

Online User Reviews as a Design Resource

Bokyoung Lee, KAIST, boing222@kaist.ac.kr

Froukje Sleeswijk Visser, TU Delft, F.SleeswijkVisser@tudelft.nl

Daniel Saakes, KAIST, saakes@kaist.ac.kr

Abstract

User-centered design processes are comprised of several methods and are deployed to gain insights about user needs and experiences. Many of these methodologies require qualitative studies with small groups of users based on set guidelines and are time and resource intensive. In this paper, we propose a new technique: “User Review Analysis” that makes use of big data to uncover user needs. The technique consists of collecting and analyzing online User Reviews on shopping sites such as Amazon. The basic idea is that because of the fast and cyclic nature of consumer products development, reviews of Today’s products inform designers on the next product generation. As the data is based on actual product-use experience with similar products, the aggregated insights provide product-in-use experience and brings to light several product design aspects and complement the existing methods.

User Reviews; User-Centered Design Method; Product Experience;

Currently, the relationship between designers and users is getting closer with increasing speed (Sanders & Stappers, 2008). In the past, industrial designers were focused on developing the physical object and considered users as customers. However, with User-Centered Design, the perspective towards users changed from passive consumers to experts of their experiences (Sanders, 2002). User Experience (UX) is defined as “a person’s perceptions and responses that result from the use and/or anticipated use of a product, system or service” according to ISO 9241-110:2010 (clause 2.15). Kujala (2009) argues that since UX offers information on user interactions with certain products, it should be considered from the start of the design process. Not only when to use the UX is important, but also how to use the UX within the process should be addressed. According to Sleeswijk Visser (2009), the product being studied only plays a minor role in the experiences of people in their everyday lives. People’s experiences and interactions with a product are governed by

the underlying situation and the context in which it is used. Therefore, she suggests studying the “context of product use”, which provides a more realistic perspective on user experiences from a holistic point of view. Analyzing user-generated contents including narratives, comments, pictures and other activity results is the key way to understanding user’s context (Olsson & Salo, 2012; Korhonen et al., 2010). Some of the more well-known techniques conducted at the fuzzy front end of the design process are Focus Group, Contextual Inquiry, Interview and Contextmapping (Visser et al., 2005). These methods all support designers by providing information and inspiration for new product development.

Although these methods are seen as essential in product design and commonly applied, they come with several limitations. Most of these methods require controlled environments, willing volunteers, copious amount of time, and a generous budget (Opdenakker, 2006). For research teams on a budget, these constraints unavoidably lead them to conduct their studies on a non-representative and insufficient subject pool. The lack of their dataset’s general applicability could often lead to skewed information. However, the ongoing advances in information technology and online social platforms open up new avenues for such user-generated experience data gathering.

In the last few years, online shopping has become immensely popular and often these online reviews (UR) people review and discuss the merchandise online (Chen & Xie, 2008). These online reviews (UR) include rich pool of data, including both positive and negative product experiences with existing products (Zhu & Zhang, 2010; Hennig-Thurau et al., 2004; Stauss, 2000; Schlosser, 2011). Hedegaard & Simonsen (2013) argued that User Reviews contain a significant amount of usability and UX data. Although their findings imply the existence of UX data within the User Reviews, they haven’t explored how it can be used as a design resource. On the other hand, Van Kuijk et al. (2007) indicates that after sales feedback offers a large potential for gaining insight into real-world product usage and usability issues. And he argues to use those data for ergonomics design. As User Reviews are, in essence, a type of after sales feedback, the combination of the aforementioned researches suggests a way to view User Reviews as a viable source of information in the design process.

In this paper, we investigate the practical use of User Reviews in a design process and propose a new technique: User Review Analysis (URA). We focus on how designers can use User Reviews for the design of the next iteration of a product within a certain category (e.g., a new handbag), and how information distilled from User Reviews can complement other user research methods. Although any big data repository of User Reviews can be used, Amazon was selected, and products of a few categories were analyzed. Workshops with design experts are used to study the influence of User Reviews in the design process. Finally, the value of the User Reviews as a user-generated data and the insights from the workshops are presented and discussed.

User Review Analysis Study

We analyzed User Reviews to extract ‘Experience of product-in-use’ to confirm that they contain valuable information to inform a design process. We selected four product categories: bags, bicycles, shoes and curtains and all having both aesthetic and functional considerations. We show our method with the bag, other products are summarized in Figure 3. Seven office bags (Figure 1) were selected on Amazon.com. For the bags, we sampled 2485 reviews were on May 6, 2014, from 16:00 to 18:00 by using the filtering function of ‘the most helpful reviews.’ Each review was split into sentences manually and written down on different cards. To trace the reference product of the quotes, we set different colored cards for different bags, as shown in Figure 2.

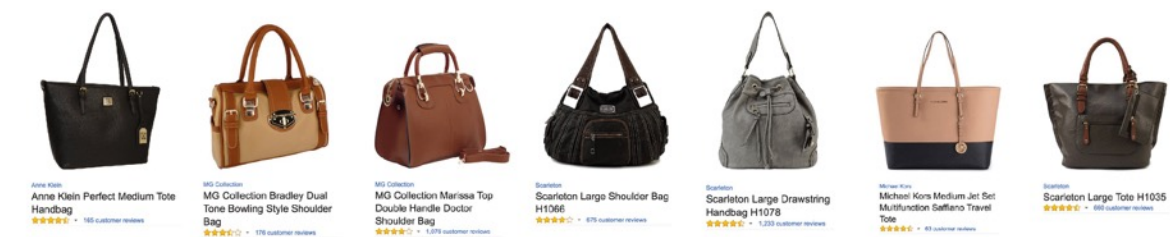


Figure 1: Bags selected for the study

Affinity Diagramming was used for the analysis procedure, allowing the evaluators to categorize the cards into groups that were perceived to be a coherent informative unit (Figure 2). While the method used by Hedegaard & Simonsen (2013) only focuses on measuring the existence of UX in User Reviews, our goal is to analyze the crux of the matter mentioned in the User Reviews and interpret their meaning. This is why we used an open-ended analysis method like affinity diagramming. Seven design students performed this process individually and made their groups. The participants’ samples were compared and regrouped by authors using our own terminology.



Figure 2: User Review Analysis: Categorization (on the left), result comparison process (on the right)

Results

Most of the reviews focused not on the users’ holistic context but on the specific experiences of the product’s different features (e.g. material functionality, colors, size, strap, etc.) that are

best described as “design aspects.” From the results, 13 factors emerged, shown in Table 1, column “design aspects.”

Table 1: Result of User Review Analysis Study for Bags

Criteria	Design Aspects	Review Examples
Environmental Harmony	Harmony with Wardrobe	<i>“It is very simple and elegant, for the corporate look that I was looking for”</i>
Aesthetics	Material Looks	<i>“Doesn’t look fake and isn’t too shiny.”</i>
	Overall Feelings	<i>“It’s classy in appearance, but it’s not formal...”</i>
	Colors	<i>“I was worried the color of this bag would end up looking cheap/ gaudy...”</i>
Functionality	Material Feels	<i>It is soft as butter...”</i>
	Material Functionality	<i>Easy to clean even though the surface has a slight woven texture.”</i>
	Functional Accessories	<i>“...No zip to the top.”</i>
	Opening Functionality	<i>“It is good quality, but the opening is narrow.”</i>
	Size	<i>“I was able to store almost everything I needed... enough room for a small water bottle.”</i>
	Strap/Handle Functionality	<i>“Feels very durable-strong handles...”</i>
	Weight Functionality	<i>“Light weight, comfortable and handy.”</i>
	Inner Compartments	<i>“Enough compartments to easily find my stuff. Handy inside pockets.”</i>
Social	Eccentric factor	<i>“You can attract more attention than you wanted..(icebreaking).”</i>

At a glance, the resulting groups seems to relate to four overarching criteria: Environmental Harmony, Aesthetics, Functionality, and Social. The Environmental criteria cover the aspects that are related to other products or spaces, for example harmony with the wardrobe, which shows that User Reviews contain slight amounts of contextual information (*“It’s classy in appearance, but it’s not formal so I can take it to any place or event”*). The material looks, feels, colors and overall feelings can be combined into the Aesthetic criteria and represents the appearance of the bags (*“Just feel like fake. The leather just like the plastics and I don’t like it”*). Also, we could find considerable functional factors and details of the bags as shown in the table (*“I was able to store almost everything I needed...enough room for a small water bottle and iPhone.”*). The Social criteria cover the factors that discuss how people think and react to the products (*“This item can be a good ice breaking item”*). The initial results (Table 1) show that it is possible to extract design aspects from User Reviews, which provide designers with potentially inspiring information for the new product, based on experiences with the existing product.

The extracted design aspects of the bags were compared to the other product categories as shown in Figure 3, and the results illustrate different qualities and characteristics of each product category. Interestingly, the design aspects of bicycles were focused predominantly

on its functionality, which reminds us that they are performance-centric products. Shoes show a similar configuration with bags, most likely because they are collectively considered to be both a fashion item and a functional item.

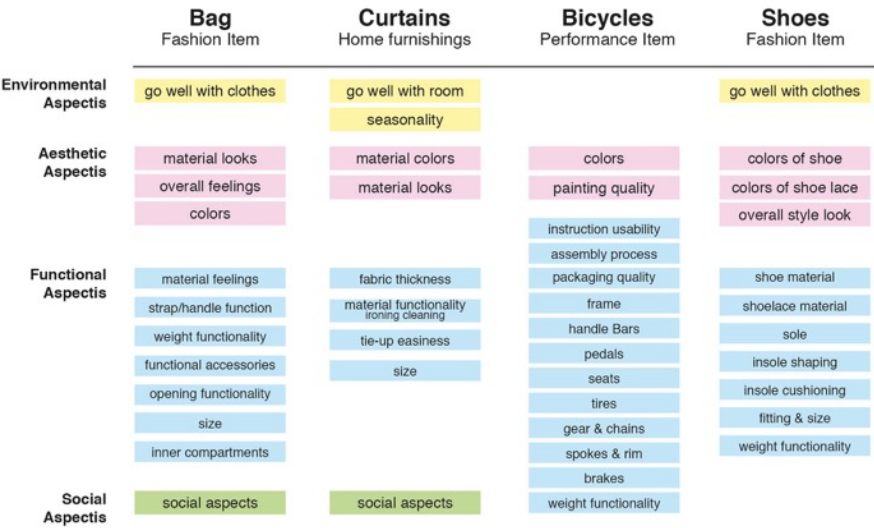


Figure 3: Design Aspects for different product groups (bag, curtains, bicycles, and shoes) extracted from User Review Analysis based on Reviews from Amazon.com 7 Bags (2485), 2 curtains (180 reviews), 4 Bicycles (290 reviews) and 3 Shoes (320 reviews)...

Design Workshop with User Reviews

In two ideation sessions with designers, we studied the value of User Reviews to inform a design process for the design of new office lady office bags. We compared a traditional UCD ideation session to one with the use of User Review data in conjunction.

Method

As a baseline, we prepared User-Centered Experience data obtained from contextual Interviews. The interview was done with two female office employees about their overall experiences and the holistic context surrounding their bags. The data was transcribed and analyzed by the authors and organized into eight Context-Cards to deliver the insights to the participants efficiently, as shown in Figure 4. For the cards, key insight phrases were written on the top, and sample quotes related to each phrase were written at the bottom. To provide a manageable amount of data, two to five quote-samples were selected by deleting similar quotes for each insight. The User Review data from the handbags was organized on the cards in a similar way based on the earlier study results.

We hosted 2 ideation sessions each with 3 graduate design students. All were recruited from a Department of Industrial Design, and all had extensive knowledge on User Experience, Product Design Process, and Qualitative Analysis.

Session A used only the context cards, Session B the context cards and the User Review cards together. The sessions were structured as follows: Introduction, data delivery, concept ideation, sketching, and final concept presentation. This one-hour process was videotaped in its entirety. After the design workshop, we interviewed the participants about their design process, and how the given User Reviews were used during their process:

1. Regarding your final concept, what inspired you to develop this concept? What specific things did you consider the most?
2. (Session B) How did you use/organize the User Reviews during the design process, and why?
3. What are your thoughts on the use of User Reviews? Was it useful? Do you think it can be useful?

The interview was to understand the design direction, design process, and the designer's thoughts, that were not intuitively noticeable through observation. A comparison of the 'design process', 'designer's discussion flow' and 'final concept' with and without the use of User Reviews allows us to determine the influence of User Reviews in a design cycle.

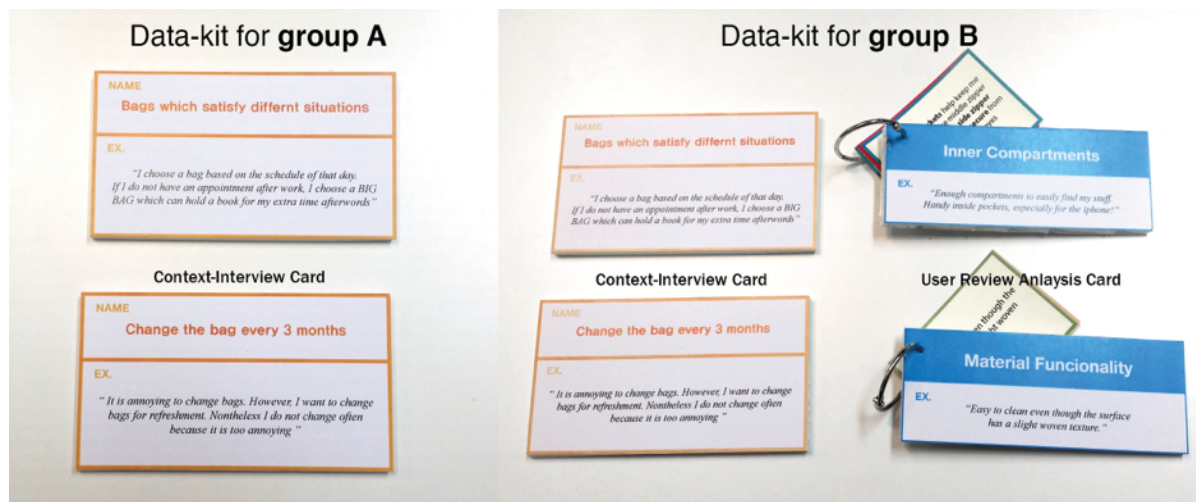


Figure 4: Provided User Data Card for each participant group

Each of the sessions delivered a new bag design concept at the end of the workshop, which was represented as visual sketches with short descriptions (Figure 5). **Session A** designed a bag that has a detachable strap so that the user can select the strap based on her taste. The main body of the bag was designed in such a way that the size of the bag could be transformed by selecting which clasp to use when closing the bag. **Session B** introduced a bag, which can control the thickness of the bag through the use of the zipper on the lower and side edges. Users could change the big tassel on the side to their liking, as the customizable accessory on the bag. Compared to **session A**, **session B** defined the inner structure of the bag, its color, material, and accessories in more detail. They made detailed decisions regarding the size of the inner-pocket, the use of zippers on the pockets, the color of the zippers, the types of the material for each section through thoughtful discussions.

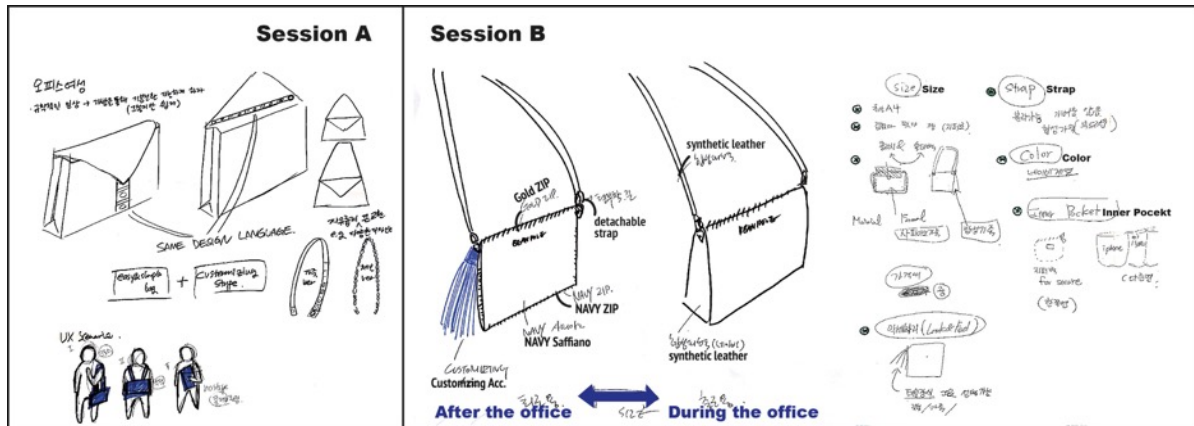


Figure 5: Design Outputs from session A and session B. Session A: A bag the user can change the size and strap type based on their daily feelings. Session B: An ordinary bag that supports functional demands for office workers that can adjust the thickness of the bag or accessories (tassel or strap) to use after work hours.

We reviewed the recorded video clips of the workshops and transcribed all the verbal comments and nonverbal behaviors expressed by the participants and labeled noteworthy comments together with the insights they conveyed (shown in Table 2). We compared the insights from both sessions, to analyze the impact of using User Review Analysis and describe the results in four themes: the perceptions on User Reviews, the process of concept ideation, concept detail definition, and evaluation.

Table 2: Deconstructing the process of design workshop

Time	Comments	P	Insights
50"	"Interview cards are focused on office bag context, but reviews are more concentrated on Aesthetics and functionality. We need to mix appropriately."	B2	Way of matching two data
5'20"	"Let's start talking about size."	B1	Starting from product detail
7'45"	(Pointing out Interview data) This has information about size, but it does not mean that it should be BIG.	B3	Linking context with product detail
10'33"	Office lady who drive her car and the other office who use public transportation might have a big difference.	B3	Persona decision
09'11"	The leather is easy to clean. But if the bag is made of canvas, we have to wash it. Quite annoying. Leather is easy to manage.	B2	Pointing out cleaning situation-detail aspects

Perceptions on User Reviews; Indirect Expression vs. Direct Expression

The review data was referred to with phrases such as 'this functionality part', 'this product aspect', 'aesthetic factors' and 'the product factors that affect to people' while the interview data was mentioned with phrases similar to 'office life', 'what they want', 'the way of they live' and 'their lifestyle.' They tended to use the Interview data for understanding the target users' needs by grasping their whole life context and indirectly extrapolating aspects of the product to focus on. For example, when the user expressed that she wanted to "change her bag once every 3 months," the participants extrapolated the need for the product to be able to show off a different feel on a regular basis. In contrast, the designers perceived User

Reviews as direct indicators that show the specific design aspects that the users have taken notice to. (i.e. Material Functionality: users interact with material functionality while cleaning their bags.)

User Reviews for the Concept ideation

The designers in both sessions tried to absorb the holistic context of the user by reading the Interview-cards and combining their personal experiences with those contexts. As a result, they defined a persona to representing the target user. Designers in session A selected office girls who do not have a frequent business trip, and in session B they selected a female employee who uses the public transportation. Surprisingly, both sessions resulted in a similar concept of a transformable and customizable office bag.

A1: “Users want a different bag based on their situation. Maybe, a bag that changes? ”

A2: “Yeah, transformable bag design could be a concept!”

Although the basic concept from session B was similar to that of session A, the design process indicates that the User Reviews affected the concept ideation stage. Session B simultaneously considered the design aspects as well as the user’s contexts while they developed the concept. For example, although they had an interesting concept resulting from their understanding of the context, they reconsidered it based on the User Reviews.

B2: “Why not a bag that the user can change the thickness by folding it?”

B1: “That’s also possible, like a paper shopping bag.”

B3: “But that does not make sense when we think about material aesthetics. If the leather is folded, there would be a crease.”

After session B had defined their persona, they started the discussion with specific design aspects mentioned in the User Reviews, but the discussion smoothly transitioned into a debate regarding the Interview data, which laid the foundation of their concept. This shows that although the User Reviews are more focused on specific product properties, the combination with the Interview Data did not constrain the idea generation process.

B2: (Picking up the User Review card) “Let’s start with the size.”

B1: (Pointing out the Interview Card) “There is a point about the size.”

B3: “It says, they prefer a bag to be small when they are leaving the office - especially when they have a date after work, but at the same time it also seems weird to bring a small bag to the office in the morning”

B1: “Then, how about a transformable bag that changes size?”

User Reviews for the Concept Details

The designers from session A spent most of their time on brainstorming a better concept, and most of the details, such as strap material or pocket structures were finalized without deep considerations. For instance, they selected leather as their main material because leather

looks formal. However, they did not consider how users interact with a leather bag, how easy it is to manage leather, et cetera.

In contrast, the designers of session B, who were provided with User Review data, discussed concept details at length. The User Reviews contain information on specific design aspects or human-product interactions obtained through real interactions with existing solutions. On the other hand, Interview data tells the participants about a specific user's needs and their life. Although the aforementioned data types are expressed with a different focus, the participants see the relationships between these data and mapped them during the discussion, which bringing in-depth details.

B1: "Then, what should the material be?"

B2: "There might be too many things to consider!"

B3: "According to these User Reviews, we not only have to consider the aesthetics but also the functionality of the materials... managing processes. Feelings... easiness of cleaning."

B2: (pointing out the Interview Card) "Also, the user wants a practical and conventional bag. This point is also connected with materials. Material functionality, material weight is related to the practical use of the bags, and material color is related to the ordinary bag"

B1: "For an ordinary, day-to-day bag, leather is better, but for the aesthetics, Saffiano is better."

B2: (Pointing out the Interview Card) "It says here that the users additionally put various small pouches into their bags. I think they need a more appropriate inner pockets."

B1: "Let's have a look at the inner pocket usage scenario from various people. (reading User Review samples) Most of them put mobile phones into the inner pockets! "

B3: "Also the User Reviews say that the zipper on the inner pocket gives a reassuring sense of security when putting small valuables in it."

B1: "Then, let's concentrate on the inner pockets that allow the users to use them flexibly based on their purpose."

It is apparent that these two different data types are not mutually exclusive. In more detail example, a context card (User-Centered Experience) tells that the user prefers a more conventional bag as it allows them to fit in better to their work environment. The User Reviews used in the workshop corroborated this by expressing one user's approval for a bag due to it not standing out, pointing to the color. These two different data both contain the same information: conventionality being a need for users. The difference is that the context cards give the contextual reason for such needs, while the User Reviews express in what way the *product's aspects* must be manipulated to satisfy that need. The fact that the two data types are not mutually exclusive could explain why session B had a more in-depth discussion during the workshop process. With both datasets, the session received complementary information that outlined the needs and solutions in multiple focuses: with respect to the users' context and specific product *aspects*. This can be seen more clearly in the mapping diagram (Figure 6) produced by session B during the workshop. This overall

thought process that included both the users' needs and important product aspects in mind facilitated session B in designing their bag in further detail.

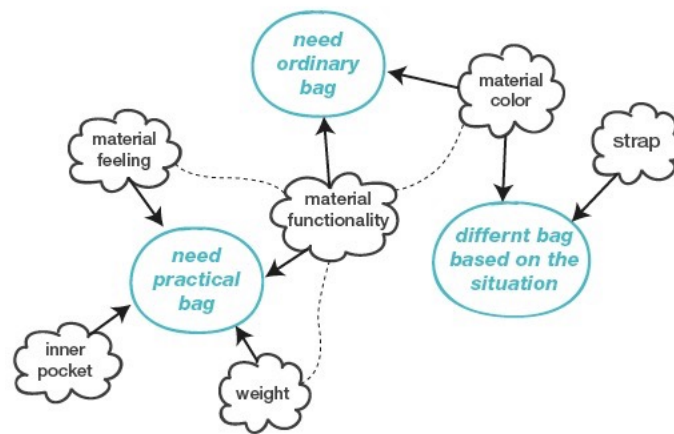


Figure 6: The map, which shows how participants (session B) linked design aspects and user needs during the process

User Reviews at the Evaluation stage

The designers in-session B used the User Reviews as a checklist, which they evaluate their concept before finalizing it. At the end of their process, one of the members from session B said:

B1: "Are we done? Didn't we miss anything?"

B2: "Let's check factors if there's anything we missed."

B1: "Wow. We didn't intend it, but, fortunately, our final solution meets these product aspects! (pointing out the user review card written as social aspects) Our customizable tassel design will make the users unique, and that can bring out some conversation."

Discussion

The ideation sessions indicate the potential of the method and that designers benefit from including User Review Analysis in a design process, specifically when used in conjunction with other methods, as its informational characteristics are complementary. However, there are several limitations of this research. Firstly, this study was performed with only a small amount of data, with a few designers. Future studies are planned to extend our initial results to more product categories within professional design teams in the field.

In this study, we analyzed User Reviews manually which was a tedious task. Advances in machine learning (Gamon et al., 2005; Kim & Hovy, 2006) and big data analysis indicate the feasibility of applying those technologies in the future studies. In that way, larger datasets can be explored, and several categories and repositories could be cross-referenced.

Whereas we focused on physical products in this study, we plan to apply a similar approach to services in the future. For instance, online reviews of accommodation sites such as

‘booking.com’ could make a good example, as those data also include the experience that user came through after using the service. (Vermeulen & Seegers, 2009; O'Mahony & Smyth, 2009) This data would provide the service designers with the context in which the shopping service is being used and the directions in which the service's aspects should take.

User Reviews to inform the design of a next-generation product

Most design processes start with a thorough understanding of existing solutions or past experiences with a target product or a target circumstance. Sleeswijk Visser et al. (2005) states that the design process starts from understanding past experiences, continues on by studying how that led to the present circumstance, and ends by making the designer conceptualize a product for the future. The various methods that embody this line of process are mapped in Figure 7 on a timeline of a typical design cycle.

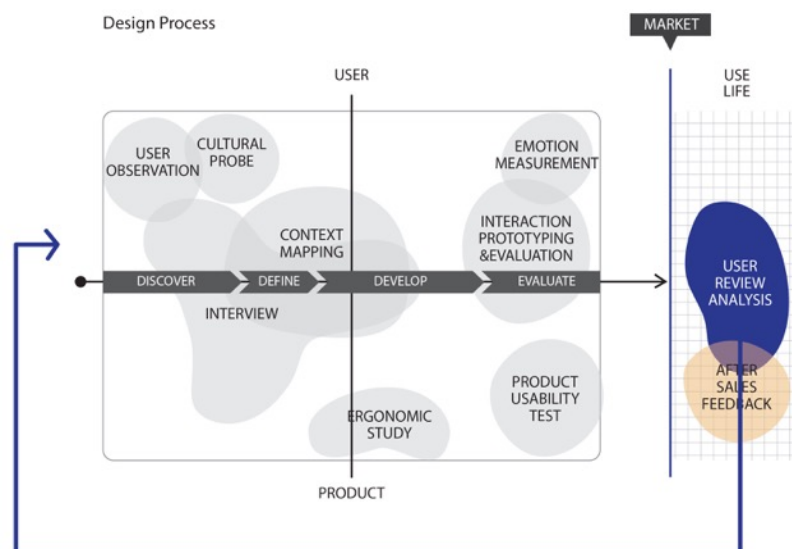


Figure 7: ‘User Review Analysis’ as input for the fuzzy front end of the design process

The data that is generated after the design cycle ends, and when the product is on the market and used by the users, is currently an untapped resource. Online User Reviews, ‘After Sales Feedback’ and ‘After Service Surveys’ offer experience data of a product’s use, which would be useful for developing the next generation of that product. Just as after sales feedback data could be used to determine usability issues or ergonomics of a design (Kuijk et al., 2007), we argue that User Reviews can be used to understand multiple users’ view on the product and provides a complementary resource at the start of the design process. Since these User Reviews are suggestions on the outcome of a cycle of design process, starting another design cycle with these experience data in mind could develop a more improved design.

User Reviews as a Design Resource

Our results confirm that the findings of Hedegaard & Simonsen that User Reviews include noticeable amounts of User Experience data. However our findings indicate that in order to understand User Reviews as a design resource, we need to distinguish two perspectives on user experiences: User-Centered Experience and Product-Centered Experience.

Popular methods in design, such as Focus Group and Contextmapping, consider **User-Centered Experience** and focus on the user, as depicted Figure 7a. Designers use these methods to better understand the user's context by empathizing with. For instance, if a home-cook was to be studied for designing a new cutting board, one may find that he or she often cuts the ingredients on the cutting board and has difficulties transferring all the ingredients into a pot. This not only demonstrates this user's interactions with the cutting board, but also with the pot and the kitchen environment and could result in a product shown in Figure 8b.

On the other hand, User Reviews is a type of **Product-Centered Experience** data that puts the product in the center (Figure 8c), and the product usage experience information from various different users is integrated together (Figure 8c). The detailed information on the user or their context is not explicitly communicated, but a more specific and in-depth interaction with the product can be extracted. Consider again the home-cook problem; people may complain about the constant smell of fish on the cutting boards or other general concerns on hygiene, which could be indicated through User Reviews, and lead to a redesign shown in Figure 8d.



Figure 8: Concept of User-Centered Experience & Product-Centered Experience

The unique perspective of the User Reviews and the readily availability as a resource, makes it a value contribution to the early stage concept development. However, there are a few limitations that need to be considered when applying User Reviews as a design resource. Compared to qualitative studies such as focus groups, it is hard to retrieve information on the demographics of the review population as online resources usually hide personal information. Additionally, online stores such as Amazon, target consumers worldwide which makes user review data both culturally and socially diverse. For instance, when preparing

the sessions we noticed that User Reviews discuss the need for a bag to hold A4 documents or a laptop. This was in contrast with what we learned from the interviews: office workers in Asia do not regularly bring documents home. This might well be a cultural difference of Western vs. Eastern office, hence, when User Reviews is presented together in conjunction with other sources, such differences would become apparent.

User Reviews could suffer from Fake Reviews. As more people are becoming dependent on reviews while shopping, sellers are starting to hire users to write attractive reviews, regardless of the truth. In addition, some markets provide extra coupons or mileage to those who leave User Reviews after the purchase as a reward for giving helpful information to other customers deciding on their purchases. To date, a reliable way to pick out these reviews has not been proposed.

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