doi: 10.5821/conference-9788419184849.06

ACHIEVING CUSTOMER ACCEPTANCE OF NOVEL PRODUCT FEATURES BY OFFERING CUSTOMER DELIGHT

Nuno Miguel Pereira dos Anjos VALVERDE[1], Simon SCHÜTTE[2]

[1] *Nuno Valverde, Logitech, Cork, Ireland, nvalverde@logitech.com*

[2] *Linköping University, Linköping, Sweden, simon.schutte@liu.se*

ABSTRACT

Today's markets often offer different product solutions to the same customer need. In particular, new products offer new features requiring new customer behavior. This is typically driven by technology push, environmental concerns, or legal requirements. Due to inconvenience users do not easily change their behavior and thereby reject novel products unless they offer an obvious delight in the eyes of the user. Product developers need to take this in account when designing products. Tools such as UX, Kansei Engineering and Kano model are amongst those supporting product practitioners. This is exemplified by the affective evaluation of computer mice over three generations. It can be seen that in particular women have different affective needs in comparison to men related to auditive properties of mice. Hence it is important to adjust the user panel composition in accordance with the expected effect in order to avoid biases due to lacking diversity.

Keywords: *Biases in UX, Affective Product development, computer peripherals, computer mice, Kano Model*

1 AIM

This paper aims to identify promoters and inhibitors for user acceptance and suggest tools for achieving customer acceptance and delight as well as listing general biases from affective engineering methods emerging from lack of panel diversity. While the panel size, as well as its composition in terms of age and gender is commonly reported in publications, there are other limitations that introduce inherent biases in the study outcome. This paper lists and identifies some of the most common biases potentially limiting UX studies and narrowing the scope of inputs for product design activities. These are either found in publications emerging from academia and its collaborations with different industries, as well as recognized limitations within the industry. This section aims at opening the discussion but mostly raising awareness of how easily multiple bias can limit the scope of product design and compromise the success of products and their successors. While UX studies, paired with all sorts of data analysis, including advanced and novel statistical methods, have been shown as historically proven promoters of product success, the source of their data is still the (always limited) panel of users made available to researchers. Established methods may lead product designers to meet captured user needs and address the Voice of the Customer (VoC), but design outcome might be based solely on a whisper.

Adopting new features that extend from functionality and performance towards a more experiential and user captured needs, essentially in the form of a better perceived UX, is a driver for future product success. In a simple but applied example, evolution of features within a specific product line, a high-end computer mouse and 3 of its consecutive generations, is visualized through a Kano Model. The goal is to understand how both performance and UX delighters features shift across the plot, from novel and delighter experiences to requirements across the evolution of the product itself. Moreover, how new attributes are introduced between generations as new product features or shifts in solely experiential requirements. These shifts are sourced from user-driven studies and by capturing the VoC in parallel with the design of the product itself. The Kano Model, in this example, should allow to visualize the emergence of new market trends, as well as temporal shifts in relevance and importance of specific product features.

2 INTRODUCTION

In times of environmental change, technology push, and increasing customer demands, products evolve fast. New features appear bringing with the novel functionalities and improving performance. Customers need to constantly adapt and change lifestyles and behaviour to accommodate products in their daily routines. This creates a constant emotional pressure of change which can be averse to the introduction of new features to the market. Customer satisfaction research traditionally focuses on functional needs only missing to address those emotional, affective aspects (Tontini, 2007).

Many product developers, therefore, feel they have no or little influence on the market perception of those novel products. In literature, these aspects are generally referred to as “illdefined requirements”(Cheng & Atlee, 2009; Gaspar, 2013; Valverde et al., 2019). Being able to outline those requirements, analyse and integrate with the physical product design is a key factor for successful product creation.

Industries such as automotive, hardware, consumer electronics, food, and software, among many others, see product development engineering activities closely supported by User Experience (UX) studies. User Experience emerges anywhere along the product development cycle: vision stages, where product requirements emerge by capturing Voice of Customer (VoC) and user feedback through benchmarking; product validation, such as prototypes and demonstrators, iterations closer to the final product; and capturing product performance, including through the promotion of emotional attachment and brand sense with its user base, when afforded to the market and throughout the whole of its lifecycle. While user experience inputs, from subjective feedback to objective and quantified data are analysed internally by the design actors, a lot of its source content is also readily available to the public in general. This is available via feedback given through large online retailers, social media content, tech reviews, and inherent discussions, amongst other media. Specific product usage can be captured through shared analytics, and embedded features capable of measuring product usage, e.g. battery cycle in an electronic device. Additionally, online data gathering algorithms capturing PUX feedback from online sources allow further expanding the information available to the design team.

Yet user experience studies still rely heavily on evaluation panels, segments of the population that aim to address target users at any level. From a selection of industry experts, typically those directly involved in the product development, to target users and naïve customers, UX panels can be formed and selected to specifically address different stages of the design cycle.

UX studies are very resource-intensive, both in time and cost, and their ability to capture holistic experiences is always limited and bounded by the panel itself, the source of information to the analysts. Bigger industries, such as the automotive may have resources to engage in larger UX studies and have permanently dedicated teams to do so (Enigk et al., 2008; Mauter & Katzki, 2003; Mittermeier et al., 2010), while also benefiting from long product development cycles. But such is not the case for most industries, either facing faster design to market cycles, as in the case of consumer electronics, and smaller companies that lack resources or face specialized markets. Many companies, including start-ups, launch their envisioned products based on a belief of market acceptance and in the hope of iterating the next generation aftermarket exposure – and fail.

In essence, products designed from UX data captured by a very particular panel will not address the overall market needs. And while it’s not expectable that the same product fits everyone, the underlying missing data is the ability to capture a larger share of the market or simply design better products, both key to success for any company. This was further constrained by the recent pandemic situation, leading to slower development cycles and an overall inability to directly access users for the most basic form of capturing UX: a live interview.

3 COMMON BIASES EMERGING FROM UX DUE TO LACK OF PANEL DIVERSITY

It is common to push UX studies towards research centers, universities and institutions, and market analyses specialized companies. Available funding for shared Research and Development (R&D) activities fosters this mutually beneficial engagement, including by bringing industry and academia together and promoting knowledge transfer among parties. But it's also here that UX studies find their scope inherently limited, particularly in the panel composition. In an always limited resource context, finding panellists within the same environment as the researchers is common practice, being within a company or a university. Many biases or the inhibition of achieving a holistic understanding of the market aren’t inherently introduced.

UX studies formed within a university immediately find themselves bonded to an age bias, typically centered on a younger population, students between ages 18-25 as these are those more easily available and willing to participate in such studies. Another underlying bias is education, as such studies are done among people of higher(est) levels of schooling. Research groups are also found within a specific school, e.g., design school, so a further narrowing of the population is forced upon the study if an active effort is not employed to seek out participants in other contexts (e.g. other departments). It is, important to note, however, that the design of a product directly aiming at these populations their target users can greatly benefit from such narrow scope. But certainly, this is not the general case.

Engineering activities immediately see a design bias introduced towards gender. STEM fields, particularly in mechatronics and surrounding knowledge areas, are well known to be heavily male populated. UX input is given mostly by males, biasing the design towards a male preference. In extreme, gender differences can be found in ergonomic assessments for designing a product. A well-known case is Swedish and German car seats, usually designed for the 90% percentile of the male body (Gjengedal, 2019), but with the bias further extended to the extreme as the local population is recognized by the highest average of human height. Beyond overall comfort, serious safety, and health issues have long been recognized (Hell et al., 2002; Mordaka & Gentle, 2003; Viano, 2003). Similarly, in the context of computer peripherals, computer mice were found to be designed for male hands, i.e. too big for the average female hand, being particularly relevant in Asian markets. A very particular example still in this context is left-handed people, as most are forced to use right-handed mice or, at best, symmetrical mice due to the lack of market options or equally good alternatives to their sought product. While biometrics and ergonomics provide clear examples, less evident and more subjective biases can be found in product aesthetics, functionalities, and features. From distinct aesthetic features such as choice of colours or shapes to even subtle features such as afforded haptics and acoustics, gender biases will result in differences from PUX response among users.

Some industries can have external groups of people that they resort to, representative of intended target users. In consumer electronics, early access to products is then given to these users for feedback but such usually occurs immediately before production or at its early stages where, by then, only minor updates or reviews of the product are possible. But these groups are usually composed of expert users, such as athletes, including esports (gaming), well-known tech reviewers, social media influencers, and other already well-recognized individuals within a specific field. Yet, it’s not easy to find a correlation between individual-specific feedback and a better product design. Expert users are a niche and they do not voice the overall larger audience of target users, albeit being quite capable of influencing the market and setting market trends. Here, bias can also be introduced from sponsoring, even if just due to have provided a free sample, leading to naturally more positive feedback from these users.

Industries can also resort to market study companies, which provide services in the design of UX methods and engaging with wider audiences of target users. Found to be costly, they are beneficial, particularly due to outsourcing non-available resources. However, this adds a new layer in-between the design team and their market: the partner company itself. However extensive the UX study might be, the final output is a report. As detailed as it might be, the design team still needs to analyse the provided data. And how much of the Voice of their Customer (VoC) and specific very valuable feedback is lost in plots, charts and statistical analysis will remain unknown. The UX panel is chosen, albeit predefined by the contracting company, is not necessarily an accurate representation of intended target users, just larger than what could have been done internally.

A larger bias can be found in the inability from capturing multi-cultural effects, especially in a global market. Products are now designed to be sold worldwide and internet-based stores allow easy access to foreign markets – and for people around the World to source such products. But it's here that a greater bias can be found in language differences (Fenko et al., 2010; Harzing et al., 2009; Spence & Zampini, 2006), such as the original language used to design the UX study, including in the formulation of questions or surveys to acquire data; to a different interpretation of the same UX descriptor for different cultures. The same experience adjective can be seen positively for a specific culture; while negatively for another, hence either not addressing specific market needs or resulting in a negative PUX in such markets. The food industry is a foremost example of the difficulty of understanding a different market for its products, even just by the struggle with the acceptance of a single simple design parameter: level of added salt.

4 ACHIEVING CUSTOMER ACCEPTANCE THROUGH POSITIVE CUSTOMER EXPERIENCE

Environmental restraints, legal requirements, technology push, or customer demands mean that new products more often feature new functions, modes of operation, appearance or features (Norman, 1988). This of course also affects the outline of products to accommodate those novelties. On the downside, customers can feel hesitant of using the products because it creates insecurity, unfamiliarity or just inconvenience. Those inhibitors for a quick adaptation to the new product can be critical to the product's success (Norman, 1988).

Often even small deviations from a familiar layout such as a different texture, colour, sound or smell can make buyers choosing the more traditional (a technically inferior) product over the new one. Hence, product developers try to design products in a way that they resemble older versions of the product by e.g. giving them the same design cues on all products of the same brand or at least allowing the use of accustomed mental functionality model for the new product (e.g. MS Windows desktop is simulating a manual work desk.) (Cornelius, 1996). Here, companies also aim at retaining their specific brand sense, a set of perceivable and distinct behaviour in their products that is associated with the brand's identity (Lindstrom, 2005), it aims at establishing itself as a unique experience. Again, it is not fulfilling the needs that are in cause or performance or feature offerings over competitors, it's the physical form by how this performance is delivered and, ultimately, perceived by the users. It is this form that distinguishes the experience from other brands.

Hagtvedt and Patrick (2009) claimed that luxury brands have a greater extendibility, in the sense of longer lasting as market players than value brands by virtue of their hedonic potential and promise of pleasure. These authors demonstrated that trade-offs between luxury and merely utilitarian products, such as increased cost vs. less social affirmation respectively, affects the desire to re-experience a brand. The ability to delight and the promise of pleasure in experiencing a luxury product promotes hedonic potential and favours affection towards the brand, favouring its extendibility. In contrast, even at a lesser cost, satisfying consumer's needs by means of full performant and utilitarian product which fulfil needs but is not felt as desirable as luxury leads to a restriction in its company extendibility (Hagtvedt & Patrick, 2009). One significant outcome of these authors' work is the importance of brand consistency, being product performance, sensorial cues, hedonic potential, and its ability to continuously delight.

However, when radically changing the products working principle, as in the case of the introduction of electric propulsion in Tesla's cars, the latter guidelines cannot be met. In this case, customers will unquestionably react hesitantly toward accepting the product since changing their routine behaviour of finding a charging station every time they park the vehicle is required. The goal of a product developer in those cases must then be to create strong delight aspects to convince users of the product's superiority. In the case of Tesla this will certainly be novel design features, excellent acceleration and performance attributes while promoting a sense of environmental friendliness. Inherently, driven from disruptive innovation, a new emotional experience emerges, along with a new brand sense, driving change in a very conservative industry such as the automotive.

Several product development tools can facilitate the optimal choice of concepts. In the further text a few are presented and discussed.

UX in product development

Engineering requirements are means to define intention and constraints of a design and are considered necessary inputs to the design process (Almefelt et al., 2006; Falk et al., 2014). Conceptually, design and requirements are related and interdependent (Lyytinen, 2009). Precisely defining the design problem is the aim of Requirements Engineering. Cheng and Atlee have listed (2009) generic and inherent difficulties in achieving a set of engineering requirements. From such list, emerges the notion of ill-defined requirements: ideas of what the design is supposed to achieve but remain imperfectly defined, without a clear outline, and sometimes conflicting within themselves or other requirements. However, these "must progress towards a single coherent, detailed, technical specification for the system" (Cheng & Atlee, 2009).

Hence any design process is started by a set of well-defined and ill-defined requirements, supported by technical specifications. These later are defined by engineering parameters, which are both inputs to the design process in the form of design variables, which are a final outcome of the product performance. However, product performance, by itself, cannot be entirely described by engineering parameters. To numerical product properties, it is necessary to consider non-parametric sensorial cues and emotional or satisfaction qualities. There isn't a common or shared taxonomy in the literature for these properties (Gaspar, 2013; Valverde et al., 2019). These authors revised the literature and found that formal design properties can be considered as: design parameters (Demirtas et al., 2009), design attributes (Bahn et al., 2009), design features (Han & Hong, 2003), design elements (Hsu et al., 2000), design features (Hsiao & Chen, 2006)(Hsiao & Chen, 2006), physical measures (X. Chen et al., 2009), engineering parameters

(Choi & Jun, 2007), and numerical features (H.-Y. Chen & Chang, 2009; S. C. Chen et al., 2009).

According to Gaspar(2013), there is a distinction between parameters and attributes: the first are directly related to physical properties and can be described through numerical values, while the latter involve some form of human perception. Perceived properties may be non-numerical and can be described through adjectives and descriptors (e.g. through Kansei words (Nagamachi, 1989).

The process of addressing ill-defined requirements finds value in UX studies. User experience research and its plethora of methods available to capture VoC and other subjective data, paired with proper statistical analysis, can better define such requirements and emerge with useful quantified data and even concrete specifications to drive design processes.

Kansei Engineering and affective design

Kansei Engineering and affective product design are obviously suitable tools for the integration of subjective, emotional customer demands into product design. One drawback of those development tools has been, that good emotional response can only be derived from products, customers are well accustomed to. In turn, this means, that novel product features need to be experienced well enough in order to be appreciated fully. With the latter discussed customer hesitation about new features means that evaluation of those on affective evaluation scales can only be done reliably if the users have access to prototypes allowing them sufficient time and interaction to build experience and thereby a solid opinion. If this is the case, it is possible to use Kansei Engineering in order to select relevant product features (Nagamachi, 1989; Schütte et al., 2004).

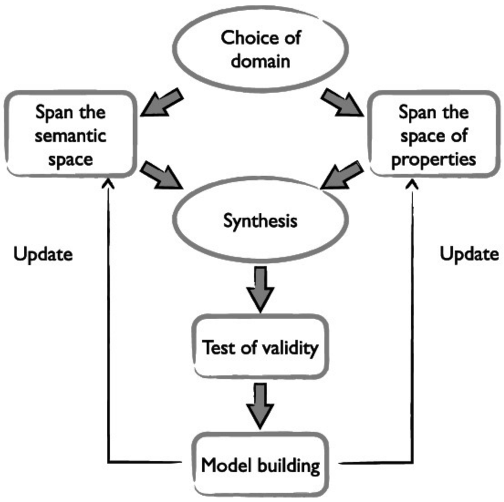

Figure 1: Kansei Engineering model (Schütte et al., 2004)

This in turn enables the product creator to select product concepts with the best combination of product features to evoke the least amount of inconvenience and at the same time create a positive attitude and in the best case a desire for the product.

Kano Model

Emerged within TQM and QFD, Kano's model is a tool that allows positioning a product by its product requirements and features regarding potential user satisfaction and achieved expectations (Kano et al., 1984). It distinguishes 3 types of product requirements:

- Must-be (or basic) requirements are those that the user expects them to be present, are inherent to the product main functionalities and are taken for granted. While these do not lead to satisfaction, they do lead to extreme dissatisfaction if unfulfilled.
- One-dimensional (or performance) requirements are those that will influence, usually proportionally, user-satisfaction. They are the product qualities characteristics that raise it above competition (comparison standards) and fulfil expectations.
- Attractive (or excitement) requirements are those that have the greatest influence in user-satisfaction, although they are not expressed or expected by the customer. They are the elements of surprise or delight in product experience. However, they do not elicit dissatisfaction if the expected functionalities are met.

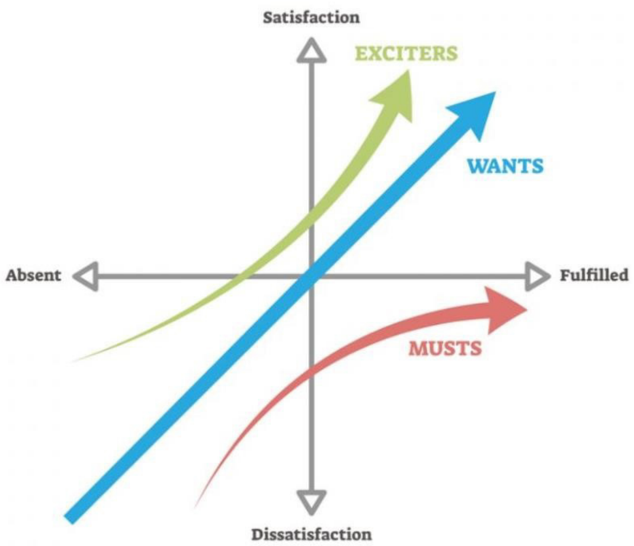

Figure 2 Kano model (Kano et al., 1984).

By using the Kano model product developers can identify potential delighters that are connected to novel product features that requires customer acceptance and subsequent user behavioral change. By emphasizing those delight factors by intuitive design, communication or even marketing, the user will be more likely to accept the new unfamiliar user patterns.

5 EXAMPLE OF KANO MODEL EVOLUTION ALONG THREE GENERATIONS OF THE HIGH-END MICE PRODUCT

Visualizing an example of the historical evolution of product features, both towards performance and UX delighters, a Kano Model is applied to a specific product line. In this case, logitech's flagship mouse MxMaster, and three of its latest generations. This product, as well the UX studies herein reported, are focused on high-end users in a professional context, such as creatives, designers, architects, engineers, programmers, accountants, and office workers in general. Focusing on the model's first quadrant only, a Kano Model is provided representing feature evolutions from MxMaster 2 to MxMaster 3 and Mx Master3S in figure Y. Along this Kano Model analysis, product features are split into four categories: features related with software used with the device and how it interacts with other devices and applications, interactions available from mouse inputs such as wheels and buttons, performance and technical specifications, and UX specific attributes. Some features are shared across multiple categories. Mouse models are depicted by different colours for each of the feature categories. Standalone labels represent either new design requirements or shifts from product to product, while overlayed labels represent features that were kept unchanged throughout the generations.

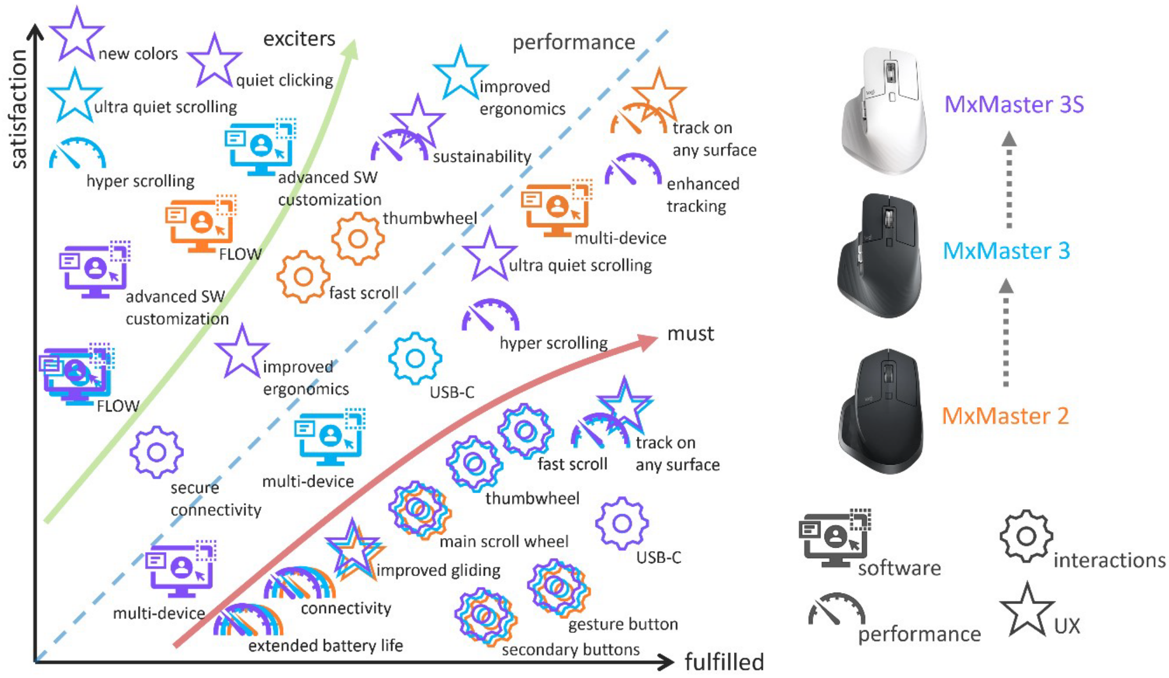

Figure 3 - Kano Model evolution from MxMaster 2 (2015) to MxMaster 3 (2019) and to MxMaster 3S (2022).

Observing the plot, new added requirements, even if related to more technical aspects in the device, can be regard as exciters when newly presented but tend to progress towards must have requirements when previously fulfilled. The novel aspect of these features justifies the increased affective response when presented in product, while it naturally evolves to an already accepted feature that users cannot do without, while no longer having an intense affective response to it. However, the removal of such feature in a new generation would potentially lead to a very negative response. This justifies why, in time, the already fulfilled features also clutter under the must have region of the model.

Focusing solely on the UX related category, Mx Master 2 saw less design entries than following generations. In fact, the number of UX related requirements has increased from generation to generation, hinting a greater influence of capturing the VoC along time. While technological progress was kept through engineering activities in improving overall product performance, product design was further complemented with more inputs from UX studies.

For the latest generation, sustainability requirements and a new quiet click for the main keys were key drivers for innovation. In the former, its relevant to mention that sustainability is not only regarded as a performance requirement, lessening the environmental impact from the company, but also an exciting UX feature valued by the users. In the latter, several specific UX studies were conducted, internally in logitech as well as externally. These not only identified a relevant market need for quieter mice but also that introducing this feature would rate very high in excitement and overall affective response for the users.

There is, however, an inherent performance aspect to mouse clicking UX, as no loss of performance, i.e., speed of clicking and accuracy can be accepted as well has no decrease in product longevity. While some adaptation to reduced audible feedback was observed, the studies showed no initial impact on user performance for quieter clicks if the haptic feedback was of a higher quality. This hints on sensorial cross-modal effects, where the lack of audible feedback can be compensated by more intense haptics, the tactile perceived mouse clicks, to form a holistic impression of feedback quality. Interesting findings were also reported about gender biases in main click haptic and audible feedback preference, with quieter and lower input user force favoured by women. In the overall, only a fringe of the population, less than 1/10 users, still preferred the more traditional and very audible click from previous generations. Data hints on an age bias towards this outcome, as these users belonged to the panellists' higher age group.

6 CONCLUSIONS

Satisfaction models are methods and tools which aim at achieving quantifiable translation of customer's needs and VoC into satisfaction related performance product requirements. In a way, they bring "the voice of the customer and the voice of the engineer closer together. While a lot of emphasis made to address user-satisfaction and, later, customer delight in product design as any company's goals, "there is a distinct lack of literature supporting the assumptions these strategies make" (Burns & Evans, 2000). Furthermore, any of these models is as good as the methodologies used to capture VoC, create its inputs and translating them (Burns & Evans, 2000). Acquiring VoC, by means of traditional surveys and inquiries, places the customer outside of real product experience. Moreover, customers may not be entirely aware of their needs or, even, adequately express themselves (Falk et al., 2014). Product designers also usually deal with more negative information (e.g. failures in previous products) and user expressions usually reaches them by numerically translated models and summarized VoC reports and tables (Burns & Evans, 2000).

Novel products feature new properties which in turn require altered customer behaviour. To make customers adapt to those products they need to agree on changed functionality. This requires a good understanding from the users' side and proper communication from the product provider's side.

This paper evaluated an evolution of such features, through a Kano Model visualization, within a specific product line. Here, amongst other performance attributes, a specific experiential requirement has emerged from UX studies specifically designed and employed within the brand to address a specific feedback cue: the feedback afforded from the mouse main keys. The outcome of recognizing, both from these studies as well as from publicly available user feedback (e.g., tech reviews and user comments on social media) was an equally performant mouse clicks but now with noticeable different feedback, one that can be described by a series of affective descriptors such as a “quiet”, “professional”, “comfortable”, “precise” and “robust” amongst others.

However, understanding new features and the necessity of their existence does not in the first place lead to customer acceptance. In order to ensure customer acceptance, each change must be accompanied by a “delight” aspect. Concretely this means that the computer mice’s quiet click in the study certainly constitute a change in how the click feedback is delivered to the user in comparison to conventional mice and therefore necessitate change of user behaviour, but at the same time the quiet work environment serves a delight factor making it worth to the user.

The theory works fine in the example stated, but there are risks involved. If the novelty is not well enough communicated by the provider or understood by the user; or if the products are “too” innovative with a highly complex novelty, users do not experience the delight aspect and hence reject the product.

As a vehicle to achieve customer delight, several tools can potentially be used. In this paper KANO model is used in the study and Kansei Engineering and UX-methodology is suggested as suitable approaches. In this context it is important to remark that evaluation of subjective impressions is possible but can be seriously hampered by a lack of panel diversity. In the UX studies performed to develop new mice, both gender and age have found to have a measurable effect on the subjective experience of clicking sound of computer mice. The importance of selecting a proper and extended panel, even if within the specific scope of a niche market (highend professional mouse users), shows how different UX outcomes can emerge from the lack of diversity in the panel itself. And if UX studies outcomes are gaining greater influence as design inputs, further care must be taken to drive product success by addressing the VoC. Not a niche VoC but a holistic VoC that expresses its target market needs, as well its continuous shifts and trends.

The authors also recognize that current context may have played a major role here, even to the point of overwhelming previously identified gender differences in the outcomes of the UX analysis for case-study given. As the design activities have taken place in the recent pandemic, where many people saw their home merging with their main workplace, a space also now continuously shared with their relatives, audible feedback cues, i.e. repetitive and frequent loud mouse clicks, may have created and, at least, enhanced the global market need for quieter computer peripherals. The global market has voiced loudly that it needed a whisper from mice clicks and the UX methods employed have properly captured it.

ACKNOWLEDGMENTS

The authors would like to express their appreciation to Logitech International S.A., for the continuous and extensive support to this research, as well as collaborating and promoting UX studies, internally and externally, as well as the plethora of mice prototypes provided along the way.

REFERENCES

Almefelt, L., Berglund, F., Nilsson, P., & Malmqvist, J. (2006). Requirements management in practice: Findings from an empirical study in the automotive industry. *Research in Engineering Design*, *17*(3), 113–134. https://doi.org/10.1007/s00163-006-0023-5

Bahn, S., Lee, C., Nam, C. S., & Yun, M. H. (2009). Incorporating Affective Customer Needs for Luxuriousness into Product Design Attributes. *Human Factors and Ergonomics in Manufacturing*, *19*(1), 105–127. https://doi.org/10.1002/hfm

Burns, A., & Evans, S. (2000). An investigation of customer delight during product evaluation. *7th International Product …*.

Chen, H.-Y., & Chang, Y.-M. (2009). Extraction of product form features critical to determining consumers' perceptions of product image using a numerical definition-based systematic approach. *International Journal of Industrial Ergonomics*, *39*(1), 133–145. https://doi.org/10.1016/j.ergon.2008.04.007

Chen, S. C., Chang, L., & Huang, T. H. (2009). Applying Six-Sigma methodology in the Kano quality model: An example of the stationery industry. *Total Quality Management & Business Excellence*, *20*(2), 153–170. https://doi.org/10.1080/14783360802622847

Chen, X., Barnes, C. J., Childs, T. H. C., Henson, B., & Shao, F. (2009). Materials' tactile testing and characterisation for consumer products' affective packaging design. *Materials & Design*, *30*(10), 4299–4310. https://doi.org/10.1016/j.matdes.2009.04.021

Cheng, B. H. C., & Atlee, J. M. (2009). Current and future research directions in requirements engineering. *Lecture Notes in Business Information Processing*, *14 LNBIP*, 11. https://doi.org/10.1007/978-3-540-92966-6_2

Choi, K., & Jun, C. (2007). A systematic approach to the Kansei factors of tactile sense regarding the surface roughness. *Applied Ergonomics*, *38*(1), 53–63. https://doi.org/10.1016/j.apergo.2006.01.003

Cornelius, R. R. (1996). *The sceince of emotion: reserach and tradition in the psychology of emotions*. Prentice Hall.

Demirtas, E. A., Anagun, a. S., & Koksal, G. (2009). Determination of optimal product styles by ordinal logistic regression versus conjoint analysis for kitchen faucets. *International Journal of Industrial Ergonomics*, *39*(5), 866–875. https://doi.org/10.1016/j.ergon.2009.06.007

Enigk, H., Foehl, U., & Wagner, V. (2008). Haptics research at Daimler AG. In *Human Haptic Perception: Basics and Applications* (pp. 453–458). https://doi.org/10.1007/978-3-7643-7612-3_37

Falk, B., Neumann, A., Simon, F., Stoll, A., & Schmitt, R. (2014). Correlation between haptically perceived quality characteristics and measured technical parameters for leather surfaces. *Technisches Messen*, *81*(1), 30–38. https://doi.org/10.1515/teme-2014-1004

Fenko, A., Otten, J. J., & Schifferstein, H. N. J. (2010). Describing product experience in different languages: The role of sensory modalities. *Journal of Pragmatics*, *42*(12), 3314– 3327. https://doi.org/10.1016/j.pragma.2010.05.010

Gaspar, J. (2013). *A contribution to understand ill-defined requirements of in-car interfaces*. Universidade de Lisboa - Instituto Superior Técnico.

Gjengedal, K. (2019). Cars are still designed for men. In *Kilden*. https://kjonnsforskning.no/en/2019/06/cars-are-still-designed-men

Hagtvedt, H., & Patrick, V. M. (2009). The broad embrace of luxury: Hedonic potential as a driver of brand extendibility. *Journal of Consumer Psychology*, *19*(4), 608–618. https://doi.org/10.1016/j.jcps.2009.05.007

Han, S. H., & Hong, S. W. (2003). A systematic approach for coupling user satisfaction with product design. *Ergonomics*, *46*(13–14), 1441–1461. https://doi.org/10.1080/00140130310001610928

Harzing, A. W., Baldueza, J., Barner-Rasmussen, W., Barzantny, C., Canabal, A., Davila, A., Espejo, A., Ferreira, R., Giroud, A., Koester, K., Liang, Y. K., Mockaitis, A., Morley, M. J., Myloni, B., Odusanya, J. O. T., O'Sullivan, S. L., Palaniappan, A. K., Prochno, P., Choudhury, S. R., … Zander, L. (2009). Rating versus ranking: What is the best way to reduce response and language bias in cross-national research? *International Business Review*, *18*(4), 417– 432. https://doi.org/10.1016/j.ibusrev.2009.03.001

Hell, W., Schick, S., Langwieder, K., & Zellmer, H. (2002). Biomechanics of Cervical Spine Injuries in Rear End Car Impacts: Influence of Car Seats and Possible Evaluation Criteria. *Traffic Injury Prevention*, *3*(2), 127–140. https://doi.org/10.1080/15389580212000

Hsiao, K. a., & Chen, L. L. (2006). Fundamental dimensions of affective responses to product shapes. *International Journal of Industrial Ergonomics*, *36*(6), 553–564. https://doi.org/10.1016/j.ergon.2005.11.009

Hsu, S. H., Chuang, M. C., & Chang, C. C. (2000). A semantic differential study of designers' and users' product form perception. *International Journal of Industrial Ergonomics*, *25*(4), 375–391. https://doi.org/10.1016/S0169-8141(99)00026-8

Kano, N., Seraku, N., & Takahashi, F. (1984). Attractive quality and must be quality. *Quality*, *14 No.2*, 39–44.

Lyytinen, K. J. (2009). *Design Requirements Engineering: A Ten-Year Perspective: Design Requirements ...* (Issue June). Springer.

Mauter, G., & Katzki, S. (2003). The application of operational haptics in automotive engineering. *Business Briefing: Global Automotive …*, 78–80. http://www.touchbriefings.com/pdf/11/auto031_p_mauter.pdf

Mittermeier, M., Schneider, J., & Müller, J. (2010). ***Audi Feeling and Audi Click***. Audi World. http://www.audiworld.com/news/10/sensory/click/content.shtml

Mordaka, J., & Gentle, R. (2003). The Biomechanics of Gender Difference and Whiplash Injury: Designing Safer Car Seats for Women. ***Acta Polytechnica***, ***43***(3), 47–54.

Nagamachi, M. (1989). ***Kansei Engineering***. Kaibundo Publishing Co. Ltd.

Norman, D. A. (1988). ***The psychology of everyday things***. Basic Books Inc.

Schütte, S., Eklund, J., Axelsson, J., & Nagamachi, M. (2004). Concepts, methods and tools in kansei engineering. ***Theoretical Issues in Ergonomics Science***, ***5***(3). https://doi.org/10.1080/1463922021000049980

Spence, C., & Zampini, M. (2006). Auditory contributions to multisensory product perception. ***Acta Acustica United with Acustica***, ***92***(6), 1009–1025.

Tontini, G. (2007). Integrating the Kano Model and QFD for Designing New Products. ***Total Quality Management & Business Excellence***, ***18***(6), 599–612. https://doi.org/10.1080/14783360701349351

Valverde, N., Ribeiro, A. M. R., Henriques, E., & Fontul, M. (2019). An engineering perspective on the quality of the automotive push-buttons' haptic feedback in optimal and suboptimal interactions. ***Journal of Engineering Design***, ***30***(8–9), 336–367. https://doi.org/10.1080/09544828.2019.1656802

Viano, D. C. (2003). Seat Influences on Female Neck Responses in Rear Crashes: A Reason Why Women Have Higher Whiplash Rates. ***Traffic Injury Prevention***, ***4***(3), 228–239. https://doi.org/10.1080/15389580309880