

AESTHETICS OF INTERACTION: DESIGN, THE AGEING AND SENSORY EXPERIENCE

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ABSTRACT

Sensory perception is the fundamental mode by which we experience product interactions. Commonly classified as vision, hearing, touch, balance, taste/smell, our senses are the first point of contact with the physical product, and should be a valuable source of information in the development and design of products. The condition of the sensory receptors alters over time, and in some instances may not be present at all due to accidents, disease, or abnormalities. There is a gradual decline in perception from the fifth decade attributed to changes in the efficiency of peripheral sense organs and in the efficiency of signal transmission within the cortex of the brain. In addition there is decline in our functional capacities due to ageing but also due to previous disease or injury from which recovery has been incomplete. As a consequence we experience increased difficulty with our interactions with products in daily life.

This provides a challenge for designers seeking to make design inclusive for an ageing population when often sources of human performance information used by design are not comprehensive and are sometimes limited to anthropometric charts and data. Design principles seek to mitigate this effect by describing broader goals for design to achieve in order to improve levels of usability.

This paper presents and discusses an approach using assessment of sensory perception along with consideration of the characteristics of sensory perception as a tool by which design can be assessed. The approach forces consideration of a broader range of sensory conditions, characteristics and modalities, keeping the designer focused on the experience and perception of the end user.

INTRODUCTION

At the beginning of the 20th Century older adults and those living with disabilities were minorities. Today people are living longer due to better nutrition, better medicine, vaccines and sanitation. In addition more people are now living with disabilities. In 2006 there were approximately 500,000 people 65 yrs and over and approximately 900,000 children under 15 yrs in New Zealand. By the mid 2020s the projected number of people over 65 is expected to reach one million while the projected number of children under 15 yrs remains relatively stable (Statistics New Zealand 2007).

A CHALLENGE FOR PRODUCT DESIGN

Information related to human dimension capability and performance in industrial design has traditionally been gained through anthropometric reference guides. These types of resources sprang from investigations (dating back to the turn of the 20th century) into the relationship of human performance to work, or for military purposes such as uniform sizing. The elderly were often not represented.

Never-the-less this information provides a valuable resource with regards to the application and selection of human dimensions and their consideration in relation to the design of products. For example the reference text: *The Measure of Man and Women - Human factors in design* (Hendry Dreyfuss Associates) has a 50 year lineage in publication (first published as: *The Measure of Man*, in 1959) and has been a staple of many ergonomics and design papers over that period. The elderly and differently abled (who are often elderly) are addressed in separate sections. This dislocation from the main reference sections requires the designer to remain attuned to being inclusive and considered in how information is integrated meaningfully into design. There is the possibility that this salient information can be overlooked by designers who may inadvertently ‘ergowash’ a design concept by taking the road of least resistance through the application of general anthropometric statistics for reasons of expediency and compliance.

Latterly broader guidelines have been established to provide a touchstone for the development of more inclusive design practice that encompasses the elderly and differently abled along with the rest of the population in the development of design solutions. The Principles of Universal Design (Copyright © 1997 NC State University, The Center for Universal Design.) provides seven general premises to attaining universally usable design solutions that are “...inclusive of all people, to the greatest possible extent, without adaptation or specialized design.”

They include:

1. Equitable use
2. Flexibility in use
3. Simple and intuitive use
4. Perceptible information
5. Tolerance for error
6. Low physical effort
7. Size and space for approach and use

Other factors of aesthetics, cost, safety, gender and cultural appropriateness must also be taken into consideration when designing. The focus is clearly on achieving high levels of usability. These principles provide immense value integrated into a design programme. They deliver broad functional and usability attributes and provide a platform from which higher levels of user experience and emotional benefit can be advanced.

SENSORY EXPERIENCE

The fourth principle of Universal Design: Perceptible Information (The Center for Universal Design, 1997) states - “The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.”

The fundamental first stage of product interaction is mediated through the sensory abilities of the end user, their sensory perception, which generates cognitive and affective experiences. Product perception through sensory feedback is a major component in the end user product appraisal that precedes the elicitation of product emotion. Sensory evaluation is connected to a set of concepts including *appraisal*, *concern* and goal oriented *objective* (Desmet 2002).

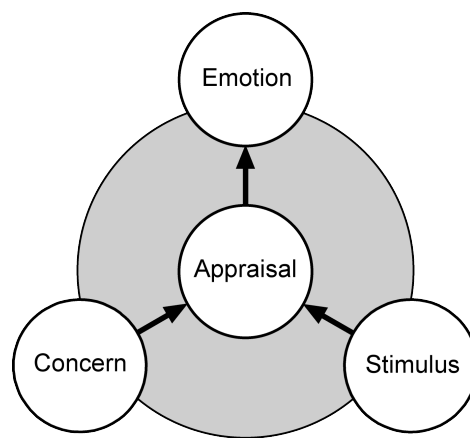


Figure 1: Desmet’s basic model of emotion.

The interplay between *stimulus* (in this case from sensory feedback) and *product concern*, which forms the basis for product appraisal, is key to understanding how design effort can affect the end user’s product perception. Understanding how decay in sensory receptors (through ageing) affects sensory perception informs design, enabling it to respond with solutions for the ageing population. Sensory perception exhibits different characteristics dependent on age, sex, and culture (Mather 2006: 343) The following characteristics can be used to describe the nature of sensory experience: *Intimacy*, *Subjectiveness* and *Temporality* (Adank & Warell 2008).

Intimacy

The intimacy of sensation is not only affected by the product type and the nature of the interaction but by the stimulus or set of stimuli that determine which senses, or sets of senses, are engaged. As a general rule, the more distant the experience of the product the fewer the senses engaged. Often vision is the first sense that comes into play. As the product experience moves closer in proximity, other sensory organs participate informing and building the intimacy of sensory experience through sensory immersion. For example, when approaching a typical rail crossing, the visual sense is engaged from afar, through flashing traffic lights. As the product experience moves closer in proximity, other sensory organs participate informing the interaction. For example, as we get closer our auditory senses perceive the sound of the alarm

bells. By using two sensory modalities to independently inform our experience we improve the communication to the end user. Taking into account the changes in sensory performance of the ageing population, a multi modal approach to product interaction would appear to provide some benefits. In this case it reduces the element of surprise by feeding information to two independent sensory organs, avoiding startling users that may have diminished sensory perception in sight or sound.

Subjectiveness

The subjectiveness of sensory perceptions gives rise to individually different experiences, mediated by factors including past experience and peer group. Where assessments of taste are at issue, the subjective perception of sensory information may be strong, as it is not mediated by an objective measure. Factors such as colour, proportions, and the overall product aesthetic, all contribute to the subjective experience. When differing levels of sensory perception are operating in an intimate environment this can give rise to subjectively different sensations. For example: the tendency for elderly women to use more perfume as olfactory sensors deteriorate can provide an over-powering sensory experience for those with full olfactory sensory capability. This provides a real challenge to design.

Temporality

Jordan (2000: 146) acknowledges the importance of considering the sensory perceptions and emotional experience of a product over time. Over time, our initial assessment of the product may be modified by subsequent interaction. We no longer notice the same stimuli as intently as we had in an earlier interaction, because we have grown used to various product characteristics such as aesthetic, feel, and operation. The modality of the sensory experience, and the importance of certain senses, changes to build a more complete ‘picture’ of the product and our experience of it.

DETERIORATION IN SENSES DURING AGEING

The physiological functioning of the sensors generally conforms to a U- shaped function, peaking in the first decade of life followed by gradual decline after the fifth decade (Mather 2006). These changes are attributed to changes in the sense organs and the signal transmission within the brain.

Vision	<ul style="list-style-type: none"> • Reduced mobility of the pupil reduces retinal illumination. • Reduced flexibility of the lens leading to longsightedness (presbyopia). • Increased light absorption by the lens reducing retinal illumination and increasing light scatter. • Degeneration of the central retina, and photoreceptor disappearance of retinal pigment resulting in progressive loss of central vision.
Hearing	<ul style="list-style-type: none"> • Decrease in efficiency of sound transmission through middle ear. • Decreased flexibility in basilar membrane. • Loss of cochlear hair cells.
Touch	<ul style="list-style-type: none"> • Reduction in skin elasticity and reduction in the number of touch

	receptors reduces touch discrimination.
Smell	<ul style="list-style-type: none"> Deterioration in the peripheral olfactory system caused by disease and the cumulative effects of inflammatory diseases.

Fig 2. Changes in sense organs. (Developed from Mather 2006)

By sampling sensory perception we are informed by the relative quality of the sensory organs of the individual, and by further considering this information in light of the differing characteristics of sensory experience we can better understand the nature of that particular product experience.

SAMPLING SENSORY EXPERIENCE

Using *Sensory Snapshot*, one of three techniques of an approach collectively described as *Five Senses Testing* (Adank and Warell, 2008), subjective information related to sensory experience can be gained. The purpose of the technique is to obtain a quick insight into the subjective experience of the end user and to present it in a graphic way that is easily understood by a designer. The results of the technique when viewed in relation to the characteristic of that sensory experience informs our understanding of product experience.

Five Senses Testing: Sensory Snapshot

Restaurant: Tsunami Sushi
Product: Ruapehu Roll

1 = highly negative
5 = highly positive

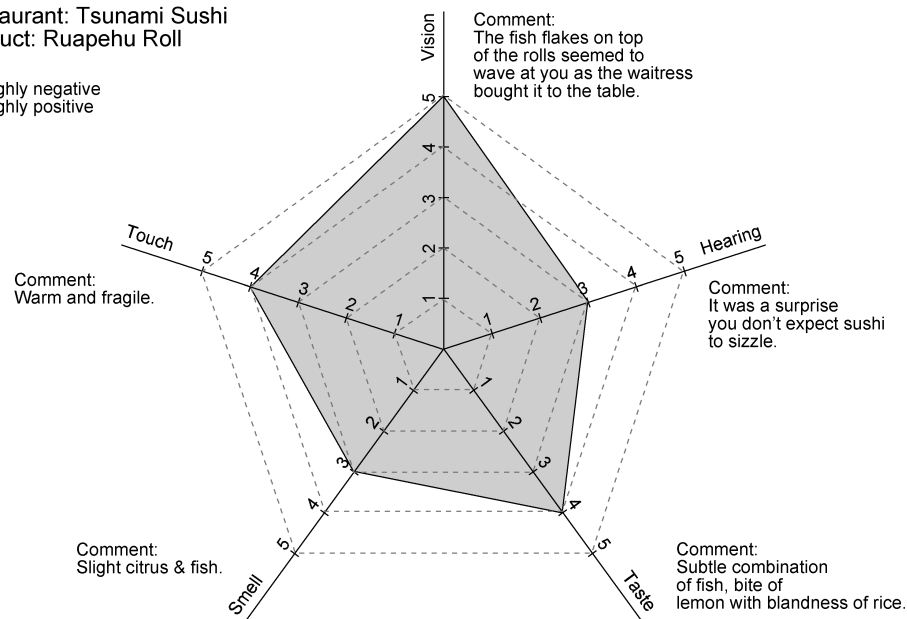


Figure 3. Example of Sensory Snapshot

In the example application (Figure 3) two female and three male students aged 25-55, used the sensory snapshot technique to evaluate the sensory modalities of lunchtime food products available from local restaurants. The diagram is for a sushi roll supplied by a restaurant called Tsunami Sushi. The sushi roll was named the *Ruapehu Roll*, after a local volcano. The Ruapehu roll was well presented and scored highly on

sight, touch and taste. Unlike many sushi rolls, this product scored for sound as it was a baked product that sizzled, to the delight of the investigation team.

The Sensory Snapshot technique identifies sensory modalities that are not performing well, or are not being used. Design activity can then be target to address these short-falls. It is fast and presents information in a format easily understood by designers. The technique applies best to an existing product or to well-developed product concepts. Because only one measure for each sense is recorded, distinctive sensory experiences, such as the sensation of simultaneously holding and writing with a pen, cannot be represented very well.

CONCLUSION

Reviewing the type of senses engaged in product interaction identifies opportunities for improving product experience by: enhancing existing stimuli or, adding other modes of stimulus to produce a richer experience for the user. Understanding the appraisal made in product interactions, by the ageing population is done so with deteriorating sensory function challenges complacency in design thinking.

REFERENCES

Adank, R.G. & Warell, A. (2008). *Exploring sensory perception, appraisal and concern: An approach to support design activity*. Design & Emotion Conference. Hong Kong.

Adank, R.G. and Warell, A. (2008). “‘Five Senses Testing’: Assessing and Predicting Sensory Experience of Product Design.” In Desmet, P.; Karlsson, M.; van Erp, J. *Design & Emotion Moves*. Cambridge Scholars Press.

Desmet, P.M.A. (2002). *Designing Emotions*. Doctoral thesis. TU- Delft.

Jordan, P.W. (2000). *Designing Pleasurable Products*. London: Taylor & Francis.

Mather, M. (2006). *Foundations of Perception*. Hove: Psychology Press.

Tilley, A.R; Hendry Dreyfuss Associates. (1993). *The Measure of Man and Woman - Human Factors in Design*. New York: Whitney Library of Design.

The Center for Universal Design (1997). *The Principles of Universal Design, Version 2.0*. Raleigh, NC: North Carolina State University.

Statistics New Zealand Tatauranga Aotearoa (October 2007). *National Population Projections 2006 (base)-2061*. Retrieved 11th May 2009 from:
<http://www.stats.govt.nz/products-and-services/hot-off-the-press/national-population-projections/national-population-projections-2006-base-hotp.htm>

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Rodney's research and teaching interests lie in: Affective design, product design/development, and ergonomics. He has supervised numerous product innovation projects with New Zealand manufacturers. His work supports a strong connection between New Zealand industry and design research with a focus on new product innovation and affective design.