the product and the user" (p. 27). Using semantics to enhance user experience of a product recognizes that there are a great many personal reasons, quite separate from the product's functional qualities, that operate in any person's choice to interact with a product. The focus here is on the sub- and supra-functional characteristics of the

product, addressing and appealing to the aesthetic response of the product user. For the designer, this approach to product semantics offers a means of understanding, and perhaps influencing, the user's experience.

1.2d Cultural context of product use

The approach to product semantics that emphasises the cultural context of product use has two distinct branches. The first holds that product semantics, or more exactly the semantics of product systems, can be used to help make products reflect the culture of which they are a part. Reflecting the culture in this sense is also a means of helping to define the culture, since in making the culture tangible the opportunity to change it is presented. This use of product semantics to incite social commentary is most eloquently put forward by Andrea Branzi (1988).

The second and more widely-held understanding of product semantics emphasizes the cultural context of product use. It recognizes the potential for problems that is inherent in cross-cultural product identification (See Chapter 1.2b), and holds that product semantics can be used to ensure that a product operates optimally regardless of the cultural context in which it is used. This view sees product semantics as a possible means of communicating with product users at a non-verbal level, thereby attempting to circumvent the potential for problematic translation across disparate languages and cultures. In contrast

to the notion of increasing market specificity, this view of product semantics arises out of the recognition of the increasing importance of world markets for many products (Giard, 1989), and the need for products to meet the needs of their users in any of those markets.

Underlying this second understanding of a cultural context type of product semantics is an acknowledgement that product semantics can help to focus on the orientation of the user to the product. It is the user's interpretation of the product, with all its basis in expectation, stereotype and ritual behaviour, that can be positively influenced through product semiotics. Attaining a product design that precludes misreadings of the product is the task of the designer with this approach to product semantics.

1.3 The Rationale for Using a Semiotic Model in an Understanding of Product Meaning

The notion of using a semiotic model as a way of understanding product meaning is predicated on the product acting as part of a system of communication. There are two basic principles of semiotics that can be applied to products as part of a communication system that encourages the adoption of a semiotic model for understanding product meaning. These are:

- 1) consideration of the product as a sign, and
- 2) interpreted meaning.

Within the communication system, the product is treated as a sign, with some aspect of the product standing for, or

signifying, a particular meaning. This meaning is a message that the product designer wants to communicate to the product user; it is encoded in the product and so must be decoded in order to be received.

Since the product acts as a sign and the communication message is encoded idiosyncratically, the product meaning must be interpreted rather than read directly, for there is no systematic and unique way of encoding messages in products. This presents the opportunity for multiple interpretations, where single semiotic elements of the product can have more than one interpreted meaning, depending on the state of several other factors influencing the communication system. One way of looking at this is the idea of multiple interpretations is referred to as "layers of meaning" and is basic to an application of a semiotic model for understanding product meaning.

Further discussion of these two principles of semiotic theory as part of a semiotic model for understanding product meaning, and a detailed consideration of products acting within communication systems, can be found in Chapter 2.2, along with a complete development of the rationale for using a semiotic model for understanding product meaning.

1.4 Overview of the MDP

This section of the MDP outlines the contents of the document, identifying the connections

between the document sections and explaining the rationale for the organization.

The MDP contains five sections: a theory section, a case study section, and a section addressing directions for interaction between semiotics and industrial design, in addition to introductory and concluding sections. The first substantive section, Chapter 2, is concerned with the theoretical base for the MDP, namely semiotic theory and the theoretical underpinnings of a proposed framework for understanding product meaning. The second section, Chapter 3, describes a case study in which a semiotic analysis, arising directly from the theoretical framework, is performed for a consumer product, the Kyocera Samurai X3.0 35mm camera. The third section, Chapter 4, identifies and examines some of the issues confronting semiotics in industrial design and, building on the understanding of product semiotics promoted by the framework, suggests future directions for interaction.

Procedurally, the organization of this document follows the process of exploration and development that brought about the ideas and activities that constitute this MDP. Once the topic area had been established, the procedural sequence of the MDP approximated the following: (enclosed within parentheses is the MDP chapter corresponding to each step of the sequence)

- 1) The process began by determining the value of applying

semiotics to products. This involved an extensive study of semiotic theory, beginning from its origins in linguistics and covering a wide variety of contemporary applications of semiotics to design and cultural contexts. (Chapter 2.1)

2) Since there seemed to be some value in applying semiotics to industrial design, the semiotic theory literature and the existing product semantics research was re-examined to determine the most salient aspects of each of the different approaches to product meaning. Then the pattern of relationships among these approaches was identified and expanded to include additional aspects of product meaning. (Chapter 2.2)

3) The pattern of relationships was transformed into a conceptual framework for understanding product meaning, with examples of current activity in design-related areas included to illustrate the fit of the framework to product design. The result of the development of the framework was an explication of semiotics for industrial design. (Chapter 2.3)

4) To this point, all the MDP activity had been concerned with theory and was necessarily abstract. The next step in the process was to test the theory by applying it to a concrete situation. Two things had to happen before the theoretical framework could be applied: first, the theoretical base of the framework had to be translated into terms applicable to something three-dimensional, and second,

a suitable focus, approach, and methodology for the testing had to be determined. (Chapter 3)

5) The results of the testing provided a substantiation for the framework as a way to understand product meaning. This validation of the framework brought about a question concerning the larger role of semiotics in industrial design: how could the framework, or semiotics in general, be used most beneficially in the design of products? Answering this question lead to an exploration of potential directions for future interaction between semiotics and industrial design. (Chapter 4)

6) Reflecting upon the sequence of exploration and activity that composed the MDP allowed for some necessary conclusions regarding the process, and the subject matter, to be drawn. These conclusions brought the MDP to a close. (Chapter 5)

2. SEMIOTIC THEORY AND A FRAMEWORK FOR UNDERSTANDING PRODUCT MEANING

This section of the MDP describes some of the fundamental concepts of semiotic theory and will apply semiotic theory to product design. There are three subsections; the first describes the linguistic models of semiotics put forward by some of the seminal writers in semiotics, the second introduces my framework for understanding product meaning and will describe semiotic theory used to structure the framework, and the third subsection will expand on each component of the framework through a description of a concrete activity that is representative of the focus of the framework component.

The organization of the three subsections starts from the most abstract and general level of theory, through the application of the theory to the field of product design, to the substantive embodiment of the principles of semiotic theory in activities and ideas that are tangible to the product designer faced with the task of considering the

meaning of a product.

2.1 Linguistic Models of Semiotics

This section of the MDP describes linguistic models that form the basis of semiotic theory. The orientations of Peirce, de Saussure, and Morris are included.

It is appropriate to consider the linguistic basis of semiotics in this discussion of product semiotics because like natural language, the design language of a collection of consumer products can be thought of as a system of communication. Some of the principles of linguistic semiotics may be applicable to products as communication systems, if the same goal for semiotics is seen to apply to both cases. The goal of semiotics is to make obvious the underlying pattern of communication through the consideration of the operation of signs.

A basic model that can be used to illustrate how product use can function as a communication system is that put forward by Shannon and Weaver (1949, in Sanders, 1987). There are six components to the model, as illustrated in Figure 2.1 below.

Information is transmitted from the source to the destination through the channel. The channel is a structure that carries the information from the source to the

destination. The system requires a transmitter to carry the information provided by the source in a format acceptable by the channel, and a receiver that functions to ensure the information can be understood at the destination. The information sent by the source is encoded in the channel through the transmitter and must be decoded through the receiver at the destination. There can be noise, or error, with each of these steps of transformation.

SOURCE----TRANSMITTER----CHANNEL----RECEIVER----DESTINATION
(noise) (noise) (noise)

Figure 2.1 The Shannon-Weaver Communication Model.
(adapted from Sanders, 1987)

In the context of product design, the source is the product designer and the destination is the product user. The product is the channel and incorporates both the transmitter and receiver: the transmitter being the design process that results in the product and the receiver being the situation of use of the product by the user. The designer encodes the desired information through the product-as-transmitter and the user decodes the product-as-receiver.

However, there are limits on the extent to which product semiotics can be understood in linguistic terms, due to the difference in degree of structural sophistication between linguistic communication systems and product communication

systems, and because of the different forms of the communication systems. Linguistics maintain a linear form, which is temporal and dynamic, while products are spatial, usually three-dimensional and static.

Two approaches to modern semiotics are described here through an abbreviated consideration of the fundamentals of Ferdinand de Saussure and Charles Sanders Peirce. Some of the semiotic theory of Morris is also described. These approaches bring about real differences in how a system of signs is understood. Attention should be paid to the particulars of the fundamental components of the theories, since the two approaches assign distinct and special meanings to terms that are different from each other and from expected usage. Rather than considering the two theories as diametric opposites, they should be considered as points on a continuum of approaches to semiotics. It should be noted that the purpose of including the semiotic theories of Saussure, Peirce and Morris is not to be critical of the works in their own rights, but rather to provide a basic level of exposure to semiotic theory that is necessary for a meaningful discussion of product semiotics.

2.1a Saussure's model

Ferdinand de Saussure (1857-1913) was the founder of semiology, which has become the predominant European version of semiotics. It is an approach characterized more by reasoning from generalities as a way of understanding

specific systems than from using instances of specifics to come to generalities. Saussure viewed semiology as the study of all that is social, conventional, and systematic in communication. The following review of some of the fundamentals of Saussure's theory is taken from Hervey (1982), which is an excellent treatment of both the historical development of semiotics and contemporary applications of semiotics to various theoretical perspectives.

SUBSTANCE vs. FORM

Saussure used the distinction between substance and form to distinguish concrete phenomena from abstracted entities. He saw the constant abstract idea, or form, as underlying the variable concrete event or object, the substance. A form provides a rationale and gives a patterned appearance to the otherwise amorphous and variable substance, while a substance gives concrete realizations to a form that would otherwise be lacking in any real, practical applicability. For example, a form may be the monetary value of \$5.00, which is a constant, abstract idea, while the substance may be five one-dollar bills, or coins, or five dollars' worth of coffee beans. Without the monetary value, the bills or coins are simply bits of metal and paper and without the structure of some kind of physical representation, nothing can be done with the abstract idea of \$5.00.

IDENTITY THROUGH DIFFERENCES

Arising from the distinction between substance, which is concrete, and form, which is abstract, is the idea of identification through differences. Since forms by themselves are amorphous, they are defined by their contrastive value, or what a particular form can do. This value is determined in opposition to all other forms of a particular system and it is the differences between forms that give a particular form its identity. That is, a form is what it is by virtue of not being any other equivalent form that is part of the same system. The significance of the concept is that for Saussure, entities are defined "negatively", by their systematic value in opposition to all other parts of the system. Entities are defined by what they are not, rather than by what they are, within the limits of their concrete substance. This assumes that the entire universe for comparison is known, or that any particular system of which a form is a part must be closed. This brings up the third point, system, in Saussure's model of semiology.

SYSTEM

As has been described, Saussure's idea of system is necessarily that of a closed system. It is also synchronic. Given that a system is a collection of co-existing and mutually exclusive forms, it is not possible to consider alternatives that used to exist, or that may exist at some time in the future. A system can only exist at some fixed point in time. All possible alternatives must exist

simultaneously, or be part of a different system. So rather than having the possibility for change within a system, it is the system as a whole that is replaced.

SIGN vs. SYMBOL

For Saussure, signs are those parts (forms) of a semiological system that mediate between the substance of thought and the substance of physical expression. Signs are the mediators between messages and signals. A further condition required of signs is that they be arbitrarily established mediators. For example, the same thought can be expressed equally validly in two languages, where the words (signs) used to express the thought are arbitrary sounds understood by convention. If a mediator is not arbitrary, if there is some motivation for connecting a particular sound with a particular idea, then that mediator is called a symbol. For a symbol to exist, there must be some intrinsic connection between the thought and the physical expression.

A second point that Saussure made about signs was that they are best understood as being dyadic, or composed of two parts. The first part of the sign, the signified (signifie), is the conceptual part of the sign. The second part, the signifier (signifiant), is the physical manifestation of the sign. One part of the sign cannot exist without the other, or in Saussure's words, there must be a one-to-one relation of mutual implication between the two parts of the sign within a given system. In a separate system, the same-valued

sign may have a different physical manifestation. For example, the cat standing at the door (the signifier, the physical manifestation) means that the cat wants to go out (the signified, the concept). Following from the one-to-one mutual implication between the parts of the sign for a given system for this example, the cat cannot want to go outside without standing by the door, nor can standing by the door mean anything but that the cat wants to go outside. In another system, (maybe another cat) the cat wanting to go out may be signified by another behaviour (maybe meowing).

2.1b Peirce's model

Charles S. Peirce (1839-1914) was the originator of the American approach to semiotics. According to Peirce, the focus of semiotics is communication as a whole, with any thing acting as a sign germane to the consideration of semiotics. With this very broad range of potential foci for semiotic analysis, Peirce's treatment of semiotics is understandably more concerned with how signification, or sign systems, work in principle than with how signification works in practice. The following review of some of the fundamentals of Peirce's theory of semiotics is taken from Hervey (1982).

NATURAL CLASS

In terms of the classification of objects or ideas, Peirce put forward the idea of a natural class (as opposed to an arbitrary class) to account for those groupings of things

that occur together because of their purpose of fulfilling a common final cause. The final cause is understood as being the very reason for the existence of the things and is necessarily abstract. Classifications based on physical enactment of final causes are seen as trivial in the sense that the physical reality does not exist without the abstract final cause. This idea of natural class shows the importance for Peirce of being able to determine the purpose of any particular object or idea. For example, the natural classification of watches would be based on the idea of all things that keep time for a person, while a trivial classification may be based on the idea of all things that attach by means of a strap to the wrist. The reason for a watch to exist is to keep time, so a watch could join the natural class of time pieces, but it could not join a natural class of things that attach to the wrist, even though that may be a valid final cause for some other thing.

METHODS OF ARRIVING AT CONCLUSIONS

Peirce distinguished between three different methods that he saw as appropriate for learning. These are reasoning by deduction, induction, and retrodution (abduction). He has particularly come to be associated with reasoning by abduction. Figure 2.2 shows Sebeok's (1983) summary of Peirce's descriptions of the modes of reasoning.

Given a rule (a law of nature or general truth drawn from experience), a case (a presumption or hypothesis) and a result (an observed fact), the following relationships hold true:

1. Deduction draws an inference from rule and case to result.

RULE: All the beans from this bag are white.

CASE: These beans are from this bag.

RESULT: These beans are white.

2. Induction draws an inference from case and result to rule.

CASE: These beans are from this bag.

RESULT: These beans are white.

RULE: All the beans from this bag are white.

3. Abduction draws an inference from rule and result to case.

RULE: All the beans from this bag are white.

RESULT: These beans are white.

CASE: These beans are from this bag.

Figure 2.2 Peirce's Three Modes of Reasoning: Deduction, Induction, and Abduction.

SIGNS AS TRIADS

Peirce saw a three-part correlation operating in the function of a sign. The three parts are the sign, the object, and the interpretant, with the sign being the mediator of a relationship between the interpretant and the object. The nature of the relationship is that of representation or "standing for". In other words, the sign

mediates between the interpretant and its object.

This triadic conceptualization of signs led Peirce to a classification of signs from each of the three parts of the sign relationship. He posited that signs could be classified from the point of view of: 1) the mediating sign, 2) the object of the sign relationship, and 3) the interpretant of the sign relationship. These classification are not to be thought of as mutually exclusive, but rather as branches of a trichotomy ultimately leading to a classification system of sixty-six different kinds of signs. The classification of signs from the point of view of the object has the most relevance to a discussion of product meaning and is the only one to be described here.

A 3-PART CLASSIFICATION OF SIGNS FROM THE POINT OF VIEW OF THE OBJECT

Peirce determined that there were three alternative types of signs, based on the relationship between the sign and its object. The following are Peirce's three types of signs:

1. Icon. If the sign denotes its object by virtue of a real similarity that holds between physical properties of the sign and the physical properties of the object. An example of an icon can be found in the silhouette of a woman on the door of a public washroom indicating that the washroom is for the use of females.

2. Index. If the sign denotes its object by virtue of a cause and effect link between the sign and its object. An example of an index is contained in the colloquial expression "where there's smoke, there's fire".

3. Symbol. If the sign denotes its object by virtue of a general association of ideas that is in the nature of a habit or convention. The cross is an example of a symbol, as it has come to represent Christianity.

A distinction can be made according to the nature of the relationship between the sign and its object based on whether the relation is arbitrary or non-arbitrary. Symbols are signs with an arbitrary relation to their objects, while both icons and indices have a non-arbitrary relation with their objects.

2.1c Morris's model

Charles Morris developed a discipline that studies communication, which he called semiotic. It is directly based in the earlier work of Peirce, in that like Peirce the focus of study is both all-encompassing and based on a three part description of the sign. But where Morris differs from Peirce is in his concentration on the process of the semiotic analysis of specific and actual cases, rather than on Peirce's concern with the principles and constants of semiotic analysis. Morris called this process of semiotic analysis semiosis. He held that each process of semiosis

could be understood as a chain of events, with a whole chain making up a communication act. These communication acts could then be linked into sequences of processes or events, leading to a semiosis (semiotic analysis) of the entire event or process. Morris's focus on process and on communication as an act has lead his work to be interpreted as a behavioral approach to semiotics (Hervey, 1982).

Although Morris developed an extensive theory of semiotic analysis, it is only his consideration of three aspects of semiosis that will be considered here. Morris, in relating the process of semiosis to the pairing of "sign" with each other part of Peirce's triadic concept of the sign, drew an important distinction between the following three aspects, or levels, of semiotics (Holbrook, 1987). These are:

1. syntactics; the formal relation of signs to one another,
2. semantics; the relations of signs to their objects and
3. pragmatics; the relation of signs to their interpretants.

These three aspects of semiotics have been adopted as a classification system for types of contemporary semiotic analysis, but with a broader application beyond the triadic concept of the sign. An example of this broader use of Morris' three aspects of semiosis is as follows (Bellert and Ohlins, 1978):

1. syntax; signs and their formal relations to other signs,
2. semantics; signs and their formal relations to the objects for which they stand, and

3. pragmatics: signs and their formal relations to their users.

The preceding description of concepts basic to linguistic models of semiotics serves a twofold purpose: it provides a vocabulary for the discussion of product semiotics that follows, and it serves as an orientation to semiotic analysis. To summarize, it is appropriate and necessary to consider the linguistic base of semiotic theory in this discussion of product semiotics because like natural language, product use can also be understood as a system of communication. The linguistic concepts most basic to the discussion of product semiotics include the concept of the product as "sign" (according to both de Saussure and Peirce), the idea of the existence of more than one kind of sign (the sign/symbol distinction of de Saussure and the index/icon/symbol of Peirce), the concept of the study of meaning as a process (the semiosis of Morris) and the identification of the levels at which semiosis can occur (the syntax/ semantics/ pragmatics of Morris). These are the concepts from the linguistic base of semiotic theory that will figure most prominently in the following discussion of product semiotics.

2.2 A Framework For Understanding Product Meaning

This section of the MDP describes the framework and provides the rationale for the development of the framework with its basis in semiotic theory. The second part of the section gives an overview of the framework for understanding product meaning.

2.2a The Semiotic Structure of the Framework

The meaning that any product conveys to its users is a function of many factors. Meaning develops on different levels as a result of interactions of these factors. This resulting meaning is typically complex because of the interaction of the factors. It is also abstract because the meaning of a product exists only as the interaction of an extraction of past and present personal experience together with the potentialities of the product. The meaning of a product is also significantly influenced by the particular idiosyncrasies of the product user. As such, it can be very difficult for the product designer to engender the intended product meaning for the product user. But that does not mean that the product designer should not even try. Given some degree of shared cultural and situational experience and a sensitivity to the situation of use, the designer can put

forward parameters that facilitate or constrain the meaning of the product.

Presented here is a framework, or a structured way, of identifying some of the factors that operate in the meaning of any product. The framework is meant to be used to foster understanding of the meaning of a product in general terms; to show the different kinds of meaning operating in the use of a product.

The structure of the framework and the premises upon which it is based are taken from the linguistic models of semiotics presented earlier and the semiotic theory of social semiotics (Hodge and Kress, 1988), marketing (Leiss, Kline and Jhally, 1986), architectural theory and design theory. Basing the framework on semiotic theory affords an opportunity to examine aspects of product meaning including the effect of context on meaning.

Context is of central importance to any discussion of product meaning. From a semiotic perspective, context can be defined as the environment in which a message occurs, or more specifically, all the preceding and/or following messages which bear on the message under consideration (Sebeok, 1985). The context surrounds the focal message with alternative readings. Communication always takes place in a context (Palmer, 1987) and context can have an effect on both the content of the message that is communicated and the efficiency of the communication. In turn, messages can also

have a modifying effect on the environment in which they occur when the messages and the context are all seen to function as elements within a closed system (See Chapter 2.1a for a description of de Saussure's concept of a system).

As part of the framework presented here, the product designer should be aware of the effects of context on any message that is being transmitted through the product, since context has an effect on all aspects of product meaning. Both the conditions of the environment in which the product is used (the external context) and the constitutive conditions of the product itself (the internal context) are aspects of product meaning that are part of context. The external context can be a source of problems to communication through the product if there are qualities of the external context that are not shared by the product designer and the product user. Living in very different cultures is one example of where it may be the case that aspects of the external context are not shared by the designer and product user.

One way of understanding internal context is in terms of consistency or value (see Chapter 2.1a for a description of de Saussure's concept of value). For example, one product line, a type of audio equipment, might use rotary dials that must be turned clockwise to increase volume, bass, and treble. For a designer to specify the same type of rotary dial for frequency, with a counterclockwise motion required

to move to higher frequencies, would be to neglect the importance of internal context. The value (in the Saussurean sense) of the directionality of the rotary motion cannot be altered within a system.

Context is an integral factor of this framework for understanding product meaning. Another element of semiotic theory that, in part, determines the organization of this framework is the concept of product meaning being composed of layers of meaning. A central concept of semiology, the idea of meaning existing in layers, was put forward in Barthes' discussions of connotation and metalanguage (See Holbrook; 1987, for a brief description of Barthes' concepts). The idea of meaning existing in layers arises from the recognition of multiple levels of sign processes operating in communication systems. The simplest communication system is populated by signs that are denotative, according to Barthes. A denotative sign is one in which there is a simple relation between the sign and the object or idea for which it stands. Higher levels of sign processes involve connotation, wherein the sign itself comes to have a meaning outside the object or idea for which it stands. In turn, other higher-order meanings can further be associated with the original sign relationship. An example may clarify this concept of layers of meaning. One familiar sign relationship can be found in the traffic sign called a stop sign. That is a denotative relationship, with the physical object of the stop sign

standing for the idea "stop". There are many possible connotative relationships arising from this first-order pairing. The relationship could be looked at from the point of view of traffic: What does it mean to have traffic that has to stop? The relationship could be also be looked at from the point of view that asks "What does it mean to have alphanumeric characters that need to be widely understood?".

The concept of meaning existing in layers has the effect of encouraging interpretations of communication systems or sign systems at multiple levels of meaning. In terms of the framework for understanding product meaning, the importance of meaning existing in layers is that the designer should be aware of the existence and the ramifications of higher-level interpretations of messages encoded in the product. Also, the idea of meaning existing in layers should encourage the designer both to consider more deeply those aspects of product meaning that are most relevant to a particular situation of product use and also to consider the interaction of the different layers, and aspects of product meaning.

The framework for understanding product meaning presented here is not intended to operate as a checklist upon which any particular product can be measured to come to a conclusion about how the product will have meaning in a particular situation of use. It is theoretically impossible to prepare a checklist of all possible readings of the product and any use of semiotic theory in the understanding

of product meaning will necessarily lead to an "open list". Rather, the product designer can best address product meaning through a general awareness of some of the universal or near universal conditions arising from the interaction of people and products and then making considered decisions about the implications of product meaning in the design of the product. Through the structure of this framework, the product designer can address the product as part of a communication system and can be aware of messages encoded in the product at all levels of meaning.

2.2b An Overview of the Framework

An overview of the framework can be found in the following paragraphs. Each of the framework components are further described in greater detail in Chapter 2.3, along with examples of current approaches to product meaning that illustrate and sufficiently substantiate each of the framework components.

The framework for understanding product meaning is composed of two major components of meaning: functional and emotional. (A brief description of the framework can be found in Adams, 1989). Figure 2.3 displays this framework for understanding product meaning.

The framework for understanding product meaning takes a branched form, with the two major components contributing to overall product meaning. These two major components are each further divided into two subcomponents, providing for a more refined understanding of product meaning than that possible through a consideration of meaning based on the two major components. In terms of the framework presented here, the major components of product meaning are functional meaning and emotional meaning.

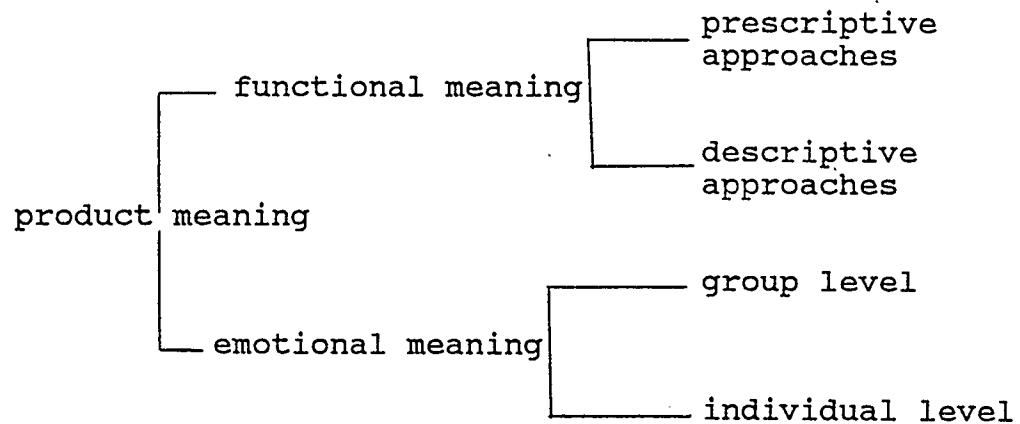


Figure 2.3 A Framework for Understanding Product Meaning

The subcomponents of the functional meaning component are identified by orientation as being prescriptive approaches and descriptive approaches to the functional meaning aspect of product meaning. The subcomponents of the emotional meaning component are identified in terms of their focus as being the individual level and group level subcomponents of emotional meaning.

Functional meaning refers to that part of a product's meaning which is arrived at through interaction with the product in an instrumental sense. The functional meaning of a product includes:

- the purpose for which the product is made,
- what the product does,
- how the product is used,
- the materials from which the product is made,
- the organization the product gives to its intended task, and
- the degree to which the product is similar in appearance to other products with a similar function.

Two approaches to the functional meaning (the subcomponents of the functional meaning component) of the product are prescriptive and descriptive. Prescriptive approaches focus on methods used to encode a message. Human factors guidelines (Sanders and McCormick, 1987) and composition theory (Dondis, 1973) are examples of prescriptive approaches to the functional meaning of products. Both offer guidelines on how product meaning can be presented through the form that the product takes. Prescriptive approaches to the functional meaning of products are comparable to the syntax level of meaning as described by Morris (See Linguistic Models Chapter 2.1), in that the reference is to relations between sign or product elements. Since prescriptive approaches to the functional meaning of

products also address the relationship between the sign and what it represents (especially from the point of view of the designer choosing how to represent certain concepts), prescriptive approaches also have aspects of Morris' semantic meaning.

Descriptive approaches to the functional meaning of products refer to the manner in which an encoded message will be understood by the user. Information design (Sanders, 1986) and the concept of internal and external metaphor (Rosenberg, 1987) follow this approach. Descriptive approaches to the functional meaning of a product detail how the product designer's choices influence the cognitive model that the user of the product formulates in the understanding of the workings of the product.

Emotional meaning refers to the personal significance of a product brought about through experience, affect, culture of all kinds, and symbolism. For example, the sense of mastery a user feels on successfully interacting with a new product, the choice against purchasing a new black vehicle in favour of one of some lighter colour, and the recognition of a matte finish as being high-tech are all aspects of the emotional meanings of products. The emotional meaning of products can be understood as approximating the pragmatic level of meaning in Morris' description of semiotics in that the relation between the sign or product and its users is what is under consideration.

Motivation is an important aspect of the emotional meaning of products. Motivation can be understood as having two components: the first is arousal, the second, direction (Loudon and Della Bitta, 1984). The emotional meanings of products arise through user interaction with products in the pursuit of goals - either physiological or psychological. It is the affective component of the goal pursuit that gives rise to the emotional meaning associated with the product. The emotional meaning can be associated with either the arousal component of the motivation or the directional components of the motivation, depending on the particulars of the situation under discussion. The desire, or motivation, to proceed with goal-directed activity, can be very strong and this intensity can be transferred to the emotional meaning of the associated product. In terms of understanding product meaning, the product designer should be aware that the consequence of motivational effects on the emotional meaning of products can create a situation in which the emotional meaning of a product is as likely to determine the quality of interaction between a product and its' user as is the functional meaning of that product.

A distinction can be made between emotional meaning at individual and at group levels (individual and group-level subcomponents of the emotional component of product meaning). Emotional meaning that arises at the level of the individual is based on personal interaction with the product. It can

include the thoughts and feelings brought about by remembering situations in which the product was used and in remembering conditions of personal significance associated with the product. Csikszentmihalyi and Rochberg-Halton's The Meaning of Things (1981) focuses on the individual-level emotional meanings.

Emotional meanings of products that arise at the level of the group are broad-based, culturally-determined levels of meaning. Product symbolism (Bush, 1988) and consumer aesthetics (Holbrook, 1987) are based on group-level understandings of emotional meanings.

In keeping with the layers-of-meaning approach basic to semiotics, the framework presented here is not hierarchical. There is interaction and enrichment of meaning between layers and the categories of meaning are not arranged from some lower point to some higher point, with the lower-ranking meaning categories requiring fulfillment prior to the higher-ranking categories. For example, it is not necessary for a product to have an identified group-level meaning before it can have an emotional meaning. Since the subcomponent categories of meaning are refinements of the major categories (e.g., group-level and individual-level are subcomponents of the major category of emotional meaning), it is implicit in the identification of some group-level meaning that an emotional meaning exists. The facets of product meaning represented by each of the subcomponents of the framework are

to be understood as contributing to the meaning of the product, as dictated by the particular situation of product use being considered.

But neither are the categories of meaning entirely independent; neither between the subcomponent and component levels nor within the subcomponent level. The subcomponents have a compositional relationship with the major component, with the major component being partially defined by the qualities of the product with respect to criteria relevant to the subcomponent level of understanding product meaning. In terms of this framework, the emotional meaning of a product is partially defined by the group-level and individual-level aspects of meaning. The subcomponents are not independent because they share some of the qualities that are characteristic of the component level of product meaning. For example, the group-level meaning is not independent of individual-level meaning because both are aspects of emotional meaning. As a component of product meaning, emotional meaning includes elements which are more than those specified in the subcomponent categories. The subcomponent categories are meant to be representative, not exhaustive. There may be aspects of the emotional meaning of products that do not clearly belong to either of the individual- and group- level subcomponents and so these aspects form part of the overarching emotional meaning. It is the effect of these aspects of meaning that preclude the

subcomponent level of the framework from being independent.

The subcomponents are independent in that the qualities of a product vary independently between criteria related to the subcomponents. That is, there is not necessarily any implication that a product having some certain quality associated with the individual level of emotional meaning will necessarily also have some other quality associated with the group level of emotional meaning, or with either of the subcomponents of the functional meaning of the product. It is, nonetheless, possible for associations to exist between the different subcomponents of meaning, depending on the situation of product use in question.

The preceding description of the framework for understanding product meaning was an overview of the framework, serving to familiarize the product designer with one way of organizing the many aspects of product meaning. The beginning of the section was a substantiation of the semiotic basis for the organization of the framework.

2.3 The Framework

This section of the MDP describes the existing activities through which principles of semiotics are applied to product design. The activities and concepts that are included are meant to be illustrative, not exhaustive, but sufficient to substantiate the framework. The examples were

chosen because of their particular relevance to product design. The section describes the activities and concepts as examples of each of the framework components translated into concrete terms. The purpose of this section is to provide the product designer with a tangible way of understanding the product meaning distinctions contained in the structure and organization of the framework.

2.3a The Framework: Functional Meanings

2.3a (1) Information Design

Information design contributes to the framework for understanding product meaning by providing a description of the cognitive processes employed by the product user as he or she comes to understand how the product functions.

Information design is part of the functional meaning of products, according to the framework presented here.

Information design, as described by Sanders (1987, 1986), has its roots in cognitive psychology. The aim of information design is to meet the communication needs of all the varied users of a communication system, making a system easy to use and easy to learn. The rationale for including information design in a discussion of a framework for product meaning is that since a communication system, for example a signage system in a zoo, is designed much like a product is

designed, and since a product can be conceived as a communication system in itself, the principles that apply to information design are equally applicable to product design.

Sanders (1987) lists and describes the following seven design principles of information design for communication systems: model, use metaphor, embed, chunk and layer, map, prime, and motivate.

1. Model

People understand the world by constructing working models of it in their minds. These working models are not necessarily perfect or well-tuned. They can overlap, or sometimes even conflict, but still these mental models are useful to help interpret the situations in which people find themselves. If people repeatedly find themselves in situations that do not fit their mental model, they will change the model accordingly. A designer can use this idea of a model in two ways: first, by forming a model of the user's behaviour for the situation under consideration and second, by designing to accommodate the conceptual model of the user.

2. Use Metaphor

People understand new concepts by comparing or matching them to something they already know. A designer can make use of the principle of metaphor by providing something familiar to help a person learn new information. But the metaphor can inhibit as much as it facilitates exploration of the new material outside the framework of the metaphor, so Sanders

(1987, p.752) cautions that it is best to make the metaphor available at the beginning of the learning process without imposing it all the way through.

3. Embed

People understand current situations by referring to organized structures of knowledge based on past experience that are stored in memory. There are many different possible ways that information and knowledge in memories are stored. It is important for the designer to note that the best way to make use of information and knowledge in memory is to provide a context for learning the new material. People can come to an understanding of the details of a situation much more easily if the current situation is embedded in a larger context.

4. Chunk and Layer

People are limited in their capacity for dealing with information. Usually seven chunks, or meaningful bits of information, is the limit of what a person can address at one time. Chunking refers to principle of grouping together bits of information so that as a group, or chunk, the individual bits hold some meaning. A designer can also organize chunks of information across time and space to control the amount of information a user is exposed to at any one time. This is referred to as layering.

5. Map

People internalize knowledge of how to get around places

in the form of cognitive maps. Neisser (in Sanders, 1987) maintains that cognitive maps include typical features like landmarks, paths, nodes, districts, and edges. Landmarks include such things as towers, unusual buildings or monuments that can be easily spotted from a distance. Paths are travelable routes and nodes are salient points where several paths meet. Districts are regions with some easily recognizable cultural or geographical characteristic, while edges are visibly defined boundaries such as rivers and escarpments. Designers can use analogues of these cognitive map features in the structure of communication systems by figuratively creating zones or districts of information and by providing paths and landmarks to access the information. Mapped communication systems can help users learn to use and internalize the information presented.

6. Prime

People remember things best if they have been "primed" or cued to remember. Designers can use the principle of priming to facilitate and give direction to a user's learning process. By helping the user develop accurate expectations, the designer also helps the user to assimilate information more readily. Priming can provide a preview of upcoming information and provide a way for the user to see what stage he or she is at in the presentation of information.

7. Motivate

People learn more easily and enjoy it more when

motivated to do so. The designer can provide motivation in the form of user control, through consistency in the communication system, through surprise or mystery and significantly, through dissonance. Dissonance is the difference between what is currently known and understood and what still needs to be learned. Dissonance can be created through complexity, challenge, novelty, and incongruity.

2.3a (2) External and Internal Visual Metaphor

The distinction between external and internal metaphor is part of the semiotics of product design. Rosenberg (1987) describes the distinction as a principle of interface design, but it is an equally useful concept for product design. In the framework presented here, external/internal metaphor can be understood as contributing to the functional meaning of a product by influencing the cognitive process employed by the user to come to an understanding of the operation of the product. In this way the external/internal metaphor, like the principles of information design, also contributes to the framework for understanding product meaning.

Metaphor is a process by which a new product user can learn about the new product. A cognitive model of the operation of the new product is developed, based on the association of the new product with some previously understood process that is in some way similar to the new product. A visual metaphor refers to the fact that the known,

existing process is communicated visually.

Moran (in Rosenberg, 1987) indicates that learning is likely to occur more readily with greater correspondence between the new product and the metaphor. The more direct the congruence between the new product and the metaphor, the more direct the association between the two. An alternate view is put forward by Marcus (in Rosenberg) stating that a metaphor need not directly refer to the new process or product, as long as the metaphor is internally consistent, that is, as long as the parts of the new process can be adequately mapped onto the metaphor.

Rosenberg (1987) uses these two alternate views of the basis for metaphor in his distinction between external and internal visual metaphor. An external metaphor refers to the metaphor being based on something very much like, or with a very high level of congruence with, the new product; usually an existing similar product. For example, if a new sewing machine was being designed and its operation was being communicated through an external metaphor, the operation of the sewing machine would follow the logic and style of earlier sewing machines, even if the microprocessor capabilities and other technological advancements of the new sewing machine made the actual earlier operations obsolete. Such an external metaphor may be expressed in the manifestation of individual controls for stitch specifications, even though the machine itself employed laser

technology to meld the fabric seams and did not rely on physically joining the fabric sheets together with thread. Regardless of the actual process, the user comes to understand the operation of the new product through the application of an understanding of how an old, similar product worked.

An internal metaphor is self-contained. There is no allusion to earlier products, but the metaphor instead refers to a fictitious or mythical mode of operation that is much easier to comprehend than the actual workings of the product. An example of an internal metaphor can be found in photocopiers that have an interface with which the user describes the copying task he or she wishes to accomplish, as opposed to an interface that requires the user to meet the demands of the machine and not the copying task. An internal metaphor allows a user to come to an understanding of a new product through the organization of the task that the product helps the user to perform.

2.3a (3) Human Factors Guidelines

Human factors guidelines are part of the framework presented here because they contribute to an understanding of the functional meaning of products. Human factors, reflecting its origins in psychology and engineering, has been defined as the endeavour to improve the effectiveness, efficiency and safety of humans in technological systems

(Schmidt, 1986). When applied to industrial design, human factors, or ergonomics, is employed to optimize the usability of the designed object (Murrell, 1985). From its inception, human factors research and applications have focused on the interface, or point of meeting, between human users and usable things. This interface is typically understood to be physical in nature, giving rise to such areas as anthropometry (both static and dynamic), biomechanics, sensation, and perception being included as part of ergonomics.

Human factors guidelines, as used in industrial design, are extractions of principles or rules from human factors theory, presented in such a way that the ergonomic information on which the guidelines are based can be applied to any design problem. The guidelines are used with the idea of improving the interaction of a user with a product by ensuring that product use does not require efforts beyond the capabilities of the user. Some of the areas of human factors guidelines that are relevant to an understanding of product meaning include the guidelines addressing visual displays and controls of static and dynamic information, displays and controls of information for the other sense modalities and guidelines addressing the size, weight and use of objects based on physical anthropometry, biomechanics, and task and safety analyses. Human factors guidelines addressing the environmental conditions in which a product are used, such as

lighting and noise, are also relevant to an understanding of the functional meaning of products.

One of the human factors guidelines that is most familiar to product designers is Humanscale, a publication of the Henry Dreyfuss Agency (1974). Others include Sanders and McCormick (1987) and Woodson (1981). Any of these guidelines can provide the designer with data regarding sizes of people, layout of controls and displays, and other information relevant to the physical interaction of people and products.

2.3a (4) Composition Theory

Composition theory operates as part of the framework described here by contributing to the understanding of the functional meaning of products. It is concerned with the meaning communicated by the product through its physical form. The elements and techniques of composition theory are the tools with which the designer must work to convey a message through the product.

Dondis, in her thorough exposition of composition theory, maintains that understanding composition first requires a complete knowledge of the elements of composition (1973, p.183). By analogy, learning composition theory is like learning to write a language in that letters are learned before words and a knowledge of words is required to put across meanings. Similarly, the product designer must be able to effectively manipulate compositional elements and

techniques when treating a product as a conveyor of visual messages. In this way, combining compositional elements is like learning the rules of syntax in a natural language (Aksoy, 1983).

Dondis (1973) identifies and describes the following eight elements and techniques of composition theory.

Composition Theory Elements:

1. Point: the minimal visual unit
2. Line: the definer of form
3. Shape: the basic shapes like circle, square and triangle
and all their variations in planes and dimensions
4. Direction: the thrust of movement
5. Tone: the presence or absence of light
6. Colour: the most expressive visual element, defined as a
co-ordinate of tone and chroma
7. Texture: the optical or tactile surface character
8. Scale: the relative size or proportion.

These elements are the individual components that can be used together to communicate visually. The various means of combining these elements, described by Dondis (1973) as polarities of contrast and harmony, are the techniques of composition theory. In order to convey meaning, the composition must make use of the appropriate technique with the chosen element. There are no absolute rules governing combination techniques, but rather, the sensitivity of the

designer is called upon to recognize effective modes of message transmission through the product as composition.

Included as techniques of composition theory are:

balance / instability,	symmetry / asymmetry,
regularity / irregularity,	simplicity / complexity,
unity / fragmentation,	economy / intricacy,
understatement / exaggeration,	activity / stasis,
predictability / spontaneity,	subtlety / boldness,
neutrality / accent,	transparency / opacity,
consistency / variation,	accuracy / distortion,
flatness / depth,	diffusion / sharpness,
sequentiality / randomness,	repetition / episodicity,

These are the techniques that the product designer has to use to manipulate product elements so that the intended messages are encoded in the product. The skills of the designer are required to be able to make choices about how product colour, or placement of accent or parting lines, or the degree of symmetry evident in the product, for example, are used to communicate with the product user. Composition theory is the language through which the product designer must communicate.

2.3b The Framework: Emotional Meanings

2.3b (1) Individual Level, Emotional Meanings of Products

In the model presented here, a distinction is made between emotional meanings of products at two levels; the

level of the individual and the level of the group. Emotional meaning arising at the level of the individual is brought about through interaction with the product in conditions of personal significance. It is composed of the memories and feelings associated with the product.

Csikszentmihalyi and Rochberg-Halton (1981), as part of their comprehensive look at the relationship between domestic items and self-identity, give a three-part categorization of the personal meaning of objects that is appropriate to the discussion of the emotional meaning of products at the level of the individual. Their three categories are positioned along a continuum of increasing power, moving toward the end of attaining the goals of an individual's existence. The personal meanings of objects vary with increasing power. At the lower end the goal is to prove one's independent existence and one's control over the environment. At this lower point, objects have meaning through active participation in challenges. Interaction with toys, sports equipment, books, tools and musical instruments can contribute to knowledge about the self and serve to confirm existence. A sense of mastery over the environment is a positive outcome of an interaction with an object that exemplifies this category of personal meaning.

The second level of goals, according to Csikszentmihalyi and Rochberg-Halton, centers around the growth of the self to include, and be included in, a network of family and other

interpersonal relationships. Here, the goal expands from seeking one's own rewards to finding meaning in rewards obtained by others. Within this category of personal meaning, objects have meaning because of their associations with other people: an object has meaning because it represents a relationship with another person. An example of this kind of object meaning may be found in family heirlooms, which are objects that are cherished because they represent continuity of family. Other examples of Csikszentmihalyi and Rochberg-Halton's second category of object meaning can be found in any gift that is kept, and valued, because of who gave the object rather than any other quality of the object itself.

The third level of goals are called "cosmic" goals by Csikszentmihalyi and Rochberg-Halton (p.249). Here, a person perceives objective relationships between the self and wider patterns of order including the community, the species, ecology as a whole and practices like an occupation, art, or religion. At this point, object meaning is based in the challenges and responsibilities incurred as part of the freedom to make a new world in which to live. Objects have meaning through their potential to contribute to a desired order of living.

In terms of the framework presented here, Csikszentmihalyi and Rochberg-Halton's categorization of the personal meaning of objects can be used to understand that

products potentially have three different kinds of emotional meaning associated with them at the level of the individual. These are; 1) emotional meaning resulting from self-growth due to interaction with the product in an environment, 2) emotional meaning arising out of interpersonal relationships embodied in the product and 3) emotional meaning arising out of identification of the product with a chosen way of life. Due to the personal nature of the emotional meaning of products that occurs at the level of the individual, this kind of meaning is not subject to overt manipulation by the product designer. Instead, the designer has some influence over individual-level emotional meanings through the degree of satisfaction experienced with the product. Because it is an important component of product meaning as perceived by the product user, the product designer should acknowledge that a product can hold very personal, emotional meanings for the product users.

2.3b (2) Product Symbolism

Product symbolism operates as part of the framework described here by contributing to the understanding of the emotional, group level of product meaning. It is concerned with the meanings attributed to products by the culture as a whole, with every user of a particular product in a particular culture sharing the same product meaning. The product becomes the symbol of an age or culture because it

carries the ideas of the culture, embodied by the designer and decoded by the user. The product can sum up the spirit of an age in a general way, with the symbolism based in accepted ideas. Bush (1987) puts forward the view that a product can have this symbolic meaning associated with it by every member of a culture group because using a product with symbolic meaning helps the user to identify him- or herself with the qualities of the product. Both the self-identity and the identity ascribed by others is enhanced through use of the product. The product acts as a proclamation: "here is who I am; this is what I believe". Bush (1988) states that there are two other motivations for using a product with a symbolic meaning: to form alliances with other people or to use the product to celebrate an idea or cause.

An example of the symbolic meaning of products can be found in The Streamlined Decade, in which Bush (1975) details the meaning of the teardrop shape, with every streamlined product becoming a symbol of the age. The decade was the 1930's and using a streamlined product made people feel they were alert and involved participants in technological advancement, that they were at the forefront of cultural change. Streamlining symbolised the importance of transportation and mobility to the era, with every streamlined product taking on the aura of the new ocean liners and aircraft. Streamlined products offered a way for every one to be part of the dream of the future. It was a

product meaning understood by everyone.

2.3b (3) Consumer Aesthetics

Consumer aesthetics is an area of research that exemplifies emotional meanings of products that occur at the level of the group. It focuses on consumers' appreciative responses to products (works of art) that give rise to experiences valued intrinsically for their own sake beyond whatever extrinsic value the product might possess as a means to some other end (Holbrook, 1987). These appreciative responses are interpreted as being distinct from product use concerned with the definition and communication of self-image and other aspects of product symbolism. The product meaning, here, is a group-level meaning rather than meaning arising at the level of the individual because the goal of consumer aesthetics is to identify components of aesthetic response across all product users. Holbrook (1987) defines consumer aesthetics as:

the study of the complex dynamics of the process by which features inherent to the design and structure of a product (artwork) shape significations that result in aesthetic experiences pursued for their own sake as ends in themselves.

Both the product features and the aesthetic experience resulting from the product use are legitimate areas of investigation within consumer aesthetic research. Visual complexity is an example of one kind of product feature that has been investigated (Huber and Holbrook, 1981), while

investigated emotional responses include joy, sadness, anger, fear, love and disgust (Holbrook and Hirshman, 1982).

Consumer aesthetics has the potential to help product designers understand aspects of product meaning related to the product as an aesthetic experience. It is a level of meaning that arises entirely within the product itself rather than being the result of product function or cultural ties to the product. It is meaning based on the evocation of emotions.

The preceding descriptions of activities and concepts provide a concrete way of approaching product meaning. Each of the components of product meaning identified in the framework, functional meaning and emotional meaning and the finer distinctions they contain, can be understood through the representative activities and concepts described above.

3. A SEMIOTIC ANALYSIS OF A CONSUMER PRODUCT

This section of the MDP describes a semiotic analysis of a consumer product, the Kyocera Samurai 35mm camera. The organization of this section reflects the fact that there are two main activities involved in this semiotic analysis. The first is the evaluation of the product using criteria derived from the previously presented framework, while the second part of the analysis is user-testing to determine consumer response to semiotic elements of the product.

The first subsection will provide an overview of the analysis, focusing on the non-positivist approach of the analysis and providing a description of the target of the analysis. The second will cover the evaluation of the product. The third subsection will detail the user-testing portion of the semiotic analysis and the fourth will provide a discussion of the results of the semiotic analysis, including recommendations for the design of the product.

3.1 Semiotic Analysis Overview

This section of the MDP describes the approach of the

semiotic analysis, identifying the point of view taken as that of a conceptual theorist, rather than that of an analytic scientist, and the target of the analysis, a new-model 35mm camera.

3.1a Approach of the Analysis

The purpose of conducting a semiotic analysis of a consumer product is to show that the semiotic theory put forward in the framework (See Chapter 2.2 and 2.3) can be applied to an actual product. This validation illustrates the value of semiotics to the practicing product designer, who is communicating through the product with the product user. Secondly, the description of the analysis provides the product designer with an example of what to include in a semiotic analysis of a consumer product. This is significant because of the lack of such analyses that are available, as revealed through an extensive search of design and semiotic literature.

The approach of the analysis warrants discussion for the same reason; since there is no established format for semiotic analyses of products, it is important to consider how this semiotic analysis compares with other modes of inquiry. Given that this analysis is being presented as an activity within an exploration of cognitive human factors, it may be expected that the approach and methods of the analysis would follow the model of analytic science, or logical empiricism, since a great deal of human factors research is scientific in its orientation. Similarly, the analysis of the product being akin to some

consumer research could also lead to the expectation of this semiotic analysis following the model of analytic science.

Balancing these influences, however, are several concepts basic to semiotics which suggest that the mode of the semiotic analysis may be something other than analytic science. Examples of some of the most relevant of these concepts, described earlier (See Chapter 2.1) in the descriptions of the semiosis of de Saussure, Peirce and Morris and the semiotic structure of the framework, include reasoning by abduction (as opposed to reasoning by deduction or induction), the idea of meaning through interpretation (as opposed to meaning through proof), the idea of meaning existing in layers, or multiple readings of the same text, and the importance of context to meaning. Mitroff and Kilman's (1978) taxonomy of methodological approaches to the conduct of social science can be used to help identify, and then expand upon, the approach taken here.

Mitroff and Kilman (1978) present four distinct modes of inquiry, or styles of conducting research. These are the analytical scientist, the conceptual theorist, the conceptual humanist and the particular humanist. Positioning these four styles along the Jungian dimensions of sensing/intuiting and thinking/feeling gives the array shown in Figure 3.1 below. Of the four styles, the analytic scientist most closely matches the traditional, logical positivist view of science. The analytic scientist holds the controlled experiment to be the best approach to knowledge because it allows the objective testing of

logical hypotheses. The other styles, as they move away from the thinking and sensing end of the dimensions, move toward feeling and intuiting. The style that exists at this extreme of the dimensions is the conceptual humanist, which closely approximates the traditional perspective of the artist. The conceptual humanist sees knowledge as best pursued through the passionate cultivation of speculative and subjective insight.

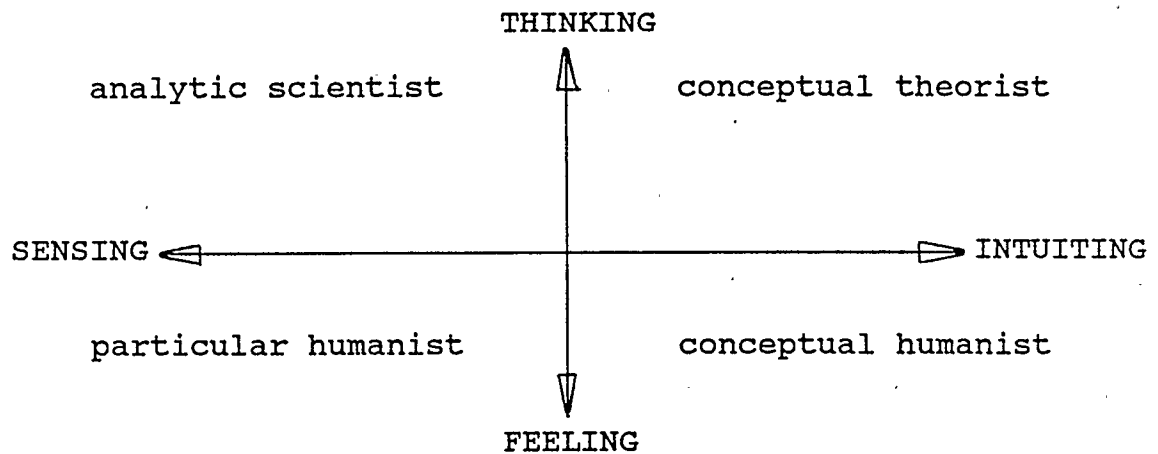


Figure 3.1 Mitroff and Kilman's Classification of Scientific Styles (from Belk, 1986 p.5).

The mode of inquiry that best matches the semiotic analysis as conducted here is that of the conceptual theorist. The following description of Mitroff and Kilman's categorization (Hirschman, 1985) will clarify the approach of this semiotic analysis of a consumer product, especially through its comparison of the conceptual theorist with the analytic scientist.

Mitroff and Kilman propose that an identifying

characteristic of the conceptual theorist's approach to science is the desire to seek out or produce multiple explanations of any phenomenon. Whereas the analytic scientist works best within a single, well-defined paradigm, often at the cost of explanatory richness, the conceptual theorist prefers to construct bridges between paradigms, especially between paradigms that are competing for recognition, or to develop new paradigms. The conceptual theorist views paradigms only as alternative representations of reality and not as truth, with truth requiring validity within logical parameters outside the paradigm. Paradigms are viewed as being useful for their ability to stimulate the imagination, and to account for alternate perceptions of reality.

In contrast to the analytic scientist, the conceptual theorist enjoys speculative theorization and engages in conceptual leaps of faith. Conceptual theorists attain gratification by developing novel concepts - especially those that challenge the accepted viewpoint. The conceptual theorist views science as a way to generate and account for anomalies and to identify previously unseen problems, as opposed to the analytic scientist, whose goal is to acquire knowledge to reduce uncertainty and ambiguity. The preferred mode of logic of the conceptual theorist is the dialectic (Mitroff and Kilman, 1978), wherein it is possible to develop multiple perspectives. Once they are established, perspectives are attacked, leading to the development of different perspectives. Using the dialectic, the

conceptual theorist seeks out conflict and uncertainty because conflict and uncertainty are not regarded as signifying the rational breakdown of inquiry but rather, are regarded as essential for promoting the advance of the inquiry and for attaining a fuller measure of accountability.

The semiotic analysis conducted here generally follows the approach of the conceptual theorist just described, especially with respect to the seeking of multiple readings of single phenomena. But the approaches described by Mitroff and Kilman should not be understood as being independent or mutually exclusive; rather, they should be seen as being inter-related. Overlaps between the approaches are expected when applied to research projects (Hirschman, 1985). Therefore, this semiotic analysis is not absolutely pure in its conceptual theorist approach and some valuable aspects of the analytic approach are used as well. In the following description of the two parts of the semiotic analysis (the product evaluation and the user testing) both approaches are used, and valuable contributions to the greater understanding of the meaning of the product are derived from each.

3.1b Target of the Analysis

Based on readings, discussions, design and semiotic experience to date, the ideal target of this analysis would be a product with a combination of the following four characteristics:

- 1) It would be a consumer product, providing a model of design

and production familiar to the product designer.

2) Being a consumer product, it would also have a large, possibly world-wide user group, so all communication between the designer and the user would have to occur through the product itself.

3) The ideal target would be characterised by newness and novelty, so that any responses to the product would more likely be motivated by the product in its own right, rather than the product acting as a generic example of a larger class of products.

4) The ideal target would be sufficiently complex in its operation to require some kind of higher-level understanding on the part of the user.

The product chosen as the target of this semiotic analysis provides these characteristics. It is a new model, 35mm camera by Yashica, the Kyocera Samurai X3.0. It is a fully-automated zoom lens single lens reflex with a built-in flash, auto-exposure, auto-focus, auto-film speed reading, auto-film load and advance, and auto-film rewind. A liquid crystal display panel on the back of the camera provides information on camera drive and mode settings, film transport status, exposure number, battery check indicator, and programmable day-time display. Viewfinder displays include sharp focus indicator, flash indicator, and self-timer indicator. Detailed specification literature for the product can be found in Appendix A.

The camera presents the film in a vertical format, whereas

traditional cameras run the film horizontally. In order to maintain a horizontal picture format, the vertical frame of the film is divided into two parts, resulting in half-frame negatives. The benefit of half-frame negatives is that twice the regular number of exposures can be made on a roll of film; the drawback is that half-frame negatives cannot be made into slides by any standard process.

Camera Canada (1988) says that the Kyocera Samurai presents the most radical design of the auto-focusing cameras, in part because of this vertical format. In Modern Photography (1988), this assessment is seconded, and the camera is called futuristic. The Kyocera Samurai is described as the first entry into the new class of cameras, the "ergonomic 35s", that are signalling a change in the market to an emphasis on visual uniqueness rather than on product feature advancement. The novelty of the appearance of the camera is certainly one of its strongest features.

3.2 Product Evaluation

The evaluation of the product was conducted using criteria derived from the functional and emotional categories of the framework for understanding product meaning presented above (See Chapter 2.3). What follows is a description of the development of the criteria and a listing of the questions posed to address the semiotic performance of the product with

regard to each listing. Preceding this is an identification of the semiotic elements of the product. The performance ratings of the semiotic elements are necessarily subjective, in keeping with the conceptual theorist-approach of the analysis (See Chapter 3.1a).

3.2a The Semiotic Elements of the Product

The identification of the semiotic elements of the Kyocera Samurai arose out of my examination of a similar product, the Nikon FG. Both cameras have similar output, but the Nikon follows the traditional 35mm camera form and is not fully automatic. Appendix B contains slides showing the semiotic elements of the Kyocera Samurai.

Since when conducting a semiotic analysis a product designer could often be faced with the task of analyzing a product not yet on the market, it was reasonable to begin this analysis with a look at an existing item. The existing product provides a way of identifying the organization of the elements of the product that is the target of the semiotic analysis. It is not expected that using an existing product for comparison with the target product will be a complete match, but rather the comparison provides a starting point for the identification of semiotic elements. Other semiotic elements will be revealed through the evaluation of the product on the derived criteria. Table 3.1 reports the semiotic elements of the Nikon FG and Table 3.2 reports the semiotic elements of the Kyocera Samurai.

Table 3.1 Semiotic elements of the NIKON FG

Hand/finger contact points:

- hand grip
- shutter release
- focus ring
- film advance lever
- film rewind crank
- film thread track
- film rewind button
- battery access
- lens mounting
- lens release button
- timer lever
- exposure compensation dial
- lens cover release.

Eye contact points (inside the view finder):

- focusing lines
- shutter speed LEDs
- flash ready indicator.

Eye contact points (on the surface of the camera):

- viewfinder
- frame number
- shutter speed
- film ASA/ISO
- compensation factor
- lens aperture/f-stop.

Textures:

Colors:

Table 3.2 Semiotic elements of the KYOCERA SAMURAI X3.0

In comparison with elements of the Nikon FG:

yes - element exists

no - does not exist, with alternative given

1, 2, 3 - subjective rating of element based on potential for improvement with respect to any aspect of semiotic theory described above (See Chapter 2.2 and 2.3).

1 = high rating, no potential for improvement

2 = mid rating

3 = low rating, potential for improvement indicated

Hand/finger contact points:

hand grip	yes (1)
shutter release	yes (2)
focus ring	no, auto focus with auto focus activation is through half-press of shutter release (3)
film advance lever	no, auto film advance (1)
film rewind crank	no, auto film rewind (1) with mid-role film rewind by means of special control (3)
film thread track	yes (1)
film rewind button	no
battery access	yes (1)
lens mounting	no
lens release button	no
timer lever	yes, mode control button with LED display (1)
exposure compensation dial	no, auto exposure control (1)
lens cover release	yes (2)

Other hand/finger contact points:

camera on/off switch	(1)
film chamber access control	(1)
battery access control	(2)
wide-angle control	(1)
telephoto control	(1)
finger rest	(1)
viewfinder focus adjustment	(2)
date mode control	(2)
date set controls	(3)
camera mode control	(2)
camera drive control	(2)
manual film rewind control	(3)

Eye contact points (inside the view finder):

focusing lines	yes (3)
shutter speed LEDs	no, auto film exposure (1)
flash ready indicator	yes (1)

Other eye contact points (inside the view finder):

focus ready LED	(2)
-----------------	-----

Eye contact points (on the surface of the camera):

viewfinder	yes (1)
frame number	yes, (1)
shutter speed	no, auto film exposure (1)
film ASA/ISO set	no, auto film read (1)
compensation factor	no
lens aperture/f-stop	no, auto exposure (1)

Other eye contact points (on the surface of the camera):

self-timer LED	(1)
camera on/off	(1)
date LCD	(1)
camera mode LCD	(2)
camera drive LCD	(2)
film load/rewind LCD	(1)
battery status LCD	(1)
film insertion line	(1)
film ASA/ISO indicator	(2)

Textures:

finger rest pad and wide/tele controls
are soft rubber (1)
focus/shutter release is hard plastic (3)
thumb groove is hard plastic (3)
camera on/off is ridged (1)
bottom resting surface is ridged (1)
controls are inset (1)

Colors:

all black (1) except the following:
camera on/off has grey push button and when in "on"
position, a red line is visible (2)
camera mode and drive controls and manual film rewind
are light grey (2)
LEDs are red, green (2)
LCDs are black on grey screen (2)

3.2b Derived Criteria on which to Evaluate the Product

After identifying the semiotic elements, the next phase of the analysis involved evaluating the product on criteria derived from the framework presented earlier. Table 3.3 below shows the categories of the framework from which the evaluation criteria were derived.

Aspects of Functional Meaning

- information design
- internal/external metaphor
- composition theory
- human factors guidelines

Aspects of Emotional Meaning

- individual-level emotional meanings
 - product symbolism
 - consumer aesthetics
-

Table 3.3. Aspects of Meaning from the Framework for Understanding Product Meaning.
(See Chapter 2.3)

The derivation of the criteria essentially arose from the inquiry "How is (can) this aspect of product meaning (be) made evident in this product?", or, "What are the implications of this aspect of product meaning regarding this product?". Again, the focus of the following, derived questions will depend upon whether or not the analysis is being conducted for an existing product. Table 3.4 reports the criteria.

The series of questions provided for a thorough consideration of the semiotics of the product. The responses to the questions, along with the results of the user testing portion of the semiotic analysis, form the basis for the design

recommendations that follow as part of the discussion of the results of the semiotic analysis.

Table 3.4 A Semiotic analysis of a consumer product: product evaluation derived from the framework presented in Chapter 2.2 and 2.3.

Questions derived from information design:

- What information is provided by the camera?
- What information is required to take a picture?
- In what order is this information needed?
- How does the camera provide the information?
- How do you think the camera works?
- Do you want to learn more about the camera?
- Does using the camera encourage picture-taking?
- How do the parts of the camera relate to each other?
- What kind of cues or reminders does the camera give?

Questions derived from internal/external metaphor:

- Do you think the camera works the same or differently than other cameras?
- Are icons used to convey information? If so, are the icons pictures of things other than camera parts?
- Are words or labels used to convey information?

Questions derived from composition theory:

- Does the camera use points, lines and shapes? Why/How?
- Does the camera use direction, tone, colour, texture and scale? Why/How?
- Does the camera use contrast? Why/How?
- Does the camera (or camera parts) look balanced? Why/How?
- Does the camera (or camera parts) look unified? Why/How?
- Does the camera (or camera parts) look exaggerated? Why/How?
- Are parts of the camera accented? Why/How?
- How does the camera use depth? Why/How?
- Are parts of the camera repeated? Why/How?
- Is (are) the camera (or camera parts) symmetrical? Why/How?
- Is (are) the camera (or camera parts) complex or simple?
- Is (are) the camera (or camera parts) bold or subtle?

Questions derived from human factor guidelines:

- Is it easy to determine where the user's hand and eye fit in relation to the camera?

How do the controls feel to the touch of the user?
How understandable are the display icons?
Is it easy to use the controls?
Is the sequence of operation optimal for all the camera tasks?
Is the camera safe to use?

Questions derived from individual-level, emotional meanings:

Is a camera (could the camera be) a special object?
Could a situation exist where a camera would be special or important?
What kind of memories are (could be) associated with cameras?
Can the camera help to bring about feelings of control over the environment?
Can the camera help to bring about feelings of belonging to a social group?

Questions derived from product symbolism:

What does the camera bring to mind?
Where would the camera "fit in"?
What words describe the camera that "everyone" would agree upon?
What kind of person would own/buy this camera?

Questions derived from consumer aesthetics:

Can the camera be appreciated as a work of art separate from its function and status-enhancing qualities?
What kind of emotions are evoked by the camera?

The above semiotic analysis is intended to provide a means of addressing all the various contributors to the meaning of a product. The product designer can use the list of questions as a preliminary consideration of product meaning. Any aspect of product meaning, which through the responses to the questions seems to be particularly salient, can be explored more fully during the course of the design process.

The real value of the semiotic analysis is going to depend on the sensitivity of the designer's responses. One way to

support the designer's analysis of the product meaning is to discover if other people concerned with the product corroborate the view of the designer. User testing is the formalized version of asking other people what they think, if the other people are part of the target market for the product. The next section of the MDP focuses on user testing as part of the semiotic analysis of the Kyocera Samurai.

3.3 User testing

This section of the MDP describes the process used to conduct user testing as part of a semiotic analysis of a consumer product. The description is divided into: 1) an introduction, including a statement of the purpose of the user testing in the context of the semiotic analysis, 2) a methods section, in which the participants, materials, and procedure of the testing will be described, 3) a results section, and 4) a discussion section focusing on the results of the testing as part of the semiotic analysis of the product. Discussion of the semiotic analysis as a whole and the implications of its use to the theoretical framework (See Chapter 2.3) is included in Chapter 3.4.

3.3a User Testing Introduction

Semiotic theory holds that meaning exists in layers (See

Chapter 2.2a). It is therefore important that semiotic analysis address product meaning both from the point of view of the designer conducting the product evaluation, and also the point of view of the product's end user. The design of the user testing conducted here represents the end user's point of view regarding product meaning.

The purpose of the user testing is to determine consumer response to semiotic elements of the product, the Kyocera Samurai. The user testing will also substantiate the results of the product evaluation and help to establish the validity of the framework for understanding product meaning presented in Chapters 2.2 and 2.3.

The user testing is based on a three-phase model of user-product interaction. The phases of the model are as follows: 1) the initial impression based on seeing the product for the first time and exposure to any promotional material, 2) the period of use of the product, and 3) the final impression of the product that comes about through the interaction of the initial impression and the period of use. Both the initial impression (reflecting emotional meaning) and the use of the product (reflecting functional meaning) operate in the formulation of the users' final opinion of the product.

In the case of the Kyocera Samurai, it is expected that users who have a positive initial impression of the camera, and who subsequently have negative experiences with the camera, will form a less positive final impression of the camera. Conversely,

users who have a negative first impression of the camera are expected to have a more positive final impression of the camera if their interaction with the camera is positive. The cases of users with negative first impressions followed by negative experience with the camera, and users with positive first impressions followed by positive interaction, will not be explored because the user's final impression of the camera would not be expected to change through product use.

These expectations will be explored through the course of the user testing. Both the initial impression and the final impression will be measured by rating responses on a 36-item semantic differential scale of bipolar adjectives. The bipolar-adjective pairs were selected from the 66 pairs that make up the Environmental Description Scale (Kasmar, 1970). A listing of the adjective pairs with the positive and negative poles noted is included in Appendix C.

The period of use of the camera is structured around using the camera for specific tasks and identifying parts of the camera. Quality of interaction, either positive or negative, will be operationally defined as the number of failed attempts prior to successfully completing the camera tasks. The mean number of failed attempts will serve as the split between positive and negative interaction: a total of 6 or fewer errors (failed attempts) will be considered positive interaction, while 7 or more errors (failed attempts) will be considered negative interaction. Subject performance on camera parts identification

tasks will be quantified similarly.

3.3b User Testing Methods

Participants: The participants for the user testing sessions were selected to match the target market for the Kyocera Samurai, as determined by the product's promotional literature, and as stated in a consumer review of the product conducted by CBC's Marketplace (1988). As such, participants were adults with limited-to-moderate experience with 35mm photography, who possessed sufficient financial resources to purchase this type of camera. The twenty-one participants (10 male, 11 female), ranged in age from 21-50. All of the participants were employed. In addition, 5 advanced camera-users were informally tested. These trials are not included in the user testing results. Table 3.5 in Appendix D reports the frequencies of the user characteristics.

Materials: The camera that served as the test stimulus was the Kyocera Samurai X3.0 (See Chapter 3.1b). A Nikon FG was used to illustrate how a camera functions, if such an explanation was required by the subject. A Sony video camera recorder, model CCD-V9, was used to tape the test sessions.

A copy of the full package of printed test materials used for each subject can be found in Appendix E. This package includes a participation consent form, a recordings consent form, both pre-test and post-test semantic differential data forms, a camera parts identification data form, a camera tasks data form,

an interview schedule and response form, a user characteristics data form, a prototypical session script and a listing of the positive and negative poles of each of the adjective pairs. From the materials package it can be noted that the continuum between the adjective pairs was undivided when presented to the participants. Responses were later quantified against a ten-point scale.

Procedure: The procedure for this user testing was granted approval by the Ethics Committee of the Faculty of Environmental Design, The University of Calgary. The user testing procedure followed an organization corresponding to the three-phase model of user-product interaction described above. Participants first completed a pre-test measure to determine their initial impression of the camera; they then entered into a manipulation phase during which they used the camera, and finally they completed a post-test measure to determine their final impression of the camera. Beginning the test session was an introductory phase, during which the procedure was explained to the participants and each participant signed consent forms. At the conclusion of the test session, an open-ended interview was conducted. Participants were also asked to provide user-characteristic data and were given an opportunity to ask questions about the test session and the camera. Each test session lasted about 45 minutes. A detailed description of the procedure can be found in Table 3.6 in Appendix D.

Data analysis included 1) frequency distributions of the

user's characteristics, and 2) frequency distributions of their success or failure ratings for each camera task and camera parts identification, with scores based on number of attempts for successful completion. Two-tailed t-tests were done to determine if a significant difference existed between pre-test and post-test semantic differential scores. Group differences in impression of the product that were tested included positive interaction vs. negative interaction. Other group differences that were considered but not tested, due to insufficient variability in responses, were high initial impression vs. low initial impression, and high level of comfort with technology vs. low level of comfort with technology. The responses to the interview questions were not quantified, but instead were used to aid in the interpretation of the statistical measures and the user testing as a whole.

3.3c User Testing Results

Results of main effect of camera impression.

The results of a two-tailed t-test (Mean = -2.04, $p < 0.06$) revealed that there was a significant difference between overall pre- and post- interaction ratings of the camera on the semantic differential scale (See Table 3.7, Appendix D for complete results). Users rated the camera more positively after interacting with the camera. Also indicated in Table 3.7 are the seven adjective pairs on which ratings significantly increased from pre-interaction to post-interaction.

Results of the interaction effect of camera impression.

There was no significant difference between the positive and negative interaction groups in camera ratings. See Table 3.8 in Appendix D for the mean ratings. Both groups were more positive after interacting with the camera.

Results of camera performance measures.

The camera manipulation tasks in which performance was the poorest was film loading (mean = 1.8 with sd = 1.4), with poorest defined as the greatest number of failed attempts prior to successful completion of the task. Table 3.9 in Appendix D shows the results of the camera task performance. The means reported refer to the mean number of failed attempts prior to successful completion of the task.

The mean number of errors made in identifying all 14 camera parts was 3.429. The camera part on which identification was poorest was the film speed indicator. Table 3.10 in Appendix D shows the mean performance value for the 4 camera parts on which identification was poorest, along with the performance values for the remaining camera parts.

3.3d Discussion of User Testing

The overall response of users to the semiotic elements of the Kyocera Samurai was positive; upon first viewing the camera, users rated it favorably and after using it they rated it even

more favorably. Given the expectation about the interaction of initial impression and use posited in the user testing introduction (See Chapter 3.3a), it would seem that the quality of all the user's interaction with the product was positive, regardless of the number of attempts required to successfully complete the camera tasks. Even if users made many mistakes, they still liked the camera more after using it. This does not necessarily indicate a basic failure of the model of product use, but rather it reveals that there may have been other factors operating in the investigation of camera impression. Results of the user testing are indicative of the effect of several factors, but a larger sample size is required to perform the more powerful statistics required for confirmation. Three of these factors are identified and discussed in the following paragraphs:

- 1) there may have been some weakness in the measure of the quality of interaction with the product. Perhaps the period of interaction was not long enough, or the results of making a mistake not severe enough, for interaction labelled as negative to be felt and retained as negative by the individual users. Also, there may not have been sufficient variability in the quality of interaction for a difference between positive and negative interactions to be significant.

- 2) it may have been that the test situation as a whole was sufficiently positive to counteract any negative feelings arising from a negative interaction with the camera.

- 3) it may have been that the product itself was so well

Designed that nothing less than a positive interaction was possible. A comparison study between products could be used to explore this possibility.

Based on the significant increase in the ratings for seven of the adjective pairs, users thought that the camera was simpler, more beautiful, brighter, more pleasant, more attractive, more tasteful and more contemporary after using it. The increase in ratings on the adjective pairs simple/complex and contemporary/traditional are interesting to note from a semiotic perspective since these pairs are closely allied with the functional meaning of the product; simple/complex is an adjective pair reflecting elements of information design, and contemporary/traditional exemplifies composition theory. The other adjective pairs are an indication of general regard, and as such reveal that the emotional meaning of the product was heightened through using the product.

The results of the camera parts identification tasks, with the film speed indicator, the mid-role film rewind control, and the focus control showing the poorest performance, correspond to the findings of the product evaluation (See Chapter 3.2). All three of these parts had been identified as needing improvement in the product evaluation.

The results of the camera tasks, wherein film loading showed the poorest performance, were less-expected from the point of view of the product evaluation. Film loading seemed to be well-designed, given that there is a diagram, prominently located in

the canister slot, showing how the film should be positioned. However, during the user testing, the two steps to the film loading process that caused the most difficulty were positioning the film canister and inserting the film leader correctly.

This discrepancy illustrates the importance of the designer being cautious in projecting his or her own experience onto product users. The designer is likely to differ significantly from the product user with respect to several characteristics. For example, designers are product experts, with professional skills, knowledge and background. They do not necessarily experience a product in the same ways as a typical product user. Maintaining a focus toward user-centered design can help the designer to overcome the differences in personal experience that may exist between him- or herself and the expected product users.

As part of a semiotic analysis, the user testing proved to be valuable in gaining an assessment of user response to semiotic elements of the product. There were two major limitations of the user testing; the small sample size and the brevity of the test sessions. The small sample size precluded more robust results to the statistical analyses and the brevity of the test sessions negatively affected the external validity of the testing. That is, allowing users to interact with the camera for less than an hour was not very true to actual life experience with cameras.

A further problem with the user testing was that the aural component of interaction with the camera was not considered. The noises that the camera makes during operation contain a

significant information component for the camera user. Sound is used as an indicator that the film is being loaded and that the lens is moving (to focus, or to compose the shot, or to protect the lens). During the interviews, users commented that the camera both looks and sounds like a movie camera, which was a positive assessment.

The interviews were important to the user testing in that they provided yet another way of gauging user response to the semiotics of the camera. Interview comments referring to the appearance of the camera, to using the camera, and to who would buy the camera highlighted user opinions of the product that otherwise would have been buried in the semantic differential scale responses. Also, the significant difference between pre- and post-interaction measures of the semantic differential scale is more plausible given the responses of users during the interviews.

3.4 Semiotic Analysis Discussion

This section of the MDP concludes the semiotic analysis of the consumer product, with a discussion of the results of the analysis. Arising from the analysis are two areas of discussion: 1) product design recommendations, and 2) implications for use of the framework. The first addresses the results of the semiotic analysis as related to the product under investigation (Chapter 3.4a), and the second addresses the results of the semiotic analysis as related to the

framework on which the analysis was based (Chapter 3.4b).

3.4a Product Design Recommendations

The product evaluation and the user testing of the Kyocera Samurai both indicated that there were aspects of the camera that could benefit from further refinement. As determined through the product evaluation, several of the identified semiotic elements were subjectively rated as showing potential for improvement. The results of the user testing, either through the camera task performance or through the interview responses, substantiate these ratings.

The most immediately apparent of the semiotic elements of the Kyocera Samurai in need of improvement is the hand positioning for holding the camera. While the position for the right hand is hinted at with the spatial relationship between the orientation of the finger rest pad, the focus control/shutter release, and the thumb groove, it could be improved by lining the thumb groove with the same soft rubber as the finger rest pad to indicate similar function. Also, there is no clear indication that the left hand has a role to play in supporting the camera and operating the wide angle/telephoto controls. The way the controls are currently configured can readily lead the user to operate the wide angle/telephoto controls with a awkward stretch of the index finger. Given that the camera does have a significant weight (560g), it is important for the two-handed support of the camera to be maintained. A similar treatment for

the left hand as that which currently exists for the right, with the top of the camera sculpted to indicate finger placement and a thumb groove at the back of the camera, would clarify intended hand positioning without resorting to placing instructions in the camera manual.

Another of the semiotic elements of the Kyocera Samurai in need of improvement is the focus mechanism. Especially for inexperienced users (the target market for the product), there is difficulty in determining when the lens has stopped moving (due to auto-focus) and when the shutter has been released. The green LED indicator inside the viewfinder does not express clearly enough its function of indicating focus readiness. Separating the focus and shutter release controls, by aligning the focus with the wide-angle/telephoto functions, would simplify operation to a level consistent with the rest of the camera.

The third element in need of improvement is the mid-roll film rewind control. Even though this is an infrequently used control, its operation should nonetheless be evident to the camera user. Increasing the control size and placing the control such that it related to the film instead of the camera running options, could improve the ability to discern this semiotic element of the camera.

One other element which is not as easily recognized and understood as it could be is the film ISO/ASA indicator. Again, this is an element of secondary importance since the camera automatically reads and uses this information; in light of the

fact that very few users could identify this camera part on a first attempt, it could be made clearer. The best way to display the film ISO/ASA would be to make it part of the LCD display panel on the back of the camera, perhaps located by the frame number. The window onto the film canister that is currently used is decidedly less in keeping with the "hi-tech" image of the camera than the rest of the camera elements.

Colour and texture as semiotic elements are further aspects of the camera that could be more fully developed. The overall matte black finish is a major contributor to the "hi-tech" appearance of the product and as such is not in need of change; at present, the use of colour and texture for subordinate purposes is unresolved for the models that show accent colors, and almost non-existent on the all-black model. In the case of the Kyocera Samurai, the product is not so simple to use and understand that the introduction of colour and texture as elements of meaning should be seen as superfluous.

The responses to the series of questions that formed part of the product evaluation also revealed opportunities for improvement in the design of the camera, but more importantly provided a way of articulating opinions about the camera. There was some ambiguity associated with determining the degree of success with which the camera met each posed question since the questions are directed toward more general concerns, addressing the camera as a whole rather than specific camera parts. For example, with respect to the questions derived from information

design, the greatest need for improvement lies in the indication of activity sequence required to take a picture, and in the distinction between required and optional activities. These are concerns that must be addressed at the level of overall camera use. The implementation of specific improvements is equally based in the designer's conceptual approach to the camera as a design problem and in the camera as a useful object. These complexities are reflected in the design recommendations and discussion that follows.

As mentioned in the above example, two areas in need of improvement became evident through the consideration of the information design questions. These areas are: 1) the manner in which the sequence of picture-taking activities are indicated, and 2) the manner in which essential activities are distinguished from optional activities. Improvements to both areas could be made if the on/off control was more prominent, since it is the very first and most critical aspect of camera operation, independent of any conceptual model for the camera. As well, controls and displays could be grouped and distinguished according to principles of organization. For example, controls with a similar function, like the date-mode and date-set controls, could be grouped together and/or colored similarly. The camera uses automatic functions for the majority of the camera operations, which in effect is the definitive form of grouping.

From the responses gathered during the interview portion of

the user testing, virtually all the users thought that the camera looked very much unlike other cameras. Most, however, recognized that the camera operated very much like other 35mm cameras despite its unusual appearance. Also, the camera uses icons to convey many different kinds of messages on its LCD panel and most users had no problem determining the correct, if not the fullest, meaning of the icons. This indicates that from the point of internal/external metaphor, the Kyocera Samurai camera is quite successful.

Considering the Kyocera Samurai camera as a composition helps to reveal how it communicates with its users; it is through its elements of composition that the camera conveys its strong, hi-tech image. The consistency with which the camera is described as unusual, modern, and stylish leads to the conclusion that product image was not only of central importance but was also well-executed during the design of the product.

Since the outstanding examples of opportunities for improvement arising from human factors considerations have already been addressed in the earlier discussion of semiotic elements of the product (i.e., hand positioning, use of accent colour), they will not be discussed here. At a general level, however, it appears that the human factors considerations have received less of a priority treatment than the product image in the design of the camera. But, in keeping with the promotional material for the camera, and compared to standard 35mm SLR cameras, the Kyocera Samurai can truthfully call itself

ergonomically well-designed.

During the course of the interviews that were part of the user testing, it became apparent that there were individual experiences of cameras that were common to the majority of the users. Almost all the users liked having a camera around to record special events, and almost all could identify what such a special event would be. Even the individuals who personally disliked being photographed, or who said they could never take a good picture, appreciated the memories of events associated with camera images. It was very difficult for the users to distinguish between the camera and the photographs it made when discussing individual, emotional meanings of the product.

As expected with such a strong and unequivocal product image, it was easy to identify who the typical purchaser of such a camera would be, both for the users during the interviews and for the subjective assessment of the camera that was part of the product evaluation. A compound characterization of the typical buyer would be: 1) a younger adult, 2) with money to spend, 3) who likes toys, and 4) who is not afraid of technology. Product symbolism is very clearly an important aspect of meaning with regard to the Kyocera Samurai.

The questions based on consumer aesthetics that formed part of the product evaluation helped to reveal how difficult it can be to appreciate qualities inherent in a product, separate from its utility or the image it radiates to its user. The greatest value of the camera as expressed by the users and during the

product evaluation was definitely divided between its novel appearance and the photographs it could take. This leads to at least two possible conclusions: 1) that it may take a qualitatively longer period of time develop an emotional response to the camera in its own right, or 2) perhaps the whole reason for a camera to exist is so closely tied to function that its inherent value is negligible. If the Kyocera Samurai camera is some day valued as a non-functional antique, the questions of consumer aesthetics could appropriately be asked of it again.

The preceding design recommendations and discussion were meant to illustrate some of the product-related issues developing out of the semiotic analysis. The next section (3.4b) will focus on the framework-related implications of the semiotic analysis.

3.4b Implications for Use of the Framework

It became apparent through the course of the semiotic analysis that there were at least three implications for the use of the framework arising from both the methodology of the analysis and from the results. One of the most important of these is that the semiotic analysis showed that the framework could be applied to products in such a way that significant and valuable information about the product could be gained. This supports the constitution of the framework, in that all its constituents parts could meaningfully be applied to the study of the particular product.

The findings of the interview portion of the user testing, which was also based on the framework, similarly substantiated

the framework in that the users, when carefully identified as matching the target market, were able to provide thoughtful and cogent responses to the interview probes. None of the material based on the framework was regarded as nonsensical or perplexing, either to the users of the product during the user testing or to the evaluator during the product evaluation. The validity of framework was therefore tested and proven through the semiotic analysis.

A second implication for the use of the framework arose out of the results of the user testing. One finding of the testing was that users rated the camera highly positively on first seeing the camera, and then rated it even more positively after using it. This has interesting implications for the relationship between the two major divisions of the framework: the functional and emotional meanings of the product. The functionalist interpretation of this finding focuses on how the rating increased after use, indicating that functional or instrumental aspects of the product are primarily responsible for the final opinion engendered by the product. This interpretation ignores the fact that the product was considered favorably even before it was used, so the instrumental aspects of the product could not have been the sole agent of the final opinion. Instead, the position advocated in the structure of the framework, with functional and emotional meanings both contributing to the overall meaning of the product, is supported by this finding.

One further implication arising from the semiotic analysis

serves to emphasize the degree to which the parts of the framework (and the meaning of the product) are layered and interconnected. Throughout the course of the analysis, there were instances of the same information, or the same camera part, revealing different aspects of the meaning of the product when considered from different perspectives. This degree of connection attests to the appropriateness of semiotic theory providing a basis for understanding product meaning, as put forward in the framework.

This concludes the semiotic analysis of a consumer product, the Kyocera Samurai. The two main activities of the analysis, the product evaluation and the user testing, were meant to illustrate the way in which the framework could be applied to a consumer product and secondly to determine consumer response to semiotic elements of the product. Embodying these goals for the analysis were the methods employed. The employed methods were meant to be sympathetic to a semiotic approach, and as such were the methods of a conceptual theorist rather than those of an analytic scientist. Together, the goals and methods of the semiotic analysis combined to provide an articulate understanding of the meaning of the product.

4. Directions for Semiotics in Industrial Design

The main focus of this MDP has been the use of semiotics in developing an understanding of product meaning. This section of the MDP describes two additional applications of semiotics that can each enhance the activities of industrial design. Chapter 4.1 focuses on the incorporation of semiotics into design education and the design process, and Chapter 4.2 focuses on the integrative, communicative role semiotics can play between industrial design and marketing, operating together within the process of product development.

It should be noted that the following discussion of semiotics refers to semiotics as represented in the framework for understanding product meaning presented in Chapters 2.2 and 2.3, and not necessarily to the popular understandings of product semantics generally in use (see Chapter 1.2): Semiotics as represented in the framework is a more comprehensive view of product meaning than any of the popular views of product semantics, including metaphor, self-evident operation/product identification, product symbolism or product context, and so the implications of incorporating semiotics are more far-reaching

than if a narrower view of product meaning is taken. The following discussion will be most substantial if this distinction is understood and recognized as a significant difference and accepted as a significant advancement in the application of semiotic theory to industrial design.

4.1 Incorporating Semiotics into Design Education and the Design Process

While there is inherent value in the development of semiotics in industrial design as a theoretical and critical pursuit, the greatest value for semiotics in industrial design lies in its application in the design of products. Better products, better interaction between users and products, and better evaluation of products, will be proof of the value of semiotics in industrial design. For this contribution to be realized, semiotics must be incorporated into the design process, and hence into design education.

The design process is indeterminate, varying between practitioners and between projects. There is no best way for semiotics to be incorporated into the activities that collectively can be called the design process, because there is no single best process for designing which is equally applicable across all designers in all situations. Regardless of how the design process is conducted, it is important that a consideration of semiotics be part of the process.

A designer has to know about semiotics before it can be

included in his or her design activities. This is equally true whether the designer learns about semiotics as part of a formal design education, or as part of the ongoing education of the professional designer.

Incorporating semiotics into formal design education is one way of encouraging the inclusion of semiotics in the design process. If it is assumed that a formal education process is a likely way for designers to learn how to design (this is an equivocal assumption), it stands to reason that the methods a designer employs will reflect his or her education. Since the whole purpose of design education is to impart the methods, knowledge bases, and communication and other skills that together are identified as design, semiotics should be represented in the education base if it is to be effectively employed in the education-based design.

In addition to the primary purpose for incorporating semiotics into design education and the design process (providing an understanding of product meaning), a secondary purpose is also served. Semiotics serves to emphasize the importance of both user-centered design and designer awareness to the process of design.

4.1a User-centered Design

User-centered design is design in which the primary focus of the design process, and the point upon which the product is evaluated, is the end-user of the product. The product designer must commonly address several factors in the design of a product,

each of which has the legitimate potential for being the focus of the design. Some of these potential focuses include:

1) manufacturing considerations such as making the molds as simple as possible to reduce tooling costs or using a particular plastic to meet quality specifications, 2) project scheduling considerations that can limit the best product to being the product that is quickest into the market, 3) designing "green" products that emphasize the product's relationship to the natural environment, and 4) personal self-expression of the designer that can result in products that reveal more about the personality of the designer than about product use. User-centered design takes exclusive focus away from any of these competing areas and provides a rationale for integrating all the concerns manifest in the design process, always with the goal of satisfying the needs of the end-user.

The professional activity of human factors within industrial design can be seen as championing the cause of the end-user in design process, since it is the interaction of users and products that are of concern to human factors specialists. R.J. Sears (1986), ergonomist and president of the Design Consortium, describes user-centered design as "customer-value experiences", in which the experience of values as desired by the product user are the basis for the development of new products. He states that an emphasis on a product's ability to satisfy the wants and needs of users is what differentiates product designers and engineers. Rubini and Thompson (1989), a human factors

specialist and an industrial designer respectively, acknowledge the primacy of the end-user in their model of design evaluation. They recognize that factors other than the needs of the end-user, such as the demands of marketing, production, finance, and overall corporate strategy impinge on the success of any product. In response to the potential for conflicts between the factors, they put forward a model that helps to identify and evaluate the needs of all of these diverse groups.

Like human factors, semiotics could serve to emphasize the end-user as the focus during the design process. This focus on the user comes about in two ways: it is the user's interpretation of the product as a sign, that is a basic premise of product semiotics, and it is the user's multiple readings of the product that give rise to the layers of product meaning (see Sec 2.2a for a description of semiotic principles). In these two ways, semiotics provides a means of understanding, and a rationale for adopting user-centered design (in addition to that put forward by human factors). Semiotics also acts as a bridge between the conceptual stance of focusing on the end-user and actually incorporating this aim into the design of the product.

4.1b Designer Awareness

The importance of designer awareness is another concern emphasized by semiotics in the design process. Designer awareness refers to the general collection of facts, issues, and trends that constitute contemporary views of design evaluation,

of which the designer must be aware to practice good design. Semiotics helps to promote designer awareness through recognition of the fact that any product has many different layers of meaning that together compose the totality of the product. Semiotics provides a way of identifying specific elements that contribute to that totality.

The argument can be made that good designers already are aware of product semiotics, that the concern for product meaning is what makes them good designers. This may be the case, but there is little to be gained by industrial design as a profession by keeping good design a mystery. By incorporating semiotics into design education and the design process, the intuitive, personal treatment of product meaning on the part of good designers is made overt and accessible to all. Semiotics then becomes a recognized part of what is called "good design" and everyone concerned with a designed product has the opportunity for equal understanding of its meaning. This is especially true if some standard definition of what constitutes product semiotics is developed. The framework presented in Chapters 2.2 and 2.3 represents a start toward such a definition.

There is a further aspect of designer awareness that is emphasized by semiotics in the design process, especially by the semiotic principle of layers of meaning and multiple reading of the same text. One of the concerns that can be included as part of designer awareness is concern for methodologies and the changing ways in which the process of design is carried out. A

way of conducting design that is sympathetic to the semiotic principle described above is that of design in multi-disciplinary teams. Each of the different members of the team brings a different, specialized point of view to the design problem, or gives a different reading of the product as text. Rather than working on the product in isolation, the team members work together. The expected result is a product with acceptable compromises, giving the potential for enriched meaning to the end-user.

Incorporating semiotics into design education and the design process will help to ensure that product meaning is represented in the design team, in much the same way that a human factors specialist, or other consultant, is included in the design team as warranted by the particulars of the design problem. Product semiotics has great potential for improving the end-user's experience of the designed product, but that potential is predicated on product semiotics being included in the design process.

4.2 Integrating Industrial Design and Marketing through Semiotics

4.2a Industrial Design and Marketing

There is an important role for semiotics as part of the process of product development. Within the varied processes of product development, especially for iterative products based on

established technology, the two groups that have the greatest input into determining new product concepts are marketing and industrial design. Semiotics is an area of inquiry shared by marketing and industrial design. Currently, semiotics is an even more active field of academic inquiry in marketing research than it is in design research. A recently-published compendium, *Marketing Semiotics* (Umiker-Sebeok, 1987) provides a sensitive and complete presentation of the current areas of investigation. The interested reader is referred there for an overview of the field of marketing semiotics.

Semiotics could be a common language to be used by industrial design and marketing within the product development process, with semiotics facilitating communication and enhancing mutual understanding of each groups' respective contribution to new product concepts. A common language is needed to encourage an integrative approach to product development. By working together and sharing information through semiotics, industrial design and marketing could bring about better-developed, and better, products. Parenthetically, better relations between industrial design and marketing may also come about, arising from a solidarity based in the semiotic bond.

A topical letter to the editor of ID International Design, written by an automotive marketing director, illustrates the need for improved communication between industrial design and marketing (Houghton, 1990):

... In all the talk about what constitutes good or effective product design, you (ID International Design

journal) never discuss any role of marketing communications in conveying the meaning of a product for consumers. More often than not, the consumer first sees the product through advertising. Marketing communication provides a valuable tool to help consumers understand the symbolic qualities of form. If we rely on consumers to interpret and understand the design of products on their own, we relinquish control over the consumer's experience of the product, as well as his or her perception of it.

Imagery is as much a product attribute as the physical product itself. The role of marketing communications is to bridge the gap between physical reality and metaphorical value, and to help the product realize its full symbolic potential. What the product is is defined by technology; what the product means is a function of both design and what it communicates...

Product design, after all, is a foreign language to most people. So why don't we recognize that advertising can give consumers the knowledge they need to better understand and appreciate what the designer intends to communicate?

The opinion of the writer clearly points to the value and necessity of improved communication between marketing and industrial design. By focussing on product meaning, support is lent to the notion of semiotics being one vehicle of communication. Using semiotics, marketing and industrial design could together ensure that not only is the concept which the product embodies satisfactorily unified, but also that all aspects of experience of the product communicated the desired message to the user.

In addition to functioning as a common language of communication, semiotics could also operate as a common methodology between marketing and industrial design. By developing, and using, methods based on semiotic theory, the two groups together could direct the encoded meaning of the product.

A methodology based in semiotics, could, for example, encourage both groups to maintain the same focus (perhaps the end-user) as new products were developed.

One way in which semiotics could be used as a methodology jointly by industrial design and marketing in the development of new product concepts has been described by Hoshino (1987) and Kawama (1987). Hoshino has detailed an account the marketing component of the process and Kawama the design component. Hoshino begins by stating the importance to contemporary Japanese marketing of differentiating products from a non-technological perspective as well as a technological perspective. This differentiation along non-technological lines is important because of the lack of technological differences that exist among products in the market. Non-technological differences among products focus on the sensuous imagery of the product, including design, colour, brand names, and the tactile qualities of materials. Sensuous imagery aims to satisfy the psychological needs of the consumer, as opposed to the functional needs of the consumer that are met by the technological qualities of the product. Since these psychological needs are too subtle and complex to be identified by traditional marketing methods, semiotic methods are used.

Hoshino reiterates the distinction between technological and non-technological differences in his classification system for the semiotic structure of a product. He sees any product as having two kinds of meaning: 1) denotative meaning, based on the

technological and functional aspects of the product, corresponding to the consumers' physical needs, and 2) connotative meaning, a non-material and imagistic meaning corresponding to the psychological needs of the consumer. Developing new product concepts requires the assignment of a denotative meaning and a connotative meaning to a new product concept that distinguishes the new product from all competitors. Hoshino describes the way in which semiotics is used in this assignment of meaning in his discussion of a semiotic marketing process.

According to Hoshino (and not conflicting with general marketing theory), marketing is composed of the two component processes of interpretation and production. Interpretation involves considering consumer behaviors and related phenomena, interpreting the hidden meanings behind the behaviors and then understanding them. Production involves creating a new product concept from the interpreted meanings of behaviors and then making a new product based on the product concept. In this way, new products are based on interpreted behaviors, or on the consumer's underlying psychological needs as interpreted by the marketer. Semiotic methods, particularly abduction, are used firstly to uncover the psychological needs hidden in behaviour and secondly to translate the psychological needs into a new product concept (See Chapter 2.1 for a description of abduction). Once a new product concept, formulated in this manner, has been determined, it is given over to the designers who continue with

the production component of marketing by materializing the new product concept. It should be noted that not all industrial designers would agree with the procedure of being given a product concept that comes to them already formed, from outside the realm of their influence.

It is at this point that Kawama takes over the description of a semiotic methodology in industrial design and marketing. Kawama begins by providing a model (See Figure 4.1) of the relationship between semiotic marketing research and the design process. This model positions the new product concept at the junction between marketing research and the design process, and separates the information gathering activities of the marketers from the materialization activities of the designers.

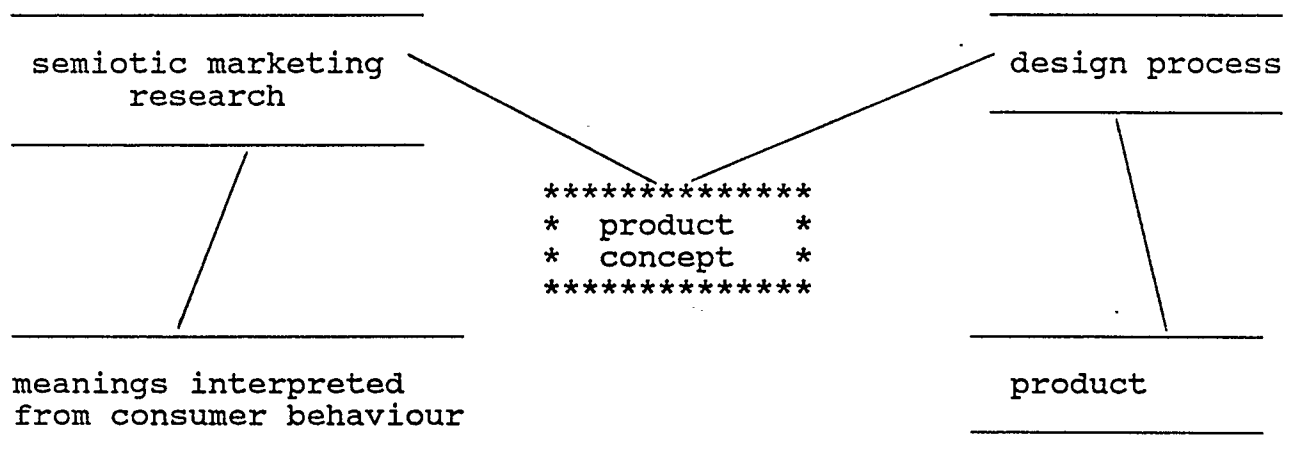


Figure 4.1 The relationship between semiotic marketing research and the design process (adapted from Kawama, p. 57)

In agreement with Hoshino, Kawama describes the design process as the means by which a product concept is transformed

into a product. The semiotic method primarily used in this transformation is inference, which is used to shift back and forth between abstract and concrete ideas related to the product concept and to develop these ideas more fully. Kawama categorizes inference as indexical inference, iconical inference, or symbolic inference and posits that iconic inference is the most useful during the design process since iconic inference is based on images (See Chapter 2.1c for a definition of indexical, iconic, and symbolic inference).

The final result of the process described by Hoshino and Kawama is a product that, through the use of semiotic methodology, is aimed at meeting the needs of the consumer. As an example of how semiotics might be employed within the process of product development, the descriptions of Hoshino and Kawama are valuable. This example is also valuable in that it firmly positions semiotics as part of the design process, encouraging designers to consider the meaning of the product they are designing. One further aspect of value arises from the constancy of the product concept between the marketing and design ends of the product development process. With the concept remaining constant, the end result should be an enhanced and unified product experience.

Arising from Hoshino and Kawama's descriptions of a semiotic methodology, however, is the potential for an even greater integration of marketing and industrial design. As the process is described by Hoshino and Kawama, the new product concept

arises from the work of the marketers and is then delivered to the designers. The opportunity exists to more fully integrate the development of the concept between the marketing and design groups. If the marketers were aware of how a potential new product concept could be physically manifested, and if the designers were aware of the consumer behaviours from which the product concept was interpreted, both groups might be able to better the product concept (and the ensuing product). This is not to say that the professional abilities and boundaries of the two groups should be eradicated, but rather that the activities of the two groups have the potential to be mutually informative. In the interests of a deeper understanding of product meaning and the enhancement of user experience that such understanding can bring about, marketing and design should share not only their individual conclusions, but also the rationales upon which such decisions are based. In this way, semiotics can help to integrate marketing and industrial design within the process of product development.

4.2b Industrial Design and Studies of Symbolic Consumption, Consumer Culture, and Social Semiotics

There is another group, operating on the periphery of the product development process, which shares with industrial designers an interest in product semiotics. This rather disparate group is united by their concern with the social meanings of products and with collections or systems of products

as reflections of the society of which they are a part. Members of this group include the marketing research areas of consumer culture and symbolic consumption, and more loosely, social semiotics. (Interested readers are referred to Hodge and Kress, 1988, for a introduction to social semiotics. Consumer culture and symbolic consumption are considered in most contemporary consumer research journals, with the Marketing Signs newsletter providing summary accounts of current research activities.)

To date, formal connections between product semiotics as part of industrial design and semiotics as part of these research areas are virtually non-existent. At a theoretical level, the potential for mutually beneficial contact exists, inasmuch as the common aim is to foster a greater understanding of what products mean to people. At a practical level, it is important for design practitioners to understand the implications of their chosen work to the society of which they are a part. It is also important for the practicing designer to be aware of how other product professionals view product meaning.

The real value of collaboration between product semiotics in design and as viewed by consumer culture, symbolic consumption, or social semiotics will depend a great deal on the specific aims, methods, and participants of the first joint projects. An increased understanding of the many levels of interaction between people and products is worthy of the effort required to initiate collaborative exploration.

5. Conclusions

In concluding this MDP, some comments will be made regarding the final outcome of the process of developing the framework for understanding product meaning that has been presented here. This will be done by way of critical commentary addressed to each of the MDP sections: the linguistic models of semiotic theory, the framework for understanding product meaning, the semiotic analysis of a consumer product, and the directions for semiotics in industrial design. Arising from these critical comments will be possible directions for the future development of product semiotics.

Conclusions Regarding the Linguistic Models of Semiotic Theory

The rationale for adopting a semiotic model as a way of understanding product meaning is based on a recognition of, and in consideration of, the product as part of a communication system. More specifically, the product is considered as a sign, and the sign is a basic unit in semiotic perspectives. The value of the product-as-sign/communication analogy has been clearly shown throughout the understanding of product semiotics that has

been put forward here. However, there are definite limits to the comparisons that can be made between language-based and product-based systems of communication. Language-based systems of communication are well-developed, systematic, and natural, and as the primary means of communication, all other forms of communication are translatable into it. Non-verbal codings of meanings, such as those found in products, are characterized by a much greater degree of temporal and contextual separation in message encoding and decoding. This is one way in which product-based communication differs from language-based communication. Therefore, rather than using the linguistic models of semiotics in any literal sense, it is most valuable to an understanding of product meaning to make use of the approach of the linguistic models of semiotics, and the basic precepts, without trying to determine the three-dimensional, product-element equivalent for every facet of linguistic and language-based communication system theory.

The abstracted version of semiotics that is used more in the service of social commentary than in the service of language-based communication systems offers a potential direction for product semiotics. Like product semiotics, this abstracted version is firmly grounded in linguistic semiotics, and it too must address differences between the distinct natures of linguistic and social communication systems. Product semiotics is a relatively new area of application of semiotic theory, if the publication of the dedicated Innovation issue (1984) is seen

to mark its beginning. As product semiotics evolves it will likely show evidence of hybridization away from the linguistic models on which it is based.

Conclusions Regarding the Framework for Understanding

Product Meaning

There are two major conclusions arising out of the development and description of the framework for understanding product meaning. The first of these concerns the two main categories of meaning defined in the framework: the functional and emotional meanings of products (See Chapter 2.3a and 2.3b). The functional meanings of products are simple to comprehend; the concept of a product having a meaning because of what it does or how it operates is in consonance with the product's structural characteristics. The emotional meanings of products, however, are not quite so easily understood, or even described. For the product designer, there are standards, guidelines and other ways to ensure that the functional meaning of the product is suitably encoded into the product. The ways in which the emotional meaning of the product are addressed by the designer are more ambiguous, and much of the success of the designer's efforts to consider the emotional meaning of a product in its design depends on the designer's sensitivity to the situation of product use.

Because the success of the product is a function of both its functional and its emotional meanings, it is imperative that the emotional meaning of the product be given fair and equal emphasis

during its design as its functional meaning. It would be easy to ill-consider the emotional meaning of a product just because it is more difficult than concentrating on the technical merits of the product, but the results of such a lack of effort could be evident, especially to the user of the product. Product designers occupy a position of responsibility, and can positively influence the quality of interaction between people and products. With an equitable consideration of all aspects of product meaning, they can help to bring about the optimal realization of the potential inherent in that interaction.

The second conclusion arising from the development and description of the framework for understanding product meaning addresses the need for further development of the theory-base of product semiotics. There is a great deal of work to be done to make product semiotics a substantive aspect of design theory. For example, the following three implications arising from the development of the framework each point to aspects of the theory of product semiotics that require further development. Each requires that particular attention be paid to the evocation of emotional responses as a function of aesthetic layering within the product:

- 1) a more complete description of the factors contributing to product meaning,
- 2) a better understanding of how meaning can be encoded into products, and
- 3) an account of how people ascribe meaning to products.

The framework represents an initial attempt to put into concrete terms an understanding of product meaning, and as such, each of the above areas is considered. However, it is not expected to be the definitive work on product semiotics, and instead should function to promote discussion that leads to the further development of the theory of product semiotics.

Conclusions Regarding the Semiotic Analysis of a Consumer Product

Arising out of the semiotic analysis of the consumer product are at least four conclusions about the importance and conduct of the semiotic analysis. Firstly, conducting the semiotic analysis showed the importance of validating any conceptual framework against an actual product. The organization and content of the framework presented here are much more easily understood, and more readily accepted, for having been successfully applied to the camera. The semiotic analysis was also important as an example of what a product designer might consider when approaching the meaning of any particular product.

The two components of the semiotic analysis, the product evaluation and the user testing, emphasised different aspects of the meaning of the product. The user testing showed the user's view of what constitutes product meaning. It showed what aspects of product meaning made sense to the product users, and showed which elements of meaning were recognizable by and important to them. The product evaluation presented an opportunity for a greater understanding of product meaning through the experience

of a process. For a product designer, a consideration of product semiotics may best come about through interaction with the product or product concept. The product evaluation provided a process for this personal involvement.

The main difference between the two components was in the point of view maintained during the analysis, with the product evaluation emphasizing the point of view of the product designer and the user testing emphasizing the point of view of the user. Both are important, since the semiotic model treats both the encoder of the message and the decoder. The differences that arose between the two points of view lead to the conclusion that a semiotic analysis is only complete if both the encoder of the meaning conveyed through a product and the decoder are both considered.

Conclusions about the semiotic analysis also arose from the methodology of the analysis. The following two conclusions are apparent from the methods of the semiotic analysis: that both the user testing and the product evaluation methodologies are in need of refinement and that the approach of a semiotic analysis requires further development. A semiotic analysis differs significantly from a scientific analysis and definitely should not be treated as such (See Chapter 3.1a for a discussion of the approach of the analysis). Given that is the case, a new paradigm must be developed to provide a collection of methods and orientations with which to conduct a semiotic analysis. The approach of the conceptual theorist, together with the modes of

reasoning of the semiotician, and some of the information-gathering techniques of the social scientist, may provide the starting point for such a paradigm.

The semiotic analysis allowed for conclusions to be drawn about the Kyocera Samurai camera, since the camera was the chosen target of the analysis. The performance of the camera for most aspects of the semiotic analysis was good, with notable exceptions being in the use of color, in the indication of hand positioning when using the camera, and in the procedure required to load film. Specific design recommendations arising from the analysis can be found in Chapter 3.4a.

Conclusions Regarding Future Directions for Semiotics in Industrial Design

The future directions of semiotics in industrial design are difficult to predict, given that the emergence of the topic as an area of design research was marked by the publication of a dedicated issue of Innovation in 1984. For anything valuable to happen, semiotics has to come to be considered as part of the regular activity of the practicing designer. Only then will there be any impetus for further development.

There are at least two possible directions for the research into semiotics and the application of semiotics in industrial design to take: 1) semiotics in industrial design may become closely-focused on the methodology of its implementation, and 2) it may become integrative in its connections with other

product professionals. There is an immediate need for both, and both are related conceptually to current developments in the field. Further, these future directions are complementary, not exclusive, and are very much inter-related.

In order for semiotics to become a regular part of the activity of the practicing designer, there needs to be a greater understanding of how to incorporate semiotics into the design process and how to impart particular meanings into products. This requires further research and the experimental application of semiotic methods to the design of products. If there is going to be any positive effect on the interaction between people and the products they use, the application of product semiotics is going to have to be developed more fully than it is at present. The semiotic analysis included in this MDP is an example of one possible direction for research into the methodology of product semiotics.

The other direction which could be explored within semiotics in industrial design is the integrative, communicative role semiotics can play between industrial design and other product professionals. The earliest stages of the product development process were emphasised in Chapter 4.2, with connections between industrial design and marketing at the concept development phase being suggested. There also exists an opportunity for semiotics to be a vehicle of integration later on in the process, especially during periods of product evaluation when a semiotic approach could provide new insight into the value of the product.

An integrative role between the application of semiotics and the application of human factors in industrial design is possible. Such an integrative role between human factors and semiotics is also likely, since the focus for both within the context of product design is on the interaction between people and the products they use. As more human factors specialists expand their realm to include cognitive as well as physical interaction, there will be greater opportunity for fruitful collaboration between semiotics and ergonomics within industrial design.

These two potential directions for semiotics in industrial design are so closely connected that what happens in one realm is sure to have influence over the other. How methodologies develop, for example, will depend to a large extent on where integration occurs. The same can be said for all the conclusions that have been drawn for all the parts of the process of developing the framework. In the end, it probably matters little wherein future development first takes place. What is important, rather, is that product semiotics has a future role in providing direction for product design. It is important that product semiotics does not degenerate, into a styling exercise for example, leaving the potential value for the betterment of user-product interaction that is inherent in the pursuit of an understanding of product meaning unfulfilled.

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APPENDIX A

APPENDIX B

APPENDIX B

Semiotic Elements of the Kyocera Samurai X3.0

Slide number	Description
1.	The three color options of the Kyocera Samurai
2.	Left-side view of the Kyocera Samurai
3.	Top view of the Kyocera Samurai
4.	Front view of the Kyocera Samurai
5.	Right-side view of the Kyocera Samurai
6.	Control panel of the Kyocera Samurai
7.	Eye-piece of the Kyocera Samurai
8.	Position of the Kyocera Samurai in use
9.	Loading the Kyocera Samurai: camera door open
10.	Loading the Kyocera Samurai: film cannister in position

APPENDIX C

APPENDIX C

Positive (scale value = 10) and Negative Poles (scale value = 0)
of the Adjective Pairs of the Semantic Differential Scale.

Pair	Positive	Negative
1.	adequate size	inadequate size
2.	impressive	unimpressive
3.	appealing	unappealing
4.	inviting	repelling
5.	attractive	unattractive
6.	small	large
7.	beautiful	ugly
8.	modern	old-fashioned
9.	bright	dull
10.	multi-purpose	single-purpose
11.	cheerful	gloomy
12.	neat	messy
13.	clean	dirty
14.	new	old
15.	colorful	drab
16.	orderly	chaotic
17.	comfortable	uncomfortable
18.	organized	disorganized
19.	simple	complex
20.	plain	ornate
21.	contemporary	traditional
22.	pleasant	unpleasant
23.	distinctive	ordinary
24.	stylish	not stylish
25.	cheap	expensive
26.	tasteful	tasteless
27.	fashionable	unfashionable
28.	uncluttered	cluttered
29.	functional	nonfunctional
30.	unusual	usual
31.	well-scaled	poorly scaled
32.	useful	useless
33.	good colors	bad colors
34.	balanced	unbalanced
35.	good lines	bad lines
36.	well-planned	poorly-planned

APPENDIX D

Table 3.5 Summary of S's user characteristics.

Characteristic	Status	Frequency
<u>Age</u>	21-35	14
	36-50	7
<u>Gender</u>	male	10
	female	11
<u>Rolls of Film Used per Year</u>		
	4-10	10
	11-18	4
	19+	3
<u>Years Using Cameras</u>		
	2-5	4
	6+	17
<u>Use of Technology</u>		
radar detector	doesn't use	15
	use	6
personal computer for letters	doesn't use	7
	use	14
personal computer for games	doesn't use	14
	use	7
cellular phone	doesn't use	11
	use	10
telephone answering machine	doesn't use	6
	use	15
VCR	doesn't use	3
	use	18
remote control for TV	doesn't use	4
	use	17
camcorder	doesn't use	12
	use	9
remote-controlled toys	doesn't use	16
	use	5
video games	doesn't use	15
	use	6

Table 3.5 Summary of S's user characteristics, continued

<u>Cameras Used</u>		
disc camera	doesn't use	16
	use	5
cartridge camera	doesn't use	6
	use	15
instant development camera	doesn't use	7
	use	14
35mm SLR	doesn't use	6
	use	15
video still camera	doesn't use	19
	use	2
large format camera	doesn't use	18
	use	3

Table 3.6 User Testing Procedure

- I. Introduction
 - 1. introduction/welcome
 - 2. describe sequence of events for the test session
 - 3. explain consent forms and request signing
- II. Pre-test
 - 1. describe sequence of events for the pre-test phase
 - 2. show Kyocera Samurai
 - 3. request that semantic differential rating be completed
- III. Manipulation
 - 1. describe sequence of events for the manipulation phase
 - 2. inquire about camera experience; demonstrate 35mm photography as required
 - 3. allow subject to become acquainted with the Kyocera Samurai
 - 4. start videotaping
 - 5. test for performance on camera tasks
 - i. film loading
 - ii. taking close-up photo
 - iii. taking wide-angle photo
 - iv. using the timer
 - v. taking multiple shots
 - vi. taking vertically-oriented photos
 - 6. test for identification of camera parts
 - i. eye piece
 - ii. film load door
 - iii. film speed indicator
 - iv. shutter release
 - v. focus control
 - vi. wide angle control
 - vii. telephoto control
 - viii. power on/off control
 - ix. frame number
 - x. camera mode
 - xi. camera drive
 - xii. date display
 - xiii. film rewind control
- IV. Post-test
 - 1. description of sequence of events for the post-test phase
 - 2. request that semantic differential rating be completed
- V. Conclusion
 - 1. conduct interview
 - 2. request that user characteristics data sheet be completed
 - 3. answer any questions/respond to comments from subjects
 - 4. thank subjects for participating

Table 3.7 Mean of responses measuring pre- and post-interaction impressions.

Adjective Pair	Pre	Post	T-value
adequate size/inadequate size	5.4	5.7	-1.45
impressive/unimpressive	5.4	5.4	0.06
appealing/unappealing	5.0	5.5	-1.27
inviting/uninviting	5.5	5.8	-1.31
attractive/unattractive	5.3	5.7	-2.33 **
small/large	4.3	4.2	0.10
beautiful/ugly	4.5	5.2	-4.05 *
modern/old-fashioned	6.4	6.4	-0.24
bright/dull	4.3	4.9	-2.09 **
multi-purpose/single-purpose	4.3	4.5	-0.32
cheerful/gloomy	4.8	5.0	-0.79
neat/messy	6.0	6.2	-1.96
clean/dirty	6.2	6.3	-0.57
new/old	6.4	6.5	-1.02
colorful/drab	3.9	4.4	-1.99
orderly/chaotic	5.8	5.7	0.10
comfortable/uncomfortable	5.1	5.4	-1.22
organized/disorganized	5.9	6.2	-1.75
simple/complex	4.5	5.7	-4.05 *
plain/ornate	5.0	4.4	1.78
contemporary/traditional	5.9	6.3	-3.78 *
pleasant/unpleasant	5.2	5.7	-3.21 *
distinctive/ordinary	5.7	6.0	-1.47
stylish/not stylish	5.7	6.0	-1.63
expensive/cheap	2.8	2.4	1.56
tasteful/tasteless	5.5	5.9	-2.58 **
fashionable/unfashionable	5.8	5.9	-0.94
uncluttered/cluttered	5.9	6.1	-0.55
functional/nonfunctional	5.7	5.9	-0.97
unusual/usual	5.2	5.8	-1.80
well-scaled/poorly scaled	5.4	5.7	-0.78
useful/useless	5.6	5.7	-0.40
good colors/bad colors	4.9	4.9	-0.25
balanced/unbalanced	5.4	5.7	-1.13
good lines/bad lines	5.4	5.7	-1.16
well-planned/poorly planned	5.2	5.6	-0.86
total	179.4	186.8	-2.04 ***

Note: * $p < 0.001$

** $p < 0.05$

*** $p < 0.06$

Table 3.8 Mean total scores for positive and negative interactions.

	interaction		t-value
	+ve	-ve	
pre-interaction p<0.6	182	177	.5
post-interaction p<0.6	189	185	.4

Table 3.9 Mean number of failed attempts prior to successful completion of camera tasks.

Task	Mean Score (SD)
film loading	1.8 (1.4)
taking a close-up shot	1.4 (.8)
using the timer	.2 (1.2)
orienting the camera lengthwise	.7 (1)
taking multiple shots	.6 (.9)
taking a wide-angle shot	.4 (6)

Table 3.10 Mean number of failed attempts prior to successful identification of camera parts.

Camera Part	Mean Score (SD)
film speed indicator	1.0 (.9)
mid-roll film rewind control	.9 (.8)
focus control	.90 (.8)
camera drive	.71 (.4)
camera mode	.38 (.5)
date display	.29 (.4)
film load door	.19 (.4)
frame number	.14 (.5)
wide angle control	.09 (.8)
eye piece	.05 (.2)
shutter release	.05 (.2)
lens	0
telephoto control	0
power on/off	0
total score	3.4 (1.2)

APPENDIX E

user testing materials

testing package to include the following:

1. participation consent form
2. recording consent form
3. pre-test semantic differential sheet
4. post-test semantic differential sheet
5. demographics data sheet
6. parts of the camera identification list
7. task recording sheet
8. post-test interview questions

CONSENT FORM

CAMERA USE STUDY
EDIE ADAMS, PRINCIPAL INVESTIGATOR
INDUSTRIAL DESIGN PROGRAM
FACULTY OF ENVIRONMENTAL DESIGN
THE UNIVERSITY OF CALGARY

I voluntarily agree to participate in this study of camera use being conducted by Edie Adams, a graduate student in Industrial Design, Faculty of Environmental Design at The University of Calgary. I understand that the purpose of the study as explained to me by the investigator is to observe users' interactions with a product to determine how product users assign meaning to the product. I understand that there will be several different phases to the study as described to me by the investigator and that some of the testing phases may be video-recorded.

I understand the following:

- 1) participation in the study will follow the procedure described to me by the investigator,
- 2) all information I provide will be kept confidential and will not be used to identify me in any way,
- 3) all study materials will be destroyed upon successful completion of the research project,
- 4) any recordings of my participation will be erased at once at my request,
- 5) I am not compelled to answer any question or provide any information requested,
- 6) danger of physical and psychological risk due to participation in the study is negligible,
- 7) I have a right to a summary of the results of the study,
- 8) I am free to withdraw from the study at any time,
- 9) I will not receive remuneration for my participation in the study.

My willingness to participate in this camera use study is indicated by my signature.

Signature:

Date:

Name (please print):

CONSENT FORM
USE OF RECORDINGS

I understand that this user study is part of a Master's Degree Project (MDP) and as such it may be useful to use excerpts of the video recording for purposes of illustration or example in the MDP document and defense presentation. I understand that my permission will be sought and must be granted before any recordings of me will be used. If recordings of me are to be used, I understand the following:

- 1) I will see the picture as it will be used prior to its use in the MDP document or defense presentation,
- 2) I am under no obligation to agree to the use of any recording,
- 3) my agreement with the conditions of use of recordings stated here is separate from my agreement to participate in the study.

My understanding of the conditions of use of recordings is indicated by my signature below. I understand that if recordings of my participation in the testing session are required for inclusion in the MDP document or defense presentation my consent will be sought at that time and must be granted before any recordings of my participation will be used.

Signature:

Date:

Name (please print):

TASKATTEMPT SUCCESSFUL

	<u>1st</u>	<u>2nd</u>	<u>3rd</u>												
1. film loading:															
1.1 orient to bottom-back corner															
1.2 locate film door release															
1.3 engage film door release															
1.4 position film roll with spool end to the right															
1.5 drop film roll into place															
1.6 extend film across sprockets															
1.7 position end of film under red line															
1.8 close film door															
2. close-up:															
2.1 orient camera to subject															
2.2 engage telephoto action															
2.3 focus															
2.4 release shutter															
3. wide angle:															
3.1 orient camera to subject															
3.2 engage wide-angle action															
3.3 focus															
3.4 release shutter															
4. timer:															
4.1 engage timer drive															
4.2 orient camera to subject															
4.3 focus															
4.4 release shutter															
5. multiple shots:															
5.1 engage multiple shot drive															
5.2 orient camera to subject															
5.3 focus															
5.4 release shutter															
6. lengthwise:															
6.1 orient camera to subject															
6.2 focus															
6.3 release shutter															
Total:	/8	+	/4	+	/4	+	/4	+	/4	+	/4	+	/3	=	/27

Please look at the camera. The experimenter will show you all its' sides, but you may not handle it.

After looking at the camera, please rate the camera on the following scale. Place a mark on the line between the two adjectives to indicate how closely you think the adjective applies to the camera. For example, if the first adjective pair was

light-----dark
and you thought the camera was light, you would place your mark on the half of the line closer to the word "light". How close to the word you put your mark indicates how closely you think the word applies to the camera.

You may look at the camera as often as you wish.

adequate size-----inadequate size

impressive-----unimpressive

unappealing-----appealing

inviting-----repelling

unattractive-----attractive

large-----small

ugly-----beautiful

modern-----old-fashioned

bright-----dull

multi-purpose-----single-purpose

cheerful-----gloomy

messy-----neat

clean-----dirty

new-----old

colorful-----drab

chaotic-----orderly

comfortable-----uncomfortable

disorganized-----organized
 complex-----simple
 plain-----ornate
 contemporary-----traditional
 pleasant-----unpleasant
 ordinary-----distinctive
 stylish-----not stylish
 expensive-----cheap
 tasteless-----tasteful
 fashionable-----unfashionable
 uncluttered-----cluttered
 nonfunctional-----functional
 unusual-----usual
 well-scaled-----poorly scaled
 useless-----useful
 good colors-----bad colors
 unbalanced-----balanced
 bad lines-----good lines
 well-planned-----poorly planned

Now that you have used the camera, please rate it again on the following scale.

This time you may handle the camera, if you wish.

adequate size-----inadequate size
impressive-----unimpressive
unappealing-----appealing
inviting-----repelling
unattractive-----attractive
large-----small
ugly-----beautiful
modern-----old-fashioned
bright-----dull
multi-purpose-----single-purpose
cheerful-----gloomy
messy-----neat
clean-----dirty
new-----old
colorful-----drab
chaotic-----orderly
comfortable-----uncomfortable
disorganized-----organized
complex-----simple
plain-----ornate
contemporary-----traditional
pleasant-----unpleasant
ordinary-----distinctive

stylish-----not stylish
expensive-----cheap
tasteless-----tasteful
fashionable-----unfashionable
uncluttered-----cluttered
nonfunctional-----functional
unusual-----usual
well-scaled-----poorly scaled
useless-----useful
good colors-----bad colors
unbalanced-----balanced
bad lines-----good lines
well-planned-----poorly planned

Please provide the following information:

1. Your age:

under 20 21-35 36-50 51-65 over 65

2. Your gender:

male female

3. Which of the following do you or would you like to use?

(circle those that apply)

radar detector

personal computer for writing letters

personal computer for playing interactive games

cellular telephone

answering machine

VCR

remote control for TV

personal camcorder

remote-controlled toys

video games

4. What kinds of cameras have you used?

(circle those that apply)

disc camera

cartridge camera

instant development camera

35mm SLR

video still camera

large format camera

5. How many rolls of film do you use per year?

less than 3

4-10

11-18

more than 18

6. How many years have you been using cameras?

1 year or less

2-5 years

6 years or more

Camera parts to be identified:

CAMERA PART	ATTEMPT	SUCCESSFUL	
	1st	2nd	3rd
lens			
eye piece			
film load door			
film speed indicator			
shutter release			
focus control			
wide angle control			
telephoto control			
power on/off			
frame number			
camera mode(auto flash/night shot)			
camera drive(multiple images/timer)			
date display			
film rewind control			

Post-test interview schedule

(questions addressing general opinion)

-what do you think of the camera now that you have used it?

-is this different than what you thought about it upon first seeing it?

-do you feel encouraged to try new things with the camera?
What?

-does the camera operate like you thought it should/would?

-would you/would you not like to own this camera?

(questions addressing semiotic elements of the product)

-you said you thought the camera was ---, what elements of the camera contribute to this assessment ?

-how like/different than other cameras is the Samurai.

-what contributes to this opinion?

-what information is required to take a picture?

-how is this info provided by the camera?

-how do you think the camera works?

-do you want to learn more about the camera?

-what kind of memories do you have associated with cameras?

-describe a situation where a camera could be thought of as special

-have you ever thought of a camera as special?

-what kind of person do you think would own/buy this camera?

(question addressing the purpose of the testing)

-what do you think was the purpose of this test session?