The Lessons of Google Glass: Aligning Key Benefits and Sociability

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Abstract. This article presents a case study of the user experience of Google Glass when it was initially introduced in 2013. By applying the combined methods of on-line data research, semantic network analysis and field research, it is argued that awkwardness of form factor and use, and failures of Google Glass's user interface explain the low acceptability of the device. From a methodological perspective that combines big data analysis and qualitative research, this article discusses the user needs and preferences that should inform development of new tech.

Keywords: Google Glass · Big data research · Semantic network analysis
UX

1   Introduction

Predicting what kind of new device will be accepted in the market is a difficult task. The difficulty is compounded when a novel type of technology and function is introduced. Google Glass, introduced and initially distributed to a limited number of tech users in 2013, was the typical case. Even though there was public concern that the attached video camera could cause privacy issues (Guardian, 6 March 2013), neither technicians nor market experts at the time knew if social concerns could hamper its proliferation in the market. On the other hand, there were reasons to imagine that new functions, with its technological charm, could deliver unprecedented benefits to the users (MIT Technology Review, 1 July 2013).

This study was conducted as market research in 2013 to investigate the key factors that might determine user acceptance. Although the privacy concern appeared as a salient one, I argue there were subtler aspects that hindered the product's success. As user experience (UX) is 'dynamic and continually modified over time in response to changing circumstances and innovations' [1], the researcher should look into what kind of invariability might exist in accordance to the changing circumstances and innovations.

This research demonstrates that the low acceptability of Google Glass was in part affected by sociological factors relating to sociability and control, and the social-psychological ego-alter relationship. By utilizing on-line data research and text-mining methods to extract key variables (concepts), this article also attempts to present a process to link them with existing qualitative methods.

2   Methodology

2.1   On-line Data Research

The research began with the collection of data from Twitter. In 2013, Twitter was one of the most widely used social media services where users communicated on a variety of issues. To concentrate on posts that gained a certain degree of agreement and/or resonance, the researcher applied the search word "google glass" in English and collected 758 original posts that were retweeted at least 10 times between 6th and 21st May 2013. The data was manually tagged in 4 categories: positive, neutral, negative and informative; categories are further defined by related keywords (Fig. 1).
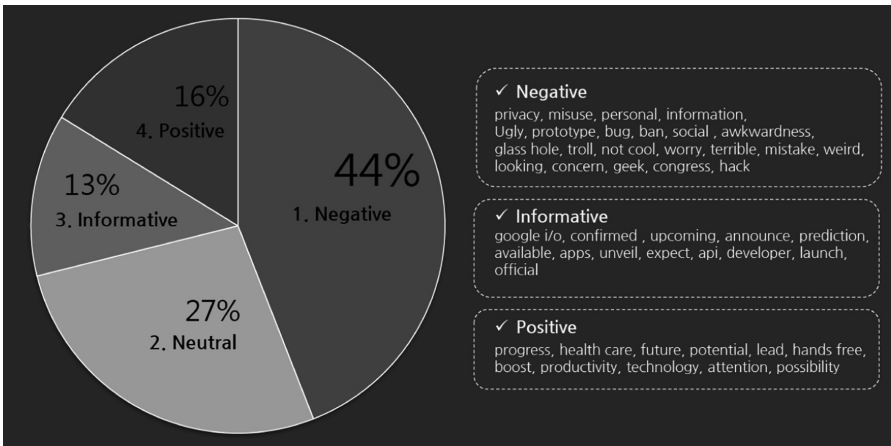

Fig. 1.   Opinion of Google Glass in Twitter (Original postings between 6–21 May 2013)

While the contents tagged as "neutral" were slight (insignificant) expressions that contained no value judgement, those tagged "informative" were mostly linked news or blog contents that reported the announcement of Google Glass and experts' general comments. By collecting these data sets, the researcher can assess overall on-line sentiment regarding the device, but also parse responses to specific aspects of the technology.

Keywords for negative contents include "privacy", "misuse", "personal", "information", "ugly", "prototype", "bug", "ban", "social", "awkwardness", "glasshole", "troll", "not cool", "worry", "terrible", "mistake", "weird", "looking", "concern", "geek", etc. For the positive contents, expressions like "progress", "health care", "future", "potential", "lead", "hands free", "boost", "productivity", "technology", "attention", and "possibility" were frequently used.

2.2 Qualitative Research

Structure of Twitter Contents

Based on the grounded theory approach [2], the qualitative approach adopted here reflects an effort to derive meaningful categories from the acquired data. The four categories of Twitter content were more specifically classified along their converging themes. As shown in Fig. 2, the themes represent the additional layer of (1) privacy and sociability, (2) fashion and design, (3) function and technology (data processing and desired features), (4) UI and UX (user interface and user preference), and (5) market (price and acceptability, applications and ecosystem). Among them, the three key positive themes include "new value and capability", "practical advantage", and "potential of Google Glass" and the four negative themes containing "privacy concerns", "deficiency as fashion item (or accessory)", "overall concern about emerging technology", and "difficulty in actual usage"; these require further scrutiny.
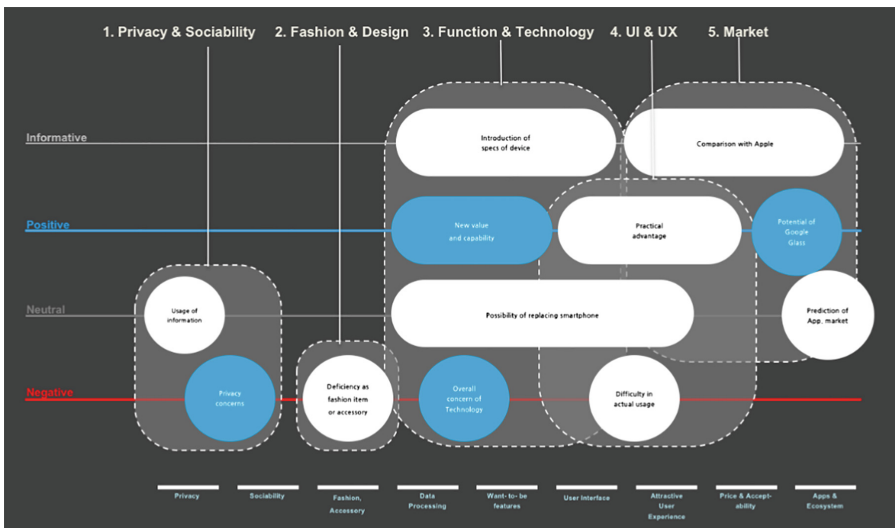

Fig. 2. Emerging thematic categories with sentiments

In-depth Interview of Experts

After deriving the five key themes, my research team conducted in-depth interviews with experts relevant in each theme (Table 1). The main purpose of the interview was to grasp guiding concepts that were important in understanding privacy and sociability, fashion and design, function and technology of Google Glass, related UI and UX, and market forecast. Those guiding concepts in turn clarified what questions to pose for the users and potential consumers.

For example, the interview with Dr. Judith Donath (Director of social media group in MIT Media Lab) clarified that public concern about privacy was more significantly related to the "fear of losing control of information" rather than the exposure of

Table 1. Interviewed experts

Domain	Name	Affiliation
Privacy & sociability	Judith Donath	MIT Media Lab
Fashion & design	Jeff Salazar	Lunar Design
Function & technology	Danny Roa	Wedding Party co.
UI & UX	David Witt	Symphony Teleca co.
Market	Jaekwon Sohn	Maeil Economy Newspaper

him/herself to the data space such as social media. Jeff Salazar (vice president of Lunar Design) pointed out there was difference between stylish object and fashionable item: if the former is judged by experts with respect to the product's design, the latter is recognized publicly by social value. These kinds of comments from the domain experts lead the research team to develop specific questions such as 'what kind of controllability people seek in Google Glass and when they feel secure or insecure?', 'Do people feel that Google Glass is fashionable? If not, why?' This kind of specific questioning was applied in field research: interviews with lead users and frequent observers of Google Glass in the Bay Area of San Francisco.

Ego-Alter Focus Groups

After clarifying key issues and questions regarding Google Glass, the research team recruited a lead user group and an observer group each composed of 6 people. The lead user group was termed "ego" group, and the observer group "alter". Following the logic of social representation theory [3], it is supposed that a common opinion of an object (Google Glass) is formed through the interaction of the user (ego, or self) and the others (alter) who make frequent contact with the user. The Ego-Alter 'jointly generate their social reality - objects of knowledge, beliefs or images' [4]. Unlike a common market segmentation, this social-psychological concept was utilized to build up the focus group interview scheme. As there was not yet any established market segment of the new device, catching early signals of social acceptability of a new technology and its usage required a more social interaction-oriented design of interview. The interview questions were semi-structured and posed separately to the two groups regarding the five main themes (Table 2). While the ego group mainly consists of technicians and app developers, the alter group included various kind of lay people like the ego group member's family, friend, colleague, restaurant owner, journalist, colleague, etc.

Semantic Network Analysis of Transcription

After gathering transcripts from the focus groups, a fully automated method of semantic network analysis was utilized to derive the structural pattern of both ego and alter group's key needs and concerns. Although the adoption of semantic network analysis is not new to UX research [5, 6], there is still no consensus as to what kind of features to focus on when interpreting the key relational concepts. A lack of theoretical underpinning makes meaningful interpretation difficult.

Literature in communication research [7, 8] offers theoretical frameworks to visualize human desires and concerns, in terms of the connectivity of expressed concepts, and helps to operationalize content analysis through semantic network analysis.

Table 2. Ego-alter focus group interviews

Domain	Name	Affiliation
Privacy & sociability	Ego	• Were there any concerns that Google Glass might affect others' privacy before purchasing it? • How have people responded when you wear Google Glass? • How did you feel and what was your reaction? • What is the awkward situation that hampers social interaction? • If you were to keep using a glass type device that might not necessarily be a Google Glass, how could the product be better designed to improve social acceptance?
	Alter	• How did you feel about people using Google Glass around you? What is the main reason? • Do you feel that you want to use some wearable device such as Google Glass? If so, why? If not, why not? • How have you reacted to people using Google Glass? • Do you think Google Glass will become acceptable to the majority of society? What could be main issues and how they might be addressed? • If some new glass type device comes out and it does not look like Google Glass, how would you imagine the product could be better designed, to improve social acceptance?
Fashion & design	Ego	• How do you evaluate the design of Google Glass? How do you think it can be improved? • If some new glass type device comes out and it does not look like Google Glass, how would you imagine the product could be better designed?
	Alter	• How do you evaluate the design of Google Glass? How do you think it can be improved? • If some new glass type device comes out and it does not look like Google Glass, how would you imagine the product could be better designed?
Function & technology + UI & UX	Ego	• From a technical perspective, can you tell your experience using Google Glass? • What are the good things and bad things? • Based on your experience, how do you feel the device can be improved?
	Alter	• Is there some potential downside when interacting with a friend using Google Glass? • Based on your experience, how do you think the device can be improved to ease your interaction with a counterpart using a Glass type device?
Consumer expectation (Market)		• What do you believe future Google Glass should improve and provide more benefits?

<div align="right">(continued)</div>

Table 2. (*continued*)

Domain	Name	Affiliation
		• If a new form of glass type device comes out, what do you imagine it would look like and how could it provide better satisfaction? Would you be willing to purchase it?
		• What do you believe future Google Glass should improve and provide more benefits? • If a new form of glass type device comes out, what do you imagine it would look like and how could it provide better satisfaction to a potential consumer or an audience?

If classical content analysis [9] focuses on the frequency of keywords in the text, semantic network analysis elucidates the relation of the keywords based on a co-occurrence matrix [10]. In this research, we utilized a commercial semantic network analysis tool Optimind (http://arspraxia.com/product) that automatically codes text, extracts core features, and visualizes them as a network. The procedure of analysis goes through:

1. Preprocessing:
   a. Checking words and listing context-specific thesauri of synonyms
   b. Automatic lemmatization of variable words (transformation into basic form) based on the English natural language processing (NLP) library and system
   c. Automatic deletion of functional words such as articles and adverbs
2. Processing:
   a. Transformation of the remaining text into an adjacency matrix of keywords, with the window size of every paragraph
   b. Applying a backbone extraction model threshold that extracts a core set of substantive keywords falling around 200
3. Visualization and Interpretation:
   a. Visualization of a network focusing on the adjacent keywords of the key concept, using the k-neighbor algorithm
   b. Interpretation of the represented semantic network.

3   Results of Semantic Network Analysis

The transcribed focus group interviews were categorized into two parts: (1) current evaluation of Google Glass and (2) future market expectation. Figure 3 below depicts the extracted frames of ego users and alter observers.

For the ego part (top half of figure), the most important frame consists of 3 keywords: "information", "interesting" and "social". Linked words emerge after passing a backbone extraction model's threshold [11] and are extracted by the k-neighbor [12] algorithm to represent directly connected words. If the users are interested ("interesting") in the new device, key binding values turn out to be "information" and sociability ("social" attached to situations and interactions). In particular, information should be
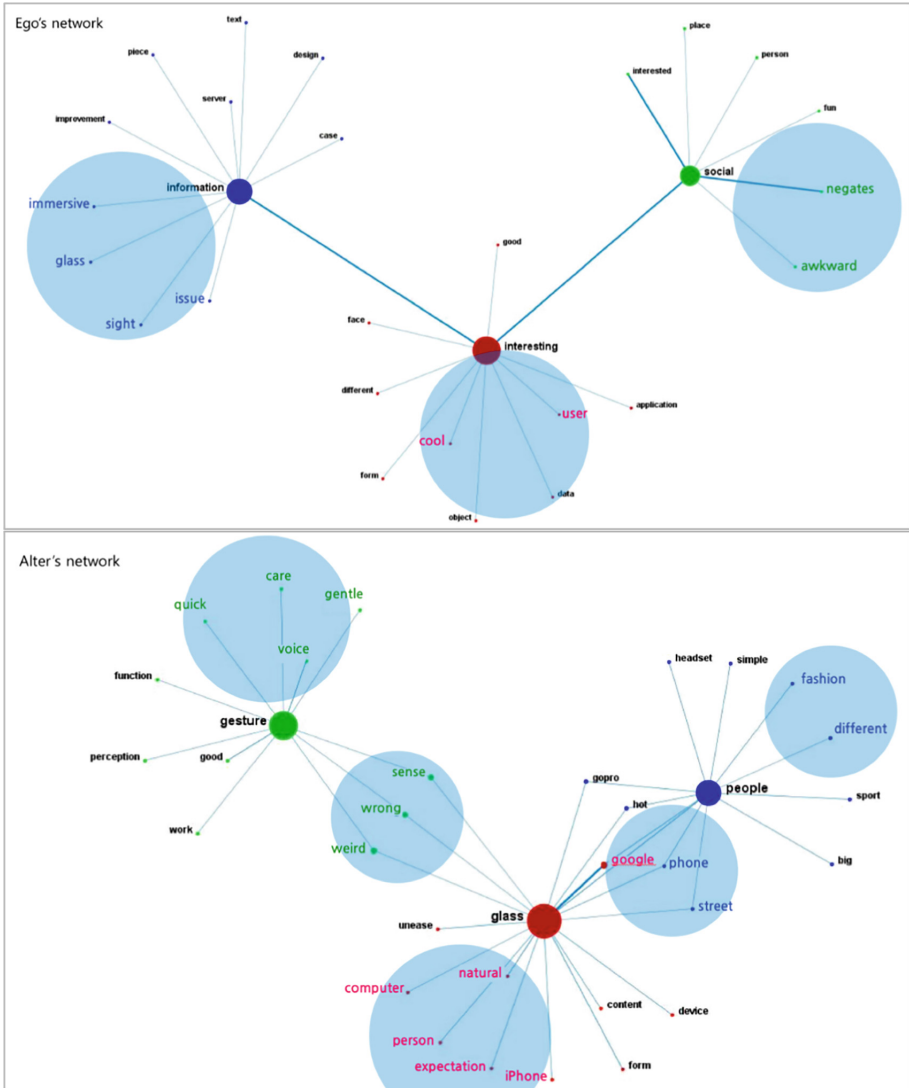
Fig. 3. Semantic networks of ego and alter

delivered with a key "issue" within the limited screen size and low resolution of Google Glass, and be "immersive". However, if social interactions are made "awkward", this "negates" the intended function and value of the technology.

While the ego group (users) point to the problem of social interaction, alters clarify the specifics of the problem: the wrongness of gesture while using Google Glass. Keywords related to preferred social gestures are: "quick", "gentle", "care", and "voice" while gestures elicited by Google Glass are considered "weird" and "wrong". Users think the introduction of Google Glass is as natural as the adoption of a

"computer" or an "i-phone". Nevertheless, the new device should offer a distinct value from smartphones ("phone") in the "street", and Google Glass can be fashionable ("fashion") only if it can address people's "different" tastes.

These observed needs of the ego and alter group elucidate their differences. The ego group's desires are focused on curated information, considering the limited screen size and low resolution of the device, that is adapted to the Google Glass's interface. On the other hand, their expressions that Google Glass is in some way a-social and weird are rather vague. Semantic network analysis of alter group's opinion reveals that operating gestures are judged important in making Google Glass socially acceptable.

From the perspective of social representation theory, one may conjecture that interaction between ego and alter will eventually form a stable projection (opinion) of Google Glass. In this research, the result of the interaction is analyzed separately by each ego and alter group. In the context of the individual, the categorized keywords in relation to gesture, depicted in Fig. 4, signify that finger swiping is often inaccurate, and seems "wrong" for interpersonal interaction. A minimalist design for operability and information feed is deemed important. In a social context, the blinking gesture especially was thought to be weird, not graceful, and even unacceptable.
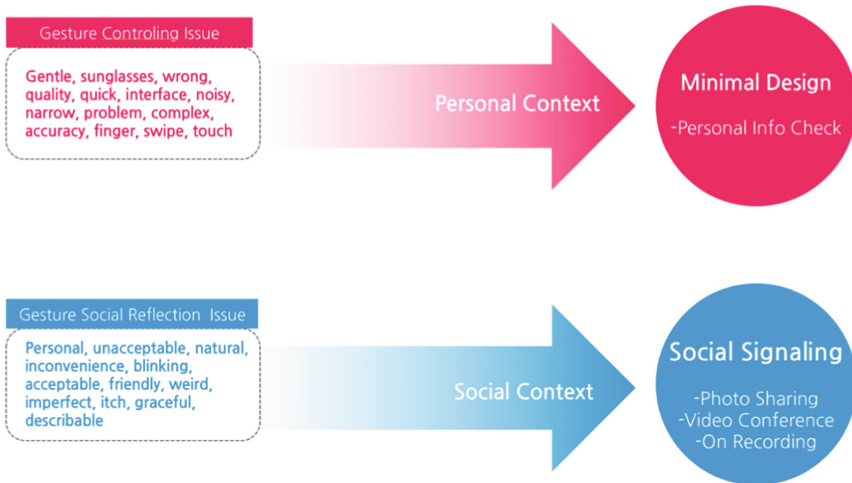
Fig. 4. Personal and social context of gesture

Beyond the evaluation reported here, there were expectations of the marketability of Google Glass for various usages in the future from the focus groups. Figure 5 demonstrates that the future market is closely related to the novel usage of data. If the non-user group of alter (left side of the figure) mainly expect health related utilization of data (e.g. blood, health, calorie), the existing user group of alter (right side of the figure) expect new services for sharable vision, photography, object recognition, and entertainment.

Fig. 5. Data-related market: ego and alter

While researching potential consumers' thoughts in the Bay Area, our research team also interviewed one of the developers of Google Glass to compare our results with the provider. The developer said that Google's team was fully aware of complex social issues that would determine Google Glass's success in the market. Therefore, the company had invested in a sizable expenditure to hire a market research agency. When asked what kind of killer usage would cause Google Glass to proliferate, the developer replied that providing services for music would make users more hands-free, mentioning people riding bicycles while wearing Google Glasses and listening to music, and this will soon create a boom in the market, according to the marketing research results (Interview with Mr. Ryan (alias) on 15 May 2013). This expectation was contradictory to our research outcomes; the provider did not seriously consider the issue of Google Glass being a-social, and did not know what part of UX was truly at stake.

4   Conclusion

Our research results were consistent with what had actually happened with Google Glass. When Google's social network service, Google Plus, received criticisms, Sergey Brin, the co-founder of Google, admitted that he was "not a very social person" (The Verge, 28 May 2014). Perhaps this scant attention to address social expectations and needs led to the failure of Google Glass. Google has practically ended sales of the device as of 16 January 2015.

My proposed research procedure: on-line data analysis, expert interview, focus group interview with ego and alter groups, and finally application of semantic network analysis, proved useful in deriving key UX issues, clarifying users' reservations about

Google Glass, especially that they deemed it to be socially jarring. The social psychological concepts of ego and alter and the study of their interaction, reflected by each groups's separate expressions of experiences, seems to be useful in projecting what kind of key variables will turn out to be important in the emerging market.

The study of UX should reflect the important aspect of social interaction. Using methods that represent sociological and social psychological concepts in market research has the potential to embrace social dynamics and therefore a worthwhile and perhaps neglected element of user experience.

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