Connectivity Model: Evaluating and Designing Social and Emotional Experiences

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Abstract: The social and emotional aspects of our daily experiences set the foundation for how we perceive interactions and how we experience artifacts, environments, and information. To design for these experiences, factors such as emotion, cognition, behavior, motivation, and the context of an activity must all be considered. This methodology can be applied to the design of artifacts, environments, information, and experience design. This methodology, called the Connectivity model, will be discussed through the context of a case study in food experience design. Food and the experience of eating are highly ritualized activities. They have cultural, social, and gender-based rules that govern the entire experience. In order to optimize an experience design for the social and emotional aspects of eating, it is important to understand and incorporate these social conventions into the entire food experience.

Key words: Connectivity model, experience design, activity theory, Kansei evaluation

1. Introduction
The Connectivity Model uses a combination of techniques to evaluate and design artifacts, environments and experiences. One technique, Kansei Engineering, is an evaluation methodology that focuses on how people respond emotionally to products, packages, and brand experiences. It addresses the question of why people like a product, package, or brand in terms of its sensory and tactile properties. Another technique, Activity theory, developed by Russian psychologist Lev Semenovish Vygotsky, provides a framework for evaluating how social, cultural, and historical conditions influence people. Activity theory has been applied to a variety of fields of study. In addition, Engeström’s human activity model has been applied to the fields of human interaction [1, 2, 3, 4], education [5], and design [6, 7, 8].

According to Engeström, “the community comprises multiple individuals and/or subgroups who share the same general object [9] and rules govern “the explicit and implicit regulations, norms and conventions that constrain actions and interactions within the activity system” [10]. The tool in the top level mediates the subject and the object in the middle level. The six components of an activity theory system are continuously developed, and reformulated by the rules of the activity system. However, Activity Theory does not take into considerations human emotion and sensitivity.

Kansei engineering was developed by Mitsuo Nagamachi at Hiroshima University about 30 years ago. [11] It is a powerful tool to access human emotions and sensitivity embedded in product development. This structure is referred to as a person’s Kansei” [12]. It focuses on how people respond emotionally to products,
packages, and brand experiences. It also addresses the intellectual and behavioral responses that people have
towards the same product, package, or brand. However, because Kansei engineering does not take into
consideration the social and cultural contexts of a design, it needs to be used in combination with Activity
Theory. This research focuses on the dual approach of incorporating Activity Theory and the Kansei evaluation
method into a new unique model of design and evaluation.

This research will show how this methodology can be used to measure the quality of an artifact,
information design, or experience design based on quantitative, qualitatively and observational data. The specific
element will be food experience design. It will look at how some foods are individual in their experience and
other foods are more social. The nature of the environment, the social connotations, the emotional expectations,
the cultural significance, and nutritional overtones will all be examined with regard to the role that they play in
the entire food experience. This case will examine how branding, package design, and product design must all
acknowledge and reinforce the target audience’s social, emotional, and cultural expectations. It will also discuss
how designers can use social, emotional, and behavioral data to make research-based design solutions in areas
such as color, typography, shape, layout, and information design. This design methodology will also take into
consideration how users’ behavior can be used to extrapolate information about their experience that is not
readily accessible through other information gathering techniques such as interviews or surveys.

2. Research Methodology

The connectivity model is a unique model based on the framework of activity theory and Kansei engineering. To
demonstrate how the connectivity model could apply to the design process, a case study is presented and an
element of design development is introduced. The case study began with a focus group that is presented in this
research. The data collected is from five different focus group studies each comprised of participants involved in
a different social snacking context. With the data from the focus group study, a small group survey was
carried out to examine how the Kansei words collected from the focus groups indicate people’s emotions,
motivations, behaviors, and cognition. An example will be presented to show how the connectivity model was
used in the design process.

3. Connectivity Model

Connectivity model is a method that uses audience analysis to understand the characteristics of a target audience,
with regard to their activities, emotions, motivations, and cognition. Experience design considers the artifact or
environment being designed as part of a larger experience. It considers the social and emotional needs of the user,
as well as the physical constraints of the project. Only those design solutions that meet these requirements will
be considered optimal solutions (Figure 1). In addition, any well formed project description that considers the
social, emotional, and physical constraints will have a plethora of optimal solutions.

The Connectivity Model, as shown in Figure 2, has been developed for this research to bridge the gap
between Kansei assessment and Activity Theory. The Connectivity Model integrates the basic relationships of
activity theory and combines them with the emotional and social aspects of Kansei assessment. This new model
contextualizes usability in terms of its social and emotional appropriateness as well as its physical and cultural
context.
According to Malcolm Gladwell, good decision-making and frugality matter. Successful decisions, he says, rely on a balance between deliberate and instinctive thinking. And by reducing a complex problem into its simplest elements, even for the most complex problems a set of identifiable underlying patterns will emerge [13].

Throughout history the mind has been viewed as a trilogy of three interdependent elements: cognition, emotion, and motivation [14]. Therefore, the Connectivity Model puts design into the context of emotion, cognition, and motivation to align with the way the mind works. To these three elements the concept of behavior is added to account for those things that can be behaviorally modified, and therefore form the basis of how we interact with our world on a physical and psychological level.

4. Case Study: Food as Experience

Food and the experience of eating are highly ritualized activities. DeVault wrote, “Food sustains social and emotional life as well as physiological being through the cultural rituals of serving and eating”[15]. Eating is not just a biological matter. Mood of individual, environment, package of food, plates, colors of food, etc, all means to eating as a personalized experience.

The broader implications of this research can be used to inform the design of food products, food marketing and branding, packaging, and the broader social and emotional experiences such as how to think about food issues such as medically necessary diets or weight loss programs. Design elements such as how to make photos or illustrations support the data findings and how to use color, typography and layout will be examined with regard to the concept of research-based design through the connectivity model.
4.1 Tostitos: Social Group Snacking

The subject of this case study was the Tostitos® Brand of chips. According to Frito Lay®, the Tostitos® product line is considered a group eating snack food. It is marketed to social group activities such as football games, family gatherings, and socialization with friends or colleagues. This is distinctly different than the marketing used by Frito Lay® for the Doritos® product line. Doritos® are considered to be an individual snack food and are marketed in very distinctive flavors and packaged in a variety of bag sizes from large quantities to individual serving sizes. Tostitos®, on the other hand, have a more neutral flavoring that is meant to appeal to larger groups of people. It is also meant to be a dipping chip and is marketed in conjunction with a variety of dip products. The Tostitos® products are packaged in large bags and are not marketed in single serving sizes. Therefore the Tostitos® assessments are done from the perspective of a group eating snack food.

4.2 Combining Methodologies

A Kansei assessment was used to evaluate the emotional and sensory richness of the chips. Qualitative data was gathered through several focus groups where the comments of the group members to a specific set of questions were recorded and later analyzed for key words or concepts. The Kansei assessment was used to inform the process of how words were selected and edited for the survey. Literature on Kansei words was used to generate the initial list and then additional words were added by the research team based on their experience as experts in the field of multi-sensory communication. Other words were added based on an analysis of the tape recordings from the focus groups. If words or concepts were mentioned that were not represented in our Kansei word list, they were then evaluated with regard to their usefulness to the survey.

In addition, Activity Theory was used as a model used to measure the social and cultural relationships of the various focus groups. To understand the role and scope of rules within various communities, a series of focus group studies were conducted in several different settings and with different demographic groups. For the focus groups, the first member of the group was identified through a random selection process. This group member was then instructed to select up to 4 additional people to fulfill the group concept such as a family, friends, or co-workers. The first person in the group was allowed to select people that were closely associated to them so that the group would truly have a cohesive and familiar character to the interactions. The first person was also allowed to select the setting for the group. This was considered important because of the social group snacking marketing position of the Tostitos® product. The specific focus group studies included a group of co-workers in an office setting, a group of friends in a tailgating setting, a family group in a home setting, and an international group of friends in a typical weekend activity setting. Each group displayed characteristics that met the criteria of the Tostitos group snacking paradigm. The participants represented a variety of age, gender, and cultural groups.

For this paper, the family snaking time focus group used for analysis and discussion using the connectivity model as a tool to measure social and emotional experience. The family group recruited for this study consisted of 3 children, a mother, and a father. Three different types of chips, restaurant style, bite size, and scoops, (Figure 3) and one salsa were provided for the family to experience.
Participants’ behaviors and actions were observed and video taped during the focus group. Voice recordings of their spoken responses to a set of questions about the emotional, physical, and sensory properties of the products and packages were also collected. The connectivity model will demonstrate how this social snacking experience is mediated through physical properties and emotional properties in social and cultural context.

4.3. Emotion and Sensory Experience

When opening a new bag of chips or a jar of salsa, the sound that the packaging makes is an auditory cue that the food is fresh. A large clear window on a plastic bag that shows the actual product is a visual indicator that the product and the brand are trustworthy and honest. For a product such as snack chips, when people see the content, they tend to trust it more [16]. Things such as the sound of the air in the bag when it is pulled open for the first time or the pop of the lid of the salsa jar are very familiar sounds that people expect as part of the total snack experience. In these ways, the design of the packaging and visual quality of the chips create a variety of emotions and experiences. Every sensory aspect of the chips and the packaging contribute to the overall experience design of the product. So in that respect, it is important to evaluate all of these various properties both individually and with regard to their relative contribution to the total social snacking experience.

When photographs of the product are used, the quality of the color and photo art direction of the photographs is very important in how people perceive the product. Based on comments and observations from the focus group, poor quality photographs create a negative impression of the quality of the product. Specifically, if the color of the photographs of the chips were too dark or had a discernable color shift, some participants commented on the lack of freshness or appeal that they got from the packaging. In some cases, the chips were even referred to as appearing stale.

Physical interaction with the products and packages were also recorded from the focus groups. With regard to the packaging, differences were observed with regard to how people open, hold, pour, and eat from the packages when in a group. These things all deal with the physical actions that take place when interacting with the chips or their packages. Some interactions were gender-based. Women tend to take on the role of hostess and will open, serve, and monitor the products in order to make the others in their group feel comfortable. Men, on the other hand, might initially serve the products but they quickly fall back into a role of a group participant. There were also differences with regard to whether the product was served from the package or poured into another type of container.

Other interactions dealt with how the chips were eaten. Some participants broke the chips before eating them. When questioned about the behavior, some participants indicated that they did not like chips that were too large to be eaten in one bite or chips that might break and spill dip on their clothing. Some participants also were observed cleaning or wiping their hands to remove the salt residue. It was also observed that people do
not like to touch or collide with others in the group when reaching for a chip or trying to put dip on their chips. They could be observed trying to gauge when it was their turn to approach the chip bag or the dip container. Other social rules such as no double dipping chips and contaminating the dip were closely observed by all participants.

When using the Connectivity Model to evaluate this experience, the sensory and emotional elements were put into two categories to measure those things that are related to the physical sensations of the body and those things that are essentially an emotional response to those physical and sensory systems. The areas that were focused on were visual, tactile, olfactory, auditory, and proprioceptive senses. The sensory category was comprised of the following variables: fresh, tasty, crispy, and crunchy, trustworthy, enjoyable, healthy, appealing, fresh, and honesty.

4.4 Social and Cultural Experience

Wives usually prepared, serve, and monitor the food [17]. In the focus group study, the foods were given yet the woman set the table. Activity Theory provides a good framework how the cultural and social context affects the interactions and experiences. In our culture, women traditionally take on a hostess role at such gatherings. This is part of the rules of society and form part of the basis of our community. According to research at Frito Lay, if the women hosting the party does not feel like she has a great enough role to play or has not properly made her guests feel special and welcome, she will feel as if she has failed. For the activity of social snacking, this means that the hostess must feel like her guests are satisfied with the foods she provides and that she is given adequate means to properly serve them. One example of how this concept can be applied to the design of packaging for a product is by putting a small photograph of the product being served in a creative or styled way on the package, thus giving the hostess an idea of how she might prepare and display the product at her social gathering.

Because people eat, drink, and interact socially with each other at a party, food is often a mediating tool to create warm and welcoming environment. Food can dictate the formality of a setting by telling us if we need to sit down and use plates or walk around and eat with our fingers. Food has the ability to give us a sense of culture and belonging. This is the case when we encounter special foods such as those served at holidays or for rituals such as a birthday cake at a party or bread served at Communion at church. In these situations, the food mediates the experience by telling us what we are expected to do and what is the desired object or outcome of the experience. This mediating aspect puts food in the role of a tool as indicated in Activity Theory. Food is often used to make people feel comfortable and slow the pace of an interaction. In the role of mediating tool, food can bring people together and can serve as a catalyst for social activities or expectations.

4.5 An Example of Food as Experience in the Connectivity Model

Food is a mediating tool in parties. Food tells people where to gathering and provides them with something in common to do. In the context of the family party, it builds stronger relationships and creates closer ties between family members. From our observations of one of the focus groups, a family snacking together, typical gender roles were observed. Even though the food was provided by the focus group facilitator, the mother took it upon herself to prepare the snack food. She poured the salsa a couple of times during the 10 minute period, brought out napkins, and kept the table clean with one of the napkins.
Opening packages, pouring chips and salsa were the major interaction components when preparing the food. The primary motivation for a woman to purchase and serve snack foods is because it makes family snacks easy to prepare. However for the children, grabbing, dipping, and eating seemed to be part of the fun. They also enjoyed choosing different shapes and sizes of chips.

The words such as fresh, crispy, crunch, tasty, and salty were used when participants described the chips and salsa. When they ate the chips, wiping hands with napkins and/or clothes were observed. The chips were powdery and women in particular seemed uncomfortable with this messy feeling. The words such as bright, eye catching, fresh, updated, and trustful were used to describe the packages and the jar. These words show how colors and images affect the feelings and emotions associated with the experience. Also the popping sound when they opened a new jar of salsa and the crunching sound of the plastic bag packaging made the food seem fresh and trustworthy. The youngest child kept asking his father to break the large chips instead of choosing the smaller bite size chips. However, most of the family members selected the smaller bite size rounded chips. The mother and daughter, however, tended to eat the scoops. The youngest child kept mentioning words such as fun, delicious, and yummy. He laughed a lot and seemed to enjoy the time spent with family eating the chips. All of the family members seemed comfortable and seemed to be having good time with snacks. The presence of the chips seemed to create a positive experience for the group. This is reinforced by the fact that most of the words and answers were positive. The mother of the family, addressed the fact that the text size of the nutrition facts on the jar is small. She expressed concern that information such as fat and calorie content should be easy to read.

The family snack area was not messy. When finished, they wrapped up the rest of chips, closed the salsa jar, and took the two bowls to away to be washed. The positive impression and good memories of a happy family could build a positive branding image for the members of the family who took part in this experience. Figure 4 shows how the packages, the jar, and chips are closely related to the sensory and emotional experiences.
The idea of comfortable, expectation, and satisfaction could be used to build brand images for this product. One interesting observation through the focus groups was the observation that food mediates the events. The family members were sitting around the food. Eating the chips created a common activity and brought out conversation that related to the food. The mood of the family event was observed as happy, fun, and loving toward each other. Everybody at the table seemed to be influenced by the mood set by the chips. The little boy in particular was excited about having different kinds of chips. Their behaviors supported the mood. In addition, their hand gestures, facial expressions, and conversation were warm and friendly.

4.4 An Example of Design Developments

Based on the results of the user assessments, it was determined that the basic characteristics of the Bite Size chips were viewed the most favorably in terms of the following five variables; taste, comfort, crispness, happiness, and ease of eating. However, Scoops received the most favorable reviews in freshness, enjoyability, crispness, and crunchiness. Combined with comments from the focus groups and a small group survey, it was determined that the smaller size of the Bite Size chips was preferred by most people. Because it is meant to be eaten in one bite, it doesn’t cause any concerns about spilling dip or double dipping the chip when snacking in groups. However, the unique shape of the Scoops chips is thought to account for its popularity in the areas mentioned. The perceived draw back of the Scoops chips comes from its larger size. Comments and observations from the focus groups found that people tend to be uncomfortable with the size and the fact that the chip cannot be eaten in one bite. Some people mentioned a concern with spilling dip from the Scoops.

The new designs developed for the chips focused on combining the smaller, one bite size of the Bite Size chips with the unique Scoop-inspired form. Other shape inspiration came from natural forms such as shells and leaves, forms that naturally contain and channel liquids. Another form consideration was the addition of a handle or a gripping area to make the chip easier to hold and dip (See Figures 5). It was also observed that many focus group participants were bothered by excessive salt and oils that collected on their hands. In order to minimize this situation, it is recommended that salt only be applied to the inner surface of the chip or possibly mixed into the corn-based substrate rather than applied to the surface of the chips.

![Figure 5 Prototyping for shapes of chips.](2254)
Based on the Kansei evaluation, the new chip should have a color and a size that is similar to that of the existing Bite Size chip. It should also incorporate a unique shape similar to what was done for Scoops. But in contrast to the Scoops design, it should have a more obvious single handle or grip area and a smaller form factor so that it can be easily eaten in one bite without dripping. It should also have a form that holds the dip inside without spillage. (Figure 6) It is hypothesized that the interior form of the chip should be approximately half the depth of the current Scoops chip. The addition of a texture to the outside of the chip is recommended to increase the ease of gripping. The addition of a texture inside the cup of the chip is recommended to make the dip adhere better and flow towards the inside the chip to decrease dripping. Another recommendation is to minimize the salt and oils on the outside of the chip or on the gripping portion. Many evaluators were disturbed by the excess oil and salt left on their hands while eating the chips. It is recommended that salt be applied only to the interior side of the chip or mixed into the dough prior to baking or frying so that it will give flavor but not come off on the hands as easily.

Figure 6 Easy grip chip shapes with a handle area and a area similar to Bite Size chips.

5. Conclusion

The findings of this research indicate that the elements in the connectivity model are measurable through qualitative and quantitative data. It was also observed that the environment and culture of the group could not be separated from an individual’s behavior [18]. This is consistent with the Activity Theory portion of this model. For future research, additional focus group studies with diverse ethnic groups will be important to understand those individual’s behavior and experiences. Also, because this was done with just one type of experience, it needs to be replicated and studied with other types of mediating tools or situations.

From a design standpoint, the Connectivity model is a powerful tool for identifying what characteristics of a design are preferred by a specific user group. The methodology is unique in its ability to quantify emotional and social feelings about a product or package into a set of design criteria that can be used to create a wide variety of new designs that can also be assessed and refined using this iterative process.

This research indicates that further studies could be done to determine more specific information about brand identity, color usage, product specifications, and social interactions between people and the food products. It is important to keep all evaluations carefully focused on social and emotional data collection by removing cognitive cues such as numeric data or traditional evaluation forms from the test environment. It is also important to make sure that focus groups represent natural social groups in actual environments. It is our conclusion, that this method represents a clear departure from traditional cognitive focus group assessments. It is also very well suited to inform the product and package design process for the development of new and unique food products. In addition, the Connectivity model clearly and easily applies to the design of any type of artifact, information design or experience design beyond this specific example.
6. References


