Kansei Marketing and Complex Systems

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Abstract: The primary purpose of this paper is to discuss a form of sensibility-focused marketing, called Kansei marketing, from the viewpoint of systems thinking. It is known that systems thinking provides a basic understanding of system dynamics. Because system dynamics is essentially describable in terms of differential equations, it may be treated as a form of complex system. It is shown that the basic behavior involved in Kansei marketing corresponds to that of a small-world network, and therefore, that the behavior involved in Kansei-driven marketing can be explained in terms of complex systems.

Keywords: Marketing, Kansei information, Systems thinking, Small-world network, Complex system

1. INTRODUCTION

Kansei information processing (or Kansei engineering) is an emerging research area and industry originating in Japan, whose informing concepts are closely tied to Japanese culture. Kansei is a Japanese word without a direct counterpart in Western languages, so that every attempt at translation captures only some aspects of the concept.

The concept of Kansei is closely tied to the concepts of personality and sensibility, and describes, among other things, the ability that allows humans to solve problems and process information in a faster and more personal way. In every action performed by a human being, traces of his/her Kansei can be perceived; as well as in human modes of thought, problem solving, and the broader human personality. Therefore, Kansei is not a synonym for emotion (though it has affinities with emotion), but refers to the human ability to process information in ways that include but cannot be reduced to traditional logical thinking. Kansei is thus related both to problem solving and to information analysis and synthesis.

Kosaka has traditionally stressed the importance of sensibility in human interaction, aiming, from his earliest research in this area, to strengthen the relation between the customer and merchant [1,2]. More recently, Kosaka and Shiizuka have applied the study of sensibility information to the field of marketing, and obtained some useful results. They have designed a methodology to solve “Current state that did not sell” of a lot of enterprises, clarified the relevant systemic structure, and constructed a model for customer value creation activity support in companies [3,4]. Kansei marketing focuses on frameworks and techniques to create customer value and increase sales, and to generate customer stability intentionally and systematically. However, the absence of a clear model of the mechanism of Kansei marketing has, until recently, presented a barrier to the application of Kansei marketing by companies in their business practice [5].

In this study, Kansei information is employed to help clarify this mechanism, with the concept of systems thinking enabling the design of a concrete simulation model using the techniques of system dynamics theory. Such a system dynamics model is described in terms of differential equations, with typical behaviors treated as various characters in the complex system. In demonstrating that Kansei marketing may be described in terms of complex systems, a promising new field of study is indicated, which includes the application of small-world network theory to Kansei marketing. This field relates to the area of MOD (management of design), and forms a branch of Kansei engineering.

2. KANSEI INFORMATION

When value creation is pursued as a company goal, the consumer mindset forms a principal focus of study. Value creation is considered to be achieved when we, as consumers, are influenced by product design (such as the use of colors), or by sales presentations, either in person or through direct mail (DM); and all this ultimately represents a change occurring in the consumer’s mind. This change is triggered by information processed through the five senses; for example, through seeing the
product design, reading the DM text, or hearing the sales talk. As a result of this information being processed, a change occurs in the mind.

The “information appealing to Kansei”, provided by the product or service and transmitted by the marketing and sales staff, creates value by means of the senses of the consumers, who are the recipients, and thereby arouses motives for consumption. This is the mechanism of marketing and sales for achieving Kansei value creation. It follows that the “information appealing to Kansei” is the critical element in the mechanism; and if we refer to this as “Kansei information,” the design of this Kansei information becomes essential in achieving value creation in business. “Designing Kansei information” for value creation means “considering what sort of information, transmitted in what way”, is most effective in triggering such a change in consumers’ minds.

3. SIGNIFICANCE OF THE ROLE OF KANSEI INFORMATION IN DECISION-MAKING

A decision may be conceived as a discrete event, through an analysis of the act of deciding. As shown in Figure 1, the basic act of decision-making can be modeled by means of a Petri net, in terms of conditions and events [6].

Now consider Kansei information, here defined as information that stimulates our senses. Sight, hearing, touch, taste and smell are among the many sensory functions of animals and humans, which help us to perceive our external environment. Currently, there are at least nine senses generally accepted in the academic community, and some theories subdivide these into more than twenty senses. However, we will limit our present discussion to the five senses most commonly mentioned.

The following is a partial list of the various forms of information that appeal to our Kansei.

Visual Information: drawing, paintings, animation, etc.
Audio Information: music and sounds
Textual Information: text, prose, poetry, etc.
Physical Information: expressions and gestures
Figurative Information: designs
Other Information: experiences of smell, touch, taste, and others

When we receive these pieces of Kansei information through our five senses, in certain contexts, we must determine whether or not to make a decision regarding some objective, such as purchasing something. And we often encounter a situation in which such a decision cannot be made solely on the basis of logical reasoning. Thus, we will consider the more complex decision-making involving Kansei.

The design of Kansei information may involve the use of verbal information (as in the example in Section 4), visual information through images, or a combination of both. In the example in Section 4, one can gain such information from the verbal descriptions and images visually; but, of course, Kansei information can be obtained through channels other than visual perception. It can be gained through hearing, as some people would want to eat steak after hearing the sizzling sound produced by the meat on the grill; or through smell, as some would want to eat the steak because of its aroma. Kansei information can also be obtained through tactile perception, as some would want to buy a sweater because it feels nice to the touch; or through taste, as some would want to buy jam because they find a tasted sample delicious.

When effective Kansei information reaches the consumer’s brain through the senses, the information is processed and increases the willingness to make a purchase. However, not all people are influenced by specific Kansei information; such information affects the buying behavior of only a certain percentage of people who receive the information, and this percentage varies depending on the content of the information.

With the willingness to make a purchase increased, the consumer makes a decision regarding the purchase. This process involves thinking about whether the purchase will be made or which type of product will be bought. If the consumer decides to make a purchase, she takes the necessary actions induced by the provided information. Conversely, if she decides not to make a purchase, she takes no further action regarding the purchase. When the consumer decides to make a purchase, and takes the necessary actions, the seller has an opportunity to make a sale.
Thus, our Kansei information-buying behavior model illustrates the process whereby Kansei information (which is provided by an external source and reaches the consumer’s brain through her senses) increases willingness to make a purchase, which in turn leads to the consumer making a decision, then to her post-decision actions necessary to make the purchase, and then to a sale, as shown in Fig. 1.

4. DECISION-MAKING WITH KANSEI INFORMATION

Decision-making with Kansei is triggered by the reception of Kansei information, which then motivates one to make a decision. Here is an example of such decision-making, which occurred at a store selling porcelain cat banks similar to the one shown in Fig. 2 (a). At one point, the store owner accidentally dropped a cat piggy bank and made a small crack in the right ear. Since the bank was no longer salable as before, the store owner created the following point-of-purchase (POP) advertisement, which read as in Fig. 2 (b), and posted it in front of the bank:

“I am a cat. I got into an accident on March 3rd, the day of the Festival of Dolls. Ouch! I injured my right ear, but I feel better now. I’m looking for an owner who will accept me the way I am and will treat me kindly. I’m a bit clumsy but good at jokes. I would like you to be my friend.”

As a result of such POP advertisement, many customers visited the store saying, “I want a cat piggy bank with an injury on its right ear,” and the store sold such cat banks until they ran out of stock.

This exemplifies the described process of decision-making; in this case, to purchase the bank, because of the transmission of Kansei information created by the POP advertisement, and the stimulation of the Kansei of the customers who saw the advertisement [7].

5. SYSTEMS THINKING IDEAS GENERATE OPTIMAL CHOICES

A host of elements make up the decision-making process. In reductionist thinking, as shown in Fig. 3 (a), decision-making is broken down into component elements, and understanding these individual elements per se leads to an understanding of human nature and behavior, which are the higher-level components of complex decision-making. Systems thinking, on the other hand, as shown in Fig. 3 (b), conceives of thought as a system, emphasizing the causal relationships between the elements, and utilizing these relationships both to understand the characteristics of human behavior, and to qualitatively analyze decision-making. This approach is based on the notion that all human activity takes place in an open system and is influenced by the environment. For this reason, the application of systems thinking is especially appropriate when decisions are being made; and in fact, we must utilize such an approach if we are to make optimal choices. In terms of entropy, reductionist methodology generates greater entropy in the process of decision-making, while entropy is lower in systems-thinking methodology. In other words, decision-making based on systems-thinking methodology allows us to make choices that are nearer to optimal [8].

6. CAUSALITY IN SYSTEMS THINKING

We have considered a causal-relationship model linking Kansei information and sales. The model implies the possibility of increasing sales with Kansei information. Let us now consider factors (and their causal relationships) which link the activities of sellers providing Kansei information, the consumer purchasing behavior affected by them, and the resulting sales. In what follows, the term ‘sales’ refers to sales generated by an increase in consumers’ willingness to make a purchase (WTMP), induced by Kansei information.

Figure 4 shows a causal loop diagram based on the work of Kosaka and Shiizuka [7]. Sales are the result of consumers making a purchase; therefore, the greater the

![](a) Reductionism, (b) Systems thinking

Figure 3: Images of two concepts

Figure 2: Cat piggy bank with injured right ear (a), and its point of purchase advertisement (b).
number of consumers executing purchases, the greater the resulting sales. Now, purchase executions follow decisions to make purchases. Hence, the number of people making purchases increases with the number of people who have decided to make purchases. And finally, a decision to make a purchase comes after a decision-making process involving the purchase, and the process begins with consumers’ increased WTMP. Thus, in general, the greater the number of people with increased WTMP, the greater the number of people who decide to make a purchase. And in each case the inverse (lesser) also holds true.

These relationships show that the generation of sales depends on the number of people with increased WTMP. What, then, determines the number of such people? There are two factors significantly affecting the number of people whose WTMP is increased by Kansei information. The first is the number of people who receive Kansei information: the number of people experiencing increased WTMP rises with the number of people receiving Kansei information. The second factor is the degree of influence possessed by the Kansei information. We call this the “power to increase WTMP”. The stronger the power to increase WTMP, the greater the percentage (and thus the number) of people, exposed to Kansei information, who experience an increase in WTMP. And again, in each case the inverse also holds true.

Let us further examine these relationships, in light of systems thinking. We will examine whether sales generated as a result of Kansei information would have an effect on the power to increase WTMP and the number of people receiving Kansei information.

In Fig. 4, the factors inside the dotted line illustrate the relation between Kansei information and sales. However, an increase in the amount of Kansei information disseminated does not necessarily lead to a rise in the number of people with increased WTMP. This is due to the significant influence of the power of Kansei information to increase WTMP. This power, in turn, is greatly affected by how well Kansei information is designed with respect to increasing WTMP. The amount of sales is substantially influenced by the degree to which the design of Kansei information contributes to the power to increase WTMP, referred to as the “design effectiveness” of Kansei information.

Design effectiveness depends on the level of skill, in designing Kansei information, possessed by those engaging in information dissemination; and this skill level, in

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**Figure 4**: Comprehensive schematic view of the causal relationships involved in Kansei marketing activity.

(Elements inside the dotted line illustrate the relation between Kansei information and sales.)
turn, is related to the amount of Kansei-information dissemination activities.

If the amount of Kansei-information dissemination activities increases, people engaging in the activities gain more experience. As they become involved in more activities and gain more experience, they will tend to deliver more fruitful results, with, for example, increased knowledge regarding the type of POP advertisements that effectively increase the WTMP for their firm’s products. This is considered to be a result of increased experience and knowledge, leading to better design of Kansei information.

Moreover, greater levels of Kansei-information dissemination activities lead to increases not only in the skill of the individuals engaging in the activities, but also in the data, collected by a firm, which is useful in improving the performance of the activities. Such data reveals consumer buying behavior associated with the firm’s products or services; and as the amount of data increases, it becomes empirically evident which future steps will result in better performance for the firm. If a firm possesses a large amount of such data, it can choose more effective Kansei-information dissemination activities, even when people engaging in the activities are inexperienced and unskilled. In this way, the firm as a whole gains knowledge useful for Kansei-information dissemination activities, and the design effectiveness of Kansei information increases.

From the above discussion, we may represent the relevant causal loops in a more comprehensive, unified schematic view, as shown in Fig. 4.

7. SYSTEM DYNAMICS AND DIFFERENTIAL EQUATIONS

The basic structure of a formal system dynamics computer simulation model is a system of coupled, nonlinear, first-order differential (or integral) equations of the form,

\[
\frac{dx(t)}{dt} = f(x, p)
\]

where \( x \) is a vector of levels (stocks or state variables), \( p \) is a set of parameters, and \( f \) is a nonlinear vector-valued function.

The simulation of such systems is easily accomplished by partitioning simulated time into discrete intervals of length \( dt \), and stepping the system through time, one \( dt \) at a time. Each state variable is computed from its previous value and its net rate of change, \( x'(x) \):

\[
x(t) = x(t - dt) + dt \cdot x'(t - dt)
\]

The computation interval \( dt \) is selected small enough to have no discernible effect on the patterns of dynamic behavior exhibited by the model.

Forrester’s original work stressed a continuous approach; however, increasingly, modern applications of system dynamics contain a mix of discrete difference equations and continuous differential or integral equations. Some practitioners associated with the field of system dynamics work on the mathematics of such structures, including the theory and mechanics of computer simulation, analysis and simplification of dynamic systems, policy optimization, dynamical systems theory, and complex nonlinear dynamics and deterministic chaos.

The main applied work in the field, however, focuses on understanding the dynamics of complex systems, for the purpose of policy analysis and design. The conceptual tools and concepts of the field -- including feedback thinking, stocks and flows, the concept of feedback loop dominance, and an endogenous point of view -- are as important to the field as its simulation methods. Fig. 5 is a system dynamics model concerning sales, based on the relevant section of Fig. 4.

The system dynamics model can incorporate the entire causal loop shown in Fig. 4, however we have omitted the fuller model in consideration of space. Kansei marketing provides Kansei information, and, in addition, attaches importance to personal relationships. Person-to-person networks are the critical element here.

Kansei marketing thus behaves as a small-world network, and can also be described as a complex network. In the next section, we will discuss such a small-world network.

8. KANSEI MARKETING AND THE SMALL-WORLD NETWORK

Watts formulated two network invariants [10]: the average length \( L \) of the shortest paths between all pairs of nodes, and the cluster coefficient \( C \). The cluster coefficient \( C \) is given by

\[
\text{Average number of purchases per person concerned}
\]

\[
\text{Purchase such products}
\]

\[
\text{Total monthly sales of products}
\]

\[
\text{Monthly amortization}
\]

\[
\text{Figure 5: System dynamics model focusing on sales}
\]
\[ C = \frac{C_v}{k_v C_v} \]  \hspace{1cm} (4)

where \( C_v \) is the number of actual edges on the network, and \( k_v C_v \) is the total number of edges for every two nodes, except for node \( v \) (as shown in Fig. 6 (b)) which is given as follows:

\[ k_v C_v = \frac{k_v!}{2!(k_v - 2)!} \]  \hspace{1cm} (4)

Here, \( k_v \) means the total number of nodes, excepting node \( v \).

Fig. 7 shows structural change according to the randomness of the network. The small-world network is characterized by just good complexity, imparting information to a great number of people, as seen in Fig. 7.

The role of the ‘connector’ (hub) in the network is important, as shown in Fig. 8, and suggests the role of word-of-mouth in marketing; however, the precise structural role of the hub in Kansei marketing has yet to be made clear. Therefore, we shall consider some relevant factors here.

Studies of social organization suggest that communities characterized by hubs are connected by strong bonds. Strength of the enterprise and the community is decided by “Strength of bonds” of the person who belongs there, as shown in Fig. 9; and one of the aims of Kansei marketing is to encourage such strong bonds. However, weak bonds connecting two or more strong bonds are actually more important in the dissemination of information, as shown in Fig. 9.

It is necessary to examine the hub from a systemic point of view, in terms of small-world network and scale-free network theory; and a central question is, what constitutes the shortest path. Kansei marketing methodology may be refined by developing a technique for determining this shortest path.

Now, let us consider the relation between four networks with marketing implications, shown in Fig. 10.

(a) The mass network, typified by mass advertisement, is characterized by weak bonds because information transmission is overwhelmingly in one direction, with little inter-communication between component elements.

(b) The random network is characterized by essentially random communication, making prediction of the actual information transmission process difficult.

(c) In the small-world network, information transmission is characterized by horizontal relations. There is a rule or it is transmitted to the distance at a dash, and, in addition, it is transmitted to the vicinity by this in the transmission destination.

(d) In a scale-free network, information transmission is hierarchical, and centred on the hub.

Typical of the mass network are “The user’s a large amount of acquisition”, “In large quantities and advertising drop of repeat”, and “The concentration and advertising drop short-term”, and “Great impact”. In the small-world network, “The user’s qualitative acquisition”, “Layer where the transmission route is long”, “Various, different edge relations”, and “Quality of information” are critical elements. The scale-free network typically depends on “The user’s qualitative acquisition”, “The hub user’s acquisition”, “Abundant numbers of friends”, and “Preacher persuasion”.

Figure 6: Quantitative network characteristics formulated by Watts

Figure 7: Comparison of three networks

Figure 8: What is the role of the connector?

Figure 9: Strong bonds and weak bonds
9. THE GENERATION OF A NEW KANSEI MARKETING MODEL IS SIMILAR TO THAT OF A SCALE-FREE NETWORK

Figure 11 shows the generation of a scale-free network. The typical methodology of current sensitivity-focused marketing is concerned with how to transmit information on the mass network shown in Figure 10 (a). However, potential Kansei marketing in the future may be able to acquire more customers by approximating the generation of the scale-free network shown in Figure 11. Simply put, a far higher rate of information transmission can be attained, regarding a given product, if human bonds are formed with the human ‘hub’ in the system. Thus, critical to the development of an improved customer-purchase model of Kansei marketing is the model’s capacity to approximate the generation of a scale-free network.

A key element in this process is the identification of the optimal hub in the new model of Kansei marketing, in terms both of the hub’s information transmission capability and of its level of influence.

Information transmission capability principally depends on the number of communication routes connecting in the hub (or, in social terms, the abundance of the hub’s interpersonal relations), with the hub spreading the information in the natural course of its daily activities. Such hub-based information transmission contributes not only to the distribution of information but to its efficient circulation, as in the transmission of information among small groups of friends or workmates, with similar information being...
shared and reinforced by frequent and familiar contact. And when the hub connects a large number of communication routes, linking not merely individuals but such small groups together, this effect is dramatically enhanced and the information takes on an omnipresent quality. Indeed, the effect may be so great that the information becomes unevenly distributed, and stagnation results. Thus, the optimal communication strategy must broaden and nuance its focus, to embrace multiple segments in a heterogeneous system. Typically, related studies have focused on confined and homogeneous system segments; however, it is possible to take into account the flow of information between customers in different segments, by understanding the respective characters of the network where the different segments are being generated.

The level of influence of the hub is typically a more qualitative element, impacting the character of the purchase decision-making of the component members of the network. It is not enough for the hub to have abundant connections; it must also exert influence over those connections, and this influence can take various forms. A 'social' hub is one with social influence, including charismatic leader types, possessing the trust of their connections. These influence consumers' decision-making through their influential social position. An 'expert' hub is typically well-informed about the respective product (such as computers or software), and influence's purchase decision-making because of its acknowledged expertise.

Hub influence may also be categorized in terms of scale, with a 'usual hub' typically influencing small groups (up to a few dozen people), based on local leadership and/or expertise; while a 'mega-hub' typically has access to the mass media, which, though its impact tends to be more one-sided than usual-hub influence, is otherwise similarly connected.

10. PURCHASE PSYCHOLOGY IN A HUMAN NETWORK

It is well known that similarities among component members are critical to the generation of human networks. Similar characteristics such as ethnicity, home town, religion, pastimes, character, money sense, and other socio-economic values, increase a network’s ‘class character’. However, herein lies a potential weakness of such a network. If the network is an interesting-information, it has the possibility of entering over the detail. However, information might not enter at all, and other networks and sense of values, etc. be extremely away to a person interested in the network oppositely.

The most important thing is that the network be connected with other networks. As noted, human beings typically establish networks based on shared values, pastimes, etc.. The common feature should be too different reversely and a weak connection of an acquaintance not intimate and the friend be treated importantly. Because the utility value on a strong surprisingly network is kept secret there. The possibility of transmitting new information is very high. A good condition of bringing up this weak relation becomes complete with the Internet. Because even if it is not so intimate or exchanges information by E-mail and so on, we need not restrain the other party so much. It is remarkable point that the network in which it died is revived. Have not you left the network such as old friends in the school days where an interrupted correspondence died now? In such a network in which it died, an infinite possibility of expanding word of mouth exists. It is pointed out that in word of mouth marketing by an excellent enterprise, such a network in which it died has been politely reproduced one by one.

11. KANSEI MARKETING AND COMPLEX SYSTEMS

There are various definitions of a complex system. Here, it is defined a system evincing complex behavior. Kansei marketing can be obtained is the one to pay attention to the relation between people, to increase the value of a given product, and to increase sales. Thus, synoptic vision is critical. Like logical thinking, systems thinking focuses on the causal relationships between component elements, and the overall structure of the system. The essential thrust of Kansei marketing lies in its systems thinking, modeling the causal relations of system dynamics. We must have the ability to integrate science and art, and constantly remember that this is necessary in all aspects of management. However, it is critical to understand the nature assumption. A critical element here may be termed ‘Kansei-awareness’ (sensibility wear), a driving force in MOD [11]. Fig. 12 shows the overall structure of such a system.

![Figure 12: From Kansei marketing to complex system and network via systems thinking](image-url)
12. CONCLUDING REMARKS

We have considered how Kansei marketing incorporates human behavior in terms of systems thinking, enabling the construction of a system dynamics model; and shown that the effective dissemination of Kansei information has the power to influence consumer purchase decision-making. We have also proposed that Kansei marketing be understood in terms of a small-world network. This offers a fruitful avenue for further research, by enabling marketing to be discussed in terms of such networks.

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