PLATE conference
Delft University of Technology
8-10 November 2017

Decontaminating experiences with circular offerings

Baxter W.[(a)], Aurisicchio M.[(a)], Mugge R. [(b)], and Childs P.[(a)]
a) Imperial College London, London, UK
b) Delft University of Technology, Delft, The Netherlands

Keywords: Contaminated Interaction; User Experience; Circular Economy; Design Strategies; Perceived Value.

Abstract: Keeping a product offering in the system through continued use and between multiple users creates the potential for interactions which become contaminated. These contaminated interactions can cause a barrier to material circulation and extended product lifetimes. This study seeks to identify the underlying design strategies useful in addressing contaminated interaction. Strategies were identified through an exploration of possible solutions to negative contamination in two phases. Phase I involved identifying 70 existing solutions to instances of negative contaminated interaction and abstracting these to identify a more fundamental underlying principle. In Phase II, designers participated in a brainstorming session to identify as many solutions as possible to several contaminated interaction design briefs. The resulting 155 solutions were analysed together with the other data to generate a final set of strategies. In the end, eight strategies distilled from the analysis which are used to address contaminated interaction. The strategies represent preventative and responsive solutions applicable to various elements of the contamination process.

Introduction

A circular offering is some combination of products and services which keep material goods in productive use rather than going to landfill. Circular products and services must provide value to consumers such that the offerings are adopted and used as viable alternatives to linear options. The task of providing said value differs from traditional linear economic offerings in that the circular economy involves some degree of reuse. Thus, the circular economy requires more than the creation of value as perceived by the user—it also demands maintaining value as products move through multiple uses and between users.

Products moving through use and between users can alter in meaning. Though there are instances in which the product becomes more desirable, this tends to be less frequent as products are typically designed to a high standard from which their quality diminishes. In such cases, interactions with products are thought to be contaminated as they differ from some ideal (Baxter, Aurisicchio, & Childs, 2016a). For instance, recyclables, once altered, are erroneously sorted as trash (Baxter, Aurisicchio, & Childs, 2016b; Trudel & Argo, 2013; Trudel, Argo, & Meng, 2016); the quality and cleanliness of shared objects is questioned (Liu, Li, Zuo, Zhang, & Wang, 2009), or negatively experienced (Bardhi & Eckhardt, 2012; Petworth, 2016); some individuals refuse to drink recycled water no matter how many times it has been cleaned (Rozin, Haddad, Nemeroff, & Slovic, 2015); and even remanufactured food processors are seen as disgusting and unfit for reuse (Abbey, Meloy, Blackburn, & Guide, 2015; Abbey, Meloy, Guide, & Atalay, 2015).

There are three effects of this negative contaminated interaction on the circulation of materials: premature disposal, hindered circular opportunities and downcycling (Baxter, Aurisicchio, & Childs, 2017). Eliminating negative perceptions and interactions with used objects then becomes central to realizing extended product life in many scenarios. This work is about understanding how to maintain a positive user experience as material is circulated within the larger system. Specifically, the aim of this research is to identify a list of design strategies that can be used to deal with the issue of negative contaminated interaction. Such strategies can then be used to overcome barriers to realising the adoption of a broader

circular economy and overall product life extension.

Background

The changing emphasis of user experience in the circular economy compared to typical linear ownership highlights the importance of addressing contaminated interaction. This changing emphasis is driven by two key dimensions, see Figure 1 (Baxter, 2017). First, circular processes necessitate that user interactions with products be considered across the entire lifecycle of the product. Designers need to seek to maintain or enhance user experience with products as they are kept in use and ultimately disposed rather than solely focusing on the point of sale as is typical with current ownership. Building on Jonathan Chapman's work on emotionally durable design (Chapman, 2005), products which achieve positive affect throughout their use are thought to provide a durable user experience. Contaminated interaction plays a major role in influencing how durable an experience is since products often change meaning with use. The aforementioned example of how altered recyclables are erroneously sorted as trash demonstrates this point (Baxter et al., 2016b; Trudel & Argo, 2013).

Second, increased circulation of products will mean that more users will engage with the same product. This is obvious in rapid cycles of use as is the case with access-based schemes but will also arise from more involved circular processes such as remanufacturing and recycling. If an object maintains a positive user experience as it moves between users it is thought to offer a resilient user experience. The dominant influence here is contaminated interaction since each user can alter the perceived value of an offering before passing it along. For instance, even saying a product is as good as new induces thoughts of prior use (Ackerman & Hu, 2016).

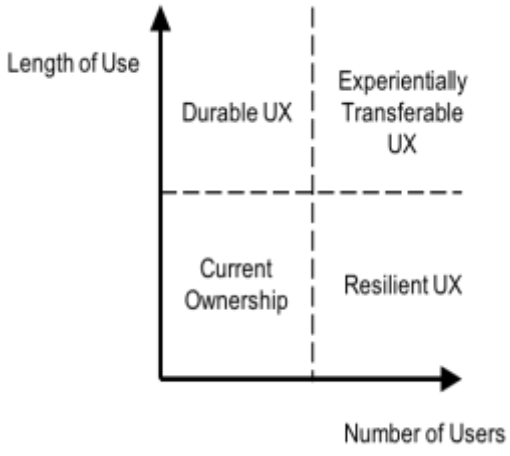

Figure 1. Dimensions of user experience (UX) for circular offerings. (Baxter, 2017)

There are times when either of these exist independent from the other and this may, at times, be adequate. The ideal, however, is when both durability and resilience occur together. In such a case the offering is thought to offer experientially transferrable experiences—experiences that are maintained or improved as they move through uses and between users (Baxter, Aurisicchio, & Childs, 2017).

Addressing contaminated interaction requires understanding what it is and how it occurs. Prior work has explored contaminated interaction in both a positive and negative context and has identified a model to describe contamination (Baxter, Aurisicchio, Mugge, & Childs, 2017). The first step of the model is to identify the user, the target object and the interaction between the two which has been or may become contaminated in some way. Next, the relevant perspective should be identified from which the interaction is considered. This may be from the user's perspective or an external perspective (e.g. company perspective). The user or external organization contrast the contaminated state of the object to some ideal or expected state of the object, e.g. used versus new or dirty versus clean.

It may be useful to further describe the contamination process to better inform design directions (Baxter, Aurisicchio, Mugge, et al., 2017). The contaminator may be the user, another user, the object itself, or some other object. The contaminant can be characterised as real or imagined. Real contaminants include objective, measurable factors such as the smell left in a car or markings left on the surface of an object. Imagined contaminants occur through mental associations or beliefs. The latter is why we value things touched by celebrities but destroy things owned by murderers (Hood, 2009). This imagined contaminant in particular may be difficult to deal with in used goods (Hood, 2016).

The process of contamination may be static or dynamic. Static contamination means that the

process of contamination has already occurred whereas dynamic contamination is ongoing. All contaminants, real or imagined, static or dynamic, are led by evaluations of the same three fundamental drivers: hygiene, territory, and utility of a product. These drivers dictate the positive or negative evaluation of an interaction that has altered from the reference state. The possible outcome from this alteration is a positive, negative or neutral contaminated interaction.

Notably, contaminated interaction is not limited to issues around material circulation. The term describes any type of contaminated interaction from noise in an office space to trying to disconnect with a former loved one on social media. Still lacking from design discourse is a clear description of what can be done to address these issues.

Methods

Strategies were identified through an exploration of possible solutions to negative contamination. This took place in two phases. Phase I involved identifying existing solutions to instances of contaminated interaction and abstracting common themes to identify broad, underlying principles. Examples were gathered from a range of interactions, not just those related to the circular economy to provide a more holistic analysis. Example solutions include air fresheners used to cover a bad smell or fabric used to hide stains on shared seats (e.g. seat coverings on public transport). Both solutions share a common strategy of concealing the contaminant by either covering it or disguising it.

Phase II of this study involved conducting an ideation session with design students to come up with possible solutions to contamination issues. Ten design briefs were constructed and presented to seven designers split into two groups. As was the case with Phase I, briefs include physical contaminants and digital contaminants in many settings to achieve a wide range of outputs. The resulting ideas generated in this section were added to the analysis in Phase I and a final set of design strategies were determined.

Results

Seventy solutions were identified and analysed in Phase I and a further 169 solutions were identified in the creative session held in Phase II. 14 of the Phase II solutions were determined to be too vague to be considered in the analysis resulting in a total of 225 usable data points. The thematic coding of these data resulted in the identification of eight unique strategies. Strategies are summarised in Table 1 and described below. Broadly, these strategies can be considered in terms of the element of the system which is targeted in the solution: the contaminator, the user, the target object and contaminant itself. All strategies were identified after examining 52 solutions, see Figure 2.

The strategy of **condemning one's actions** was the only strategy to target the contaminator—the person doing the contaminating. Condemning solutions consisted of financial punishments (e.g.

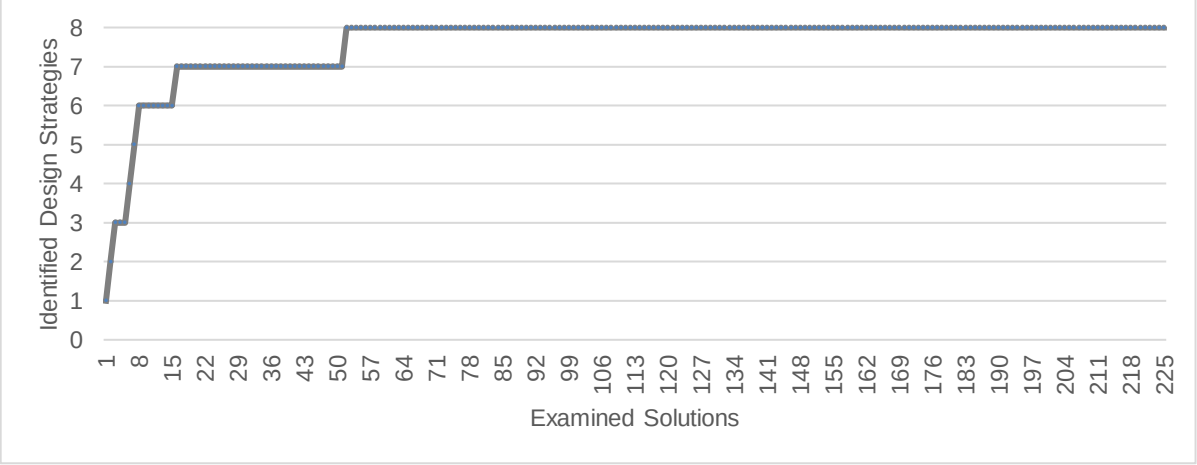

Figure 2. The number of design strategies identified versus the number of solutions examined

Table 1. Eight strategies to address contaminated interaction

Strategy	Description	Example Activities
Change meaning	Alter how the user thinks about the contaminated target	Branding, educating, or reframing of interaction
Withdraw	(Help) move the user to another situation	Engage with equivalent products, services, and environments or disengage altogether
Condemn the contaminator	Make the act of contaminating punishable	Establish social norms, terms of use or fines for misuse that carry social or financial burden
Restore the target object	Bring the target back to an uncontaminated state	Clean, air out, or otherwise purify the object
Protect the target object	Prevent object-level changes	Design for technical durability or script desired behaviour
Block the contaminant	Prevent contact with the contaminant	Create a barrier between the user and the contaminant
Remove the contaminant	Eliminate the contaminant altogether	Remove specified touchpoints or offenders
Conceal the contaminant	Disguise or cover the contaminant	Add some stimuli of proportional power that conceals the contaminant

imposing fines), social punishments (e.g. shaming) and social pressure (e.g. social norms, rules, and expectations). This could be enforced by another person, by unwritten rules of etiquette or by some form of technology such as a smoke detector or security cameras.

Two strategies target the user. The first is to **change the meaning** of the contaminant. This strategy involves changing perceptions of a contaminant without altering the contaminant itself. Methods used here included various forms of marketing, and educational campaigns. The second user-targeted strategy is about **withdrawing** from the contaminant. The focus of this strategy was to remove the user altogether. This includes various aspects of going to another place such as leaving a noisy office and finding another place to work. It also includes withdrawing from one situation where it is replaced with an equivalent. For example, switching rental cars if the one you get is unpleasant. Either way, the user makes the decision to withdraw from the situation and design can stand ready to help in that process.

Two strategies also focused on the target object. First is to **restore** the object to some prior state. This strategy includes cleaning, repair, airing out or other processes through which an object can return to a previous condition. The second strategy is the preventative counter to this, **protecting** the target object from change. Protecting is about preventing perceived change in the first place and often focuses on an ability to withstand wear. The most obvious example of this is designing for technical durability.

The final three strategies dealt with the contaminant specifically. **Blocking** is a strategy in which the contaminant is still present but blocked from interacting with the user. Examples include blocking others from social media and placing a physical barrier up to avoid the contaminated object such as a mask. A related strategy is to **remove** the contaminant itself. For instance, an online account may be revoked in which case a user is removed altogether or a doorway to a restroom may be taken out so there is no handle to grab (or avoid). This also includes more subtle forms of removing the contaminant such as rearranging rooms to prevent sound from travelling. Removing is a distinct strategy from withdrawing since it is focused on the removal

of the contaminant rather than the mere withdrawal user. The last strategy is to **conceal** the contaminant. Concealing does not remove or block the contaminant but merely overpowers it by some other stimuli. For instance, a smell may be covered up by an air freshener, an unpleasant noise may be treated by some music played over it, and pattered seats do a better job of hiding stains than would different fabrics.

Discussion

The identified strategies are meant to offer a starting point for creative ideation when dealing with contaminated interaction. Each strategy can be used as a "how might we" statement to guide in this process. A designer should first identify the user, object and contaminated interaction. Next, they can use the strategies to address this. An example may come from a company seeking to engage in a sharing scheme but finding that there is a general concern towards hygiene. The design team may ask, "how might we remove the contaminant/change the meaning of the target/conceal the contamination?" and so on. Answers to each statement will be some combination of preventative and responsive solutions to the issue at hand.

The use of the strategies still requires good creative skills to develop innovative ideas. Subsequently, it is important to treat these strategies as a tool to aid in the ideation process and not a substitute for proper exploration. The types of interventions to decontaminate the user experience will be limited by practical constraints of the specific context including important ethical concerns. There is still a debate to be had regarding the obligation to disclose information about an object (Baxter, Aurisicchio, & Childs, 2017). In many cases, information provides a negative narrative for material circulation. This is important since it is often knowing the information, not the fact itself, which is detrimental with regards to contaminated circulation. An example of this is the lost value in refurbished products. If the product has been refurbished by the original equipment manufacturer and evaluated to be the same quality as a new item, why then does the information about its refurbishment need to be disclosed as this is the actual contaminant?

This study approached the problem by understanding a range of solutions in differing contexts and two separate data sources. In the present study, all strategies were identified after only a quarter of the solutions were examined. This gives strength to the idea that the solutions identified in this document represent a complete list and adequate saturation of strategies was reached in the research process.

Conclusions and future work

The circular economy shifts the user experience focus to one that must account for how product meaning changes as it moves through use and between users. This requires examination of how interactions become contaminated. Such contaminated interactions are addressed through the eight strategies identified in this paper. The strategies include preventative and responsive measures that can be implemented to various aspects of the interaction.

Though his work offers a promising direction for design, it stops short of applying these strategies to a specific problem. Future work should seek to validate the usefulness of these strategies in the context of addressing contaminated interaction with a circular offering. More broadly, this work will hopefully contribute to a needed discussion in maintaining positive user experience with circular offerings.

Acknowledgments

Thank you to colleagues in the Human Performance and Experience (HPX) theme in the Dyson School of Design Engineering for their support in this work.

References

Abbey, J. D., Meloy, M. G., Blackburn, J., & Guide, V. D. R. (2015). Consumer Markets for Remanufactured and Refurbished Products. *California Management Review*, *57*(4), 26–42. https://doi.org/10.1525/cmr.2015.57.4.26

Abbey, J. D., Meloy, M. G., Guide, V. D. R., & Atalay, S. (2015). Remanufactured Products in Closed-Loop Supply Chains for Consumer Goods. *Production and Operations Management*, *24*(3), 488–503. https://doi.org/10.1111/poms.12238

Ackerman, D. S., & Hu, J. (2016). Assuring me that it is as "Good as New" just makes me think about how someone else used it. Examining consumer reaction toward marketer-provided information about secondhand goods. *Journal of Consumer*

Behaviour, n/a-n/a. https://doi.org/10.1002/cb.1631

Bardhi, F., & Eckhardt, G. M. (2012). Access-Based Consumption: The Case of Car Sharing. *Journal of Consumer Research*, *39*(4), 881–898.

Baxter, W. L. (2017). *Designing Circular Possessions: Exploring Human-Object Relationships in the Circular Economy*. Imperial College London.

Baxter, W. L., Aurisicchio, M., & Childs, P. R. N. (2016a). Materials, use and contaminated interaction. *Materials & Design*, *90*, 1218–1227. https://doi.org/10.1016/j.matdes.2015.04.019

Baxter, W. L., Aurisicchio, M., & Childs, P. R. N. (2016b). Tear Here: the Impact of Object Transformations on Proper Disposal. In *Proceedings of 20th IAPRI World Conference on Packaging*. Campinas, Brazil.

Baxter, W. L., Aurisicchio, M., & Childs, P. R. N. (2017). Contaminated interaction: another barrier to circular material flows. *Forthcoming*.

Baxter, W. L., Aurisicchio, M., Mugge, R., & Childs, P. R. N. (2017). Positive and negative contamination in user interactions. In *Proceedings of the 21st International Conference on Engineering Design* (p. To Appear). Vancouver.

Chapman, J. (2005). *Emotionally durable design: objects, experiences and empathy*. London: Earthscan.

Hood, B. (2016). Make recycled goods covetable. *Nature*, *531*(7595), 438–440. https://doi.org/10.1038/531438a

Hood, B. M. (2009). *SuperSense: Why We Believe in the Unbelievable*. New York: HarperOne.

Liu, Q., Li, H., Zuo, X., Zhang, F., & Wang, L. (2009). A survey and analysis on public awareness and performance for promoting circular economy in China: A case study from Tianjin. *Journal of Cleaner Production*, *17*(2), 265–270. https://doi.org/10.1016/j.jclepro.2008.06.003

Petworth, P. of. (2016, January 12). I can honestly say the cars Reeked of pot 16 of those times (I'm talking properly hotboxed for an entire Pharcyde album type-smell [Community Blog]. Retrieved July 12, 2016, from http://www.popville.com/2016/01/i-can-honestly-say-the-cars-reeked-of-pot-16-of-those-times-im-talking-properly-hotboxed-for-an-entire-pharcyde-album-type-smell/

Rozin, P., Haddad, B., Nemeroff, C., & Slovic, P. (2015). Psychological aspects of the rejection of recycled water: Contamination, purification and disgust. *Judgment and Decision Making*, *10*(1), 50.

Trudel, R., & Argo, J. J. (2013). The Effect of Product Size and Form Distortion on Consumer Recycling Behavior. *Journal of Consumer Research*, *40*(4), 632–643. https://doi.org/10.1086/671475

Trudel, R., Argo, J. J., & Meng, M. D. (2016). Trash or Recycle? How Product Distortion Leads to Categorization Error During Disposal. *Environment and Behavior*, *48*(7), 966–985. https://doi.org/10.1177/0013916515577635