Are Wearables Good or Bad for Society? An Exploration of Societal Benefits, Risks and Consequences of Augmented Reality Smart Glasses.

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Abstract: Recent market research forecasts predict that a new form of wearable devices will soon influence the media landscape: Augmented Reality Smart Glasses. While prior research highlights numerous potentials in personal and professional settings of smart glasses, this technology has also triggered several controversies in public discussions, for example, the risk of violating privacy and copyright laws. Yet, little research addresses the questions of whether smart glasses are good or bad for societies, and if yes, why. This study conducts exploratory research to contribute to narrowing this gap. Based on a survey among consumers, we identify several societal benefits and risks that determine consumers' evaluation of the anticipated and desired success of smart glasses. These findings lead to numerous important implications for consumers, scholars, managers, and policy makers.

Introduction

A recent study by Goldman Sachs (2016) asserts that Augmented reality (AR) smart glasses are the latest step in an evolution of digitization of reality and a large developing future market. What began with stationary computers that were temporarily online to receive and display information to their mostly business users in the last century turned into a network dominated by user-generated content (UGC), with users being mainly consumers that are permanently online and access the internet through a multitude of devices (Hennig-Thurau et al., 2010). Smart glasses mark the current latest step in this evolution as they hold the potential to merge online and offline – not just through ubiquitous and permanent online accessibility, but rather by merging online senses directly with consumers' vision (Rauschnabel, Brem, & Ro, 2015). This results in entirely new ways for consumers to interact with the Internet and its content.

Smart glasses represent a radically new invention with an important number of potential use cases for both civil and business life (Berque & Newman, 2015; Hein & Rauschnabel, 2016; Moshtaghi et al., 2015). However, because they are so new and their uses so unexplored, part of their success will depend on the hopes and fears consumers hold with regard to their usage and their proliferation (Lee, Bojanova, & Suder, 2015). Consumers do not just care about their mere self-interest, but rather include interests of the environment and society in the decision making (Doane, 2001). This trend of ethical consumerism can be defined as "spending that makes a positive difference in the world" (Witkowski & Reddy, 2010). It may become problematic with regard to smart glasses. When trying to predict smart glasses adoption, the technology acceptance literature would typically be of high relevance. However, early research suggests that smart glasses possess the potential to radically change society and the rules and norms it operates on for better and for worse (Wassom & Bishop, 2015). Anecdotal evidence for this derives from various newspaper articles, press commentaries and articles that discuss (predominantly negative) consequences of this technology for societies. However, the academic literature does not provide findings on what these potential consequences are and how these factors influence consumers' evaluations from a societal perspective. Absent such knowledge, managers may find it difficult to promote the use of smart glasses while policy makers may have difficulties in developing appropriate legislation. Finally, for theory, the lack of pre-market knowledge on societal consequences might hinder the understanding of the diffusion of smart glasses, as prior research has shown that consumers tend to include various ethical (Jacobsen & Dulsrud, 2007) and social (Venkatesh, Thong, and Xu, 2012; Davis, Bagozzi, & Warshaw, 1989) variables in their decision making.

In this chapter, we aim at increasing the understanding of societal factors associated with smart glasses. We are particularly interested in providing answers to the following research questions (RQs):

> **RQ1:** How do consumers evaluate the potential opportunities and threats of smart glasses for society?
>
> **RQ2:** How are these potential opportunities and threats related to consumers' desired and anticipated success of smart glasses?

The remainder of this chapter is organized as follows: First, we provide a definition of smart glasses as well as findings and use cases from prior research. Then, we briefly review technology acceptance theories and their applications on smart-glasses. This is followed by a review of ethical consumerism and consumer citizenship studies. For the empirical part of this chapter we present an exploratory survey study. Survey data was gathered and factor analyzed in order to extract factors that consumers use to evaluate smart glasses. In subsequent analyses, we empirically assessed how these factors relate to consumers' anticipated and desired success of smart glasses, particularly, the degree to which they anticipate and hope that smart glasses will become a successful technology. The chapter ends by discussing the results and providing managerial implications on how to react to the study's outcome.

Research Background

Smart Glasses – Definition and Use Cases

Smart glasses are wearable computing devices with integrated AR features. AR is a "medium in which digital information is overlaid on the physical world, that is, in both spatial and temporal registration with the physical world and that is interactive in time" (Craig, 2013, p.20). AR is not a very novel concept. Applications have been developed for stationary and mobile devices for years. An example of a smartphone app is Wikitude. With this app, users can look at a famous building. Wikitude then automatically includes relevant Wikipedia information in the view field on the smartphone's screen.

Wearables are a sub category of mobile devices that is attached to a user's body. Often, wearables share several physical and design-related similarities with fashion items (e.g., a smartwatch looks similar to a traditional watch). This is why some authors term them as 'fashnology' (e.g., Rauschnabel et al., 2016).

Smart glasses are wearable devices that are worn like regular glasses and possess the ability to merge the physical environment with virtual information within the view field of the AR

technology user. Typically, they are equipped with various sensors that gather information about the user's situational context, a WiFi-antenna to receive and send online information, a small memory, a processing unit and a small screen located in front of one eye or integrated into one or both of the translucent lenses. The processing unit allows the smart glasses to operate various recognition technologies to give the user context-relevant information on his/her social and spatial surrounding (Rauschnabel, Brem, & Ro, 2015). These AR devices need to be clearly distinguished from their virtual reality (VR) counterparts, that possess an opaque screen and do not allow for an overlay of virtual and physical reality, but that conceal the user's vision within the device shutting him off from all exterior visual stimuli. Typical models of VR devices include Oculus Rift and Samsung Gear VR. This chapter solely focuses on AR smart glasses.

Smart glasses represent a topic of growing interest in multiple disciplines. Researchers from various fields have made efforts to understand and describe use potentials for their respective domains, for instance, for maintenance processes (Quint & Loch, 2015; Yang & Choi, 2015), in customer service (Depari et al., 2015) or for medical settings, in which either doctors can share information live and remotely in surgery (Albrecht et al., 2014; Muensterer, Lacher, Zoeller, Bronstein, & Kübler, 2014), implicitly for administering a signal system for surgeons (Geißler et al., 2013) or as a means of augmenting patients who suffer from diseases that call for permanent behavioral monitoring, as is the case for instance for diabetes (Wall, Ray, Pathak, & Lin, 2014). In brief, the new technology possesses the potential to improve R&D activities, overall business process efficiency, or even allow for the creation of entirely new business models (Rauschnabel, Brem, & Ro, 2015). An example of a concrete activity that smart glasses can augment business with are specific apps which ultimately may fuel an entirely new business model: these apps provide contextualized advertisements shown to consumers as a new form of push-marketing and can be used for a new way of offering market research, as described by Hernandez, Jimenez, and José Martin (2010). A theoretical example for the improvement of knowledge management processes by means of smart glasses can be found with Hein and Rauschnabel (2016). They introduce a generic multi-level framework for the introduction of smart glasses as building blocks in a corporate knowledge management system that remains open to the adaptation of smart glasses for other business-related contexts.

The available devices that can be used for implementation are about to become as numerous as their potential use cases. Google Glass 2.0 as seen on table 1, for example, is an enterprise edition of smart glasses. Google's perceived intention is to benefit companies in the

manufacturing and other sectors. Other smart glasses are for entertainment or niche market purposes. For example, Everysight is for mountain bikers, who could use the smart glasses for calculating distance or managing rough terrain. Other glasses, like the Microsoft Hololens , also provide hedonic benefits like gaming. Table 1 provides an overview of some exemplified smart glasses.

Company	Glasses	Release Date	Price	Features
Carl Zeiss Optics	Zeiss Smart Lens	Estimated: 2017	unknown	Better optics Improved look
Epson	Moverio BT-300	Late 2016	To be announced BT-200 (previous model): $699.99	Front facing camera Lightest on the market OLED display (HD) Fits over normal glasses 5m pixel camera
Google	Glass 2.0 Enterprise Edition	unknown	unknown	Front light with camera Waterproof Wireless connectivity
Microsoft	Microsoft HoloLens	3/30/2016	$3,000.00 (beta version)	3D content enabled HoloStudio – video-editing Skype, Gaming etc. Actiongram-3D visual effects
ODG	ODG R-7	6/9/2015 (announced)	$2,750.00	Bluetooth Autofocus camera Magnetic lens Swappable lenses
Sony	SmartEyeGlass	3/27/2015	$899.00	Gyrosope Accelerometer Light sensor Camera
Everysight	Raptor	2016	To be announced	Advertised for use while biking. Overlays information on, for examples, distance, speed, elevation, navigation, time etc. Built-in camera

Acceptance Theories

Scholars attempt to understand new technologies by resorting to models such as the technology acceptance model (TAM) (Rauschnabel, Brem, & Ivens, 2015; Spagnolli,

Guardigli, Orso, Varotto, & Gamberini, 2014). The TAM sees the adoption of any technology as the result of perception and evaluation processes of a technology's usefulness and its perceived ease of use. More recent research on AR technologies acknowledges their multi-faceted character and turns to more advanced models of technology adoption (e.g., the "unified theory of acceptance and use of technology", UTAUT) that further elaborate on the drivers of adoption (e.g. East & Havard, 2015; Yiwen, Li, & Luo, 2015). These approaches differ from the original TAM in that they consider factors beyond usefulness and ease of use as relevant to drive adoption intention. Furthermore, these models are based on the assumption of enterprise instead of personal use, which brings the aspect of cost tolerance and other differences into play. The latest model by Venkatesh, Thong, and Xu (2012) provides researchers with the adoption drivers in in personal settings, such as hedonic motivations. While extant technology acceptance theories provide a solid and robust framework to study a user's adoption intention, they do not aim at understanding the impact a technology has societies, which has been shown to be an influential factors in consumption decisions (Bijker & Law, 1992; Doane, 2001). Supported by prior research (Shaw, Newholm, & Dickinson, 2006), we propose thse awareness of social consequences (i.e. societal benefits and risks) to affect consumers' individual evaluation of smart glasses.

Literature Review

Although research on smart glasses is still relatively new, few studies have looked at consumers' reactions to them. We organize these findings around the UTAUT2 model (Venkatesh et al. 2012) and discuss the degree to which they can be suitable to explain societal acceptance. Drivers that are connected to societal questions of smart glass adoption will be discussed in more detail than those without relevance to our research question.

Performance expectancy and hedonic motivation

Performance expectancy and hedonic motivation both directly refer to the intentions that drive people to use a technology. Performance expectancy refers to motivations whose cause lies outside of the user's personality – an extrinsic motivation. In contrast, hedonic motivation refers to the potential enjoyment one might perceive without benefitting from any increase in efficiency or benefits other than well-being (Ratneshwar & Mick, 2005; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh et al., 2012). Often, these performance expectancies are termed 'perceived usefulness' (Davis, 1989), 'functional benefits' (Rauschnabel, Brem and Ivens, 2015) or 'utilitarian benefits' (Chitturi, Raghunathan, & Mahajan, 2008). Performance expectancies are functional and task-oriented expectations about a technology that are

associated to performance improvements. In contrast, hedonic motivations cover the enjoyment and entertainment factor of technologies (Venkatesh et al., 2012).
For various sorts of wearable devices, like smart glasses, studies have shown that performance expectancies positively influence adoption and use in personal settings (Gu, Wei, & Xu, 2015; Rauschnabel & Ro, 2016) and suggested them in the context of enterprises (Hein & Rauschnabel, 2016). To the best of our knowledge, only one study has looked at the hedonic benefits smart glasses can offer and shown its empirical relevance (Rauschnabel et al., 2016). Although hedonic motivations play a role in the adoption process, we do not include these drivers into our model as they bear no relevance with regard to the ethical consumer. However, utilitarian benefits could play an importance in evaluations from a societal perspective.

Effort Expectancy

User friendliness of the technology in question has been introduced in various forms into the technology acceptance literature. Originally, the focus lay on the *'perceived ease of use'* of a respective technology, as office software was typically the subject of research and its use often less than intuitive with Graphical User Interfaces not yet invented (Davis, 1989). Subsequent models changed this notion when describing the degree of complexity associated with technology use (Thompson, Higgins, & Howell, 1991) and unifying theories further abstracted this acceptance aspect to the concept of effort expectancy (Venkatesh et al., 2003), which was tailored to more user-friendly systems that would call for a limited amount of effort to learn effective operation. However, we assume that the effort expectancy does not pose a matter of interest to ethically motivated users.

Social Influence

Social influence (syn: social norms or normative believes) are indicative of social influence and represent personal beliefs a person holds regarding whether a behavior is desired or frowned upon by those who are closest to him/her (Fishbein & Ajzen, 1975; Weiz, Anand, & Ernst, 2016). Smart glasses can evoke a negative effect of social influence, as they can interfere with the normal way people interact with each other in conversations in an undesired way (Due, 2015). For instance, smart glasses can be used to record people without their knowledge, which would be an infringement to their personal rights, or users may dedicate their attention to online content while being in conversation. Given normal circumstances, both examples would be considered as socially unacceptable behavior. In fact, the term "glasshole" emerged for smart glasses users who – willingly or unwillingly – violate these

norms of social behavior (Lawler, 2013). This presence of social norms within society antagonizing smart glass use may pose a problem to their large-scale adoption (Weiz, Anand, & Ernst, 2016). Two other studies provide support for this. First, Rauschnabel, Brem & Ivens (2015) study descriptive norms and show that people who think that using smart glasses will be common among their peers are more likely to adopt them. Rauschnabel and Ro (2016) complement this by showing that social influence, as in TAM studies, is positively related to smart glasses adoption intention.

Social influence, as it is considered in UTAUT2, only refers to the desires of thirds regarding whether a person should show a specific adoption behavior and how this wish influences the adopter (Fishbein & Ajzen, 1975; Venkatesh et al., 2003). The mechanisms could work differently when studying the societal perspective. Smart glasses can fundamentally change how people communicate, because they introduce a potential information asymmetry into every conversation in which one is permanently online, connected to various databases and equipped with such a device, while the other is not (Due, 2015). We argue that whereas, in the past, scientists and technologists discussed amongst each other who to blame for potentially unwanted consequences of their inventions (Koepsell, 2010), responsibility has shifted to the consumer as it is now up to him to decide how to use a new technology. Ethically motivated consumers recognize their responsibility reaching further than the mere control for an ecologic supply chain design or use and deposit of products. They integrate the awareness of potential influences on society into their reasoning process and their evaluation of a technology, making the question whether to adopt a question of consumer ethics (Vitell, 2003). With the ethically responsible consumer active in today's markets, we research those scenarios that consumers think of when pondering how smart glasses may affect society at large and how these projections alter adoption intentions and expectations.

Facilitating conditions

Facilitating conditions refer to a user's ability to access resources that are relevant to the adoption of a technology, such as financial and knowledge resources (Venkatesh et al., 2012). With regard to smart glasses, these facilitating conditions should play a role because, for the near future, they will remain a high-price high-tech product. However, manufacturers will be eager to gather use information about use cases and how to improve early models through their products and respective support, presumably granting early adopters generous access to support and other knowledge resources needed in order to efficiently operate them. Still, neither the availability of financial resources nor the knowledge resources do relate to questions that supersede the individual and thus could be of interest to ethically oriented

consumers. Thus, this factor shall not be discussed further as it does not contribute to the understanding of society adoption with regard to ethical consumerism.

Price Value

Price value refers to the commitment of users who compare the monetary sacrifice for the purchase of the technology with the benefits they may expect from the purchase in a cognitive trade-off (Venkatesh et al., 2012). According to UTAUT2, perceived price value determines the behavioral intention to use the purchased technology. Again, this factor is well-established, yet presumably does not constitute a driver relevant to ethically motivated consumers and has not yet been studied in the context of smart glasses.

Experience and habit

Experience and habit also contribute to the adoption intention of any user which has been acknowledged only in UTAUT2 (Venkatesh et al., 2012). The difference between these two lies in their character; experience engulfs a temporal component, covering the amount of time someone already spent using a particular technology, with operationalizations ranging from the time passed since the initial use to various levels of experience at different points in time (Venkatesh et al., 2003; Venkatesh et al., 2012). Habit, in contrast, is the extent to which people show behavior automatically as a consequence of having learned it. From a logical point of view, this requires some prior experience making experience a necessary condition (Venkatesh et al., 2012), which is, in the current stage of smart glasses penetration, scarce. What could the role of habit and experience from a societal perspective be in the future? People might get used to them and adjust their behavior. For example, during the turn of the millennium, many people were skeptical about the use of mobile phones for societies and might have used this reason to not adopt a mobile phone. Current cellphone penetration rates of close to, or even above, 100%, indicate that this fear seemed to have decreased or lost in importance.

Privacy

Just like the wearer's surrounding, a **user's level of privacy** may exert an influence on the adoption intention, as privacy can be seen as a "psychological as well as a social and a political requirement" (Mann, Nolan, & Wellman, 2003, S. 334). The question whether a user's own privacy is safe may ultimately be a technological question, as informational safety in corporate contexts is a precondition to any adoption (Hein & Rauschnabel, 2016). For private contexts, different cultures have shown to have different levels of tolerance when it comes to informational uncertainty and will to disclosure (Petronio, 2002). However, a given

level of mistrust against technology is endemic in many populations. It manifests itself in behaviors such as laptop users blocking the integrated webcam with Post-its. For a camera, microphone and a whole range of other sensors worn on the head, this mistrust may become even more severe. Prior studies do not report a statistically significant effect of privacy risks on adoption intention or attitude measures (Rauschnabel & Ro, 2016). Rauschnabel and colleagues (2016) studied the role of two different conceptualizations of privacy risks of smart glasses. What they labeled 'personal privacy risks' describes the extent to which smart glasses threaten a user's own privacy (for instance, if a hacker get access to the camera). The authors then show that personal privacy concerns do not affect adoption intention. However, public privacy concerns (i.e. the extent to which using smart glasses can threaten other people's privacy) do. They conclude that when it comes to smart glasses, people tend to care more about other people's privacy than about their own. In this study, we look at privacy concerns from a third perspective: Is smart glasses penetration related to perceived 'societal privacy'? That is, does overall public privacy decrease and does this matter to consumers?

Fashnology-related factors

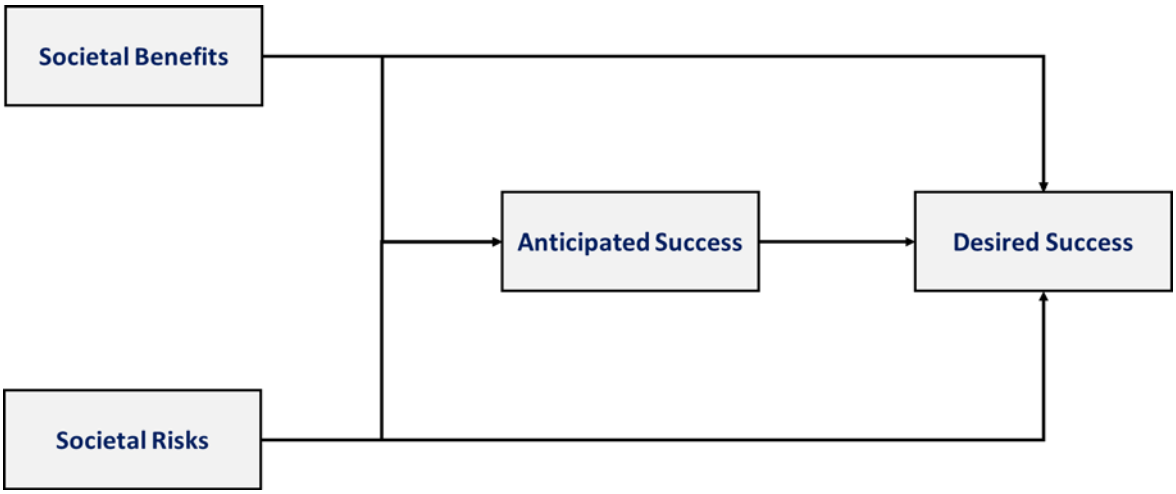
Adding to the drivers hypothesized in UTAUT2, we stress that smart glasses are not just a technology to be 'used', they are also products to be 'worn' like fashion. That is, factors that determine fashion decisions are important predictors of smart glasses' adoption. Particularly, "Smart glasses […], as any wearable devices, [are] also a new form of fashion accessory for users" (Rauschnabel, Brem, & Ro, 2015). Research suggests using the term '**Fashnology'** for smart glasses – a conceptual combination of fashion and technology. Fashion is characterized by high visibility and serves as means of constructing a social identity through the symbolic value its conveys (Davis, 1992) and therefore also needs to meet a specific level of comfort. Prior research provides first evidence. For example, the influence of design on usage intention has been confirmed for wearable headphones (Reinelt, Hadish, & Ernst, 2016). Hein & Rauschnabel (2016) discuss that smart glasses need to meet certain expectations of physical appearance (i.e., design) and comfort (i.e., weight, well-fitting). For wearable devices, the aspect of wearing comfort is even more true as part of its functional value is a direct result of it being attached to the human body in an ergonomic way. If users perceive the wear of a wearable device to be physically or emotionally uncomfortable or its use overly tiring, this will negatively affect willingness-to-use (Hein & Rauschnabel, 2016; Bodine and Gemperle 2003). Chun et al. (2016) and Kim, Shin, and Park (2015) also show that these self-presentation related factors also hold for other wearables, such as smart watches. However,

wearing fashion-like smart glasses in everyday life that integrate virtual elements in one's view field could distract people. This will be addressed later.

Research Questions

Figure 1 shows the framework for this research. We propose that consumers make judgments about both positive and negative societal factors (societal benefits and risks) which they then use to anticipate the success of smart glasses and make judgments about their desire of the success (see figure 1). Thus, in contrast to the traditional technology acceptance and adoption model, our framework does not use a consumer's personal evaluation of smart glasses, but his/her societal evaluation – that is, if he/she thinks that smart glasses are something good or bad for society.

Figure 1: Framework



Anticipated success is the degree to which people expect that a new technology (like smart glasses) will be an established technology in the near future. A related, but distinct construct is desired success, defined as consumers' aspiration that a technology (like smart glasses) becomes widely adopted. Societal benefits describe expected positive consequences of an established technology, whereas risks cover negative consequences. Thus, in contrast to traditional acceptance models (Venkatesh & Bala, 2008; Venkatesh & Davis, 2000), our proposed model does not focus on a user's personal benefits or risks, but on the societal evaluations, which is a novelty of this research.

Because of the exploratory nature of our research, we formulate two research questions:

RQ1: How do consumers perceive smart glasses in terms of societal benefits and risks?

RQ2: Which societal benefits and risks influence the anticipated and desired success of smart glasses?

Methodology and Research Design

Because of the novelty of the technology we use a scenario-based survey approach. We conducted computer-assisted personal interviews in which 364 students from a mid-sized German University were asked to take part in a survey on laptop computers in summer 2014. Candies and snacks were offered as incentives for participation. The sample consisted of 43.1% male and 56.9% females, with an average age of 22.6 years (SD=2.4). 61.7% were undergraduate students. A high educational level characterizes university students, including a high ability of critical thinking and an appropriate level of interest in new technologies, making them an appropriate sample for this context. As Google Glass was the most well known smart glasses devices, we focused the study around Google Glass.

As prior research does not provide appropriate scales we used a very exploratory approach. More specifically, we extracted items by adopting existing scales and items to a society context (e.g. perceived usefulness, Davis, 1989), discussing items in the research team and with an AR expert who is not involved in this study, and by extracting statements from newspaper articles and discussions in online forums. We believe that the exploratory nature of this research, the lack of theory and prior research, as well as the pre-market stage of the technology justify this ad hoc approach compared to established complex scale development procedures. All items were measured on 7-point-Likert scales, anchored from 1 ("I do not agree") to 7 ("I fully agree").

Identification of Societal Benefits and Risks

26 items were subject to a series of exploratory factor analyses. After the application of various rotation methods and dropping of two items (due to low factor loadings and/or high cross-loadings across different rotation methods), we received a stable six-factor solution, consisting of three risk and three benefit factors. We assessed the reliability of the factors calculating Cronbach's alphas. All of them were close to or exceeded the recommended threshold of .70 (Nunally, 1978). Based on the corresponding items, we generated names for each factor. In the following sections, we will introduce, define and discuss each factor in detail.

Antecedents to anticipated and desired market success

Societal Risk of Loss of Awareness is the risk of society members losing their sense for processes and events happening in their immediate environment because they become distracted by the visual overlay of information provided by the smart glasses. Similar fears emerged with regard to the Sony Walkman when it became introduced to the end consumer market in 1980. Public criticism raised that users would ultimately lose touch with their surrounding and degenerate to self-enclosed and incommunicative individuals, all part of what David Riesman referred to as the "lonely crowd" (Hosokawa, 1984; Riesman, Glazer, Denney, & Gitlin, 2001). For smart glasses, this concern exists in a similar manner as described. Therefore, smart glasses hold the potential to make society a social place characterized by a loss of mutual considerateness and thoughtfulness amongst members. We name this the potential for a societal loss of awareness.

Societal Risk of Social Cohesion: The extent to which consumers expect smart glasses to diminish the amount of social behavior in a society in general. This concern is the result of consumers expecting information asymmetries to be used by users of smart glasses in opportunistic ways, thereby eroding the social norm of non-opportunistic behavior. For instance, users of smart glasses may look up personal information on their conversation partners without them knowing, and use that informational advantage to their own benefit (Rauschnabel, Brem, & Ivens, 2015). Furthermore, seeking of self-interest with guile, which is the definition of opportunism according Williamson (1985), can be greatly facilitated. With these unwanted side-effects of widespread adoption of smart glasses, we propose smart glasses may pose a threat to social cohesion.

Societal Risk of Public Privacy: This construct refers to consumers' fear that widespread use of smart glasses may make infringements to their right to informational self-determination. This is exacerbated, as most built-in cameras possess no outward-facing indicator of activity. People who are filmed or photographed cannot tell they are being recorded. Thus, this risk covers the fear of people that privacy and anonymity in daily life and public may be threatened, as everyone can become subject of recording anywhere anytime by someone linked to the Internet. These fears are not new. First, a recent study has shown that when it comes to smart glasses, people tend to care more about other people's privacy than their own (Rauschnabel et al., 2016). Second, similar concerns regarding the loss of privacy in public were raised when CCTV (closed circuit television) was introduced for public supervision in Great Britain, which consisted of large numbers of TV cameras in public spaces surveyed by

public authorities (Armitage, 2002). Wearables like smart glasses pose a form of 'sousveillance' - which is surveillance directed at the public authorities surveilling its citizens to permanently exert power (Mann et al., 2003). Adding to the inventors' conceptualization, we note that sousveillance based on endemic use of wearables does not stop at focusing and exerting counter-power to authorities, but that it also focuses other citizens.
Similar to these concerns, smart glasses pose a risk to privacy in public, which we term societal risk of public privacy.

Societal Benefit of Public Safety Improvement: Smart glasses, when adopted at a large scale, can also provide some of the benefits of a CCTV. Benefits concern crime prevention as well as disaster management (Armitage, 2002). For crime prevention, CCTV works by addressing both potential offenders as well as potential victims. Potential victims will be reminded of eventual hazards, altering their behavior to a more precautious one. Potential offenders can be deterred, as the anonymity in public spaces that allows them to commit crimes is replaced by the possibility of having their identity uncovered and to allow prosecution (Armitage, 2002). For crisis management, CCTV can allow emergency managers to evaluate the situation at different locations, allowing for an efficient deployment of forces (Alvear, Abreu, Cuesta, & Alonso, 2013; Sime, 1999). Similar to CCTV, smart glasses possess the properties of being able to record felonies and, in case of emergencies, provide real-time footage which allows for a more efficient deployment of rescue forces. Thus, smart glasses hold what we call a public safety improvement potential.

Societal Benefit of Progress: Smart glasses, like any other new technology, give rise to hopes regarding how its proliferation will enable societal progress to happen. We suggest that this societal progress has a social and an economic side to it, which both are interlinked. Regarding the social side, hopes articulated include the abstract ideal of increasing social cohesion by making the world a smaller place, as people can communicate even more using smart glasses. Specifically, people who previously interacted in the context of various small-groups (e.g. families, colleagues, sports clubs) jump to a situation where they communicate with other dispersed individuals, surpassing the boundaries of any group (Mann et al., 2003). Regarding the economic side, smart glasses and their widespread use affect both business and private contexts, creating an entirely new business model. These new business models call for new technologies, new understandings and ultimately result in entirely new jobs and, potentially, job descriptions, increasing a society's welfare.

Societal Perceived Usefulness: Drawing on classical Technology Adoption Literature, we found a general assessment of perceived usefulness at a society dimension without further specifications, thus measuring a utilitarian value. This factor captures consumers' perception of how useful smart glasses may become to society.

Results

RQ1: Societal Perception of Smart Glasses

To answer RQ 1, we computed means across variables. Table 1 provides an overview of the means in the main sample, as well as several comparisons between numerous sub groups.

Among the overall sample, respondents seem to rate the societal risk factors higher than the societal benefits. When comparing desired and anticipated success, consumers seem to rate the anticipated success higher than the desired success. We now discuss several variables along which consumers' perceptions differ:

The first variable is gender. More females demonstrate agreement in the societal loss of social cohesion (4.84 female to 4.26 male), societal loss of awareness (5.77 female to 5.24 male), and Google brand attitude (4.91 female to 4.25 male). Males, on the other hand, demonstrate agreement with their desired success for Google Glass (2.95 male to 2.12 female), anticipated success for Google Glass (4.11 male to 3.19 female), and familiarity with Google Glass (5.30 male to 4.42 female).

Second, consumers' level of familiarity with smart glasses (median split) matters. While there are no significant differences concerning benefits, high familiarity consumers tend to rate the risks higher. Surprisingly, high familiarity consumers also tend to have higher levels of anticipated and desired market success.

Third, respondents' attitude towards the manufacturer brand of the smart glasses matters. For respondents with low Google brand attitude, there is larger agreement for societal loss of awareness (5.65 low to 5.41 high) and societal loss of privacy in public (5.71 low to 5.15 high). For respondents with a more positive brand attitude, there is larger agreement for societal perceived usefulness (3.60 high to 3.00 low) and desired success (2.79 high to 2.21 low).

RQ2: Drivers of anticipated and desired market success

In order to answer RQ2, a covariance-based structural equation model was calculated to predict the desired success of Google Glass based on both negative and positive consequences for society and the anticipated success as a mediating variable using SPSS AMOS 23. Negative consequences as mentioned afore contained damage of social cohesion, the loss of awareness of individuals and a loss of society level privacy. Positive consequences, in contrast, engulfed safety improvement potential, social progress potential and a societal usefulness potential. Inspired by prior research and because of the novelty of the technology (Rauschnabel et al., 2015; Rauschnabel & Ro, 2016), we controlled for the Attitude towards the brand Google, familiarity with Google Glass, gender and age. The overall model fit was acceptable, as indicated by a significant χ^2-value (χ^2=305.53; df=212; p<.001; CFI=.98; TLI=.98, NFI=.95). Furthermore, an RMSEA value of .035 indicated the absence of substantial approximation errors. By choice of our independent variables, we were able to explain 28.9% of variance with regard to anticipated success, and, including it into the model, 63.2% of variance (R^2_{Δ}=34,4%) of desired success. The results are visualized in figure 2 and fully documented together with their respective p-values, in table 3.

For potential benefits to increase respondents' expected success, we identified beliefs in general usefulness ($ß_3$=.234, p=.02) and a tendency to believe in potential safety improvements enabled by smart glasses ($ß_1$=.130, p=.097). Desire for Google Glass to succeed was significantly caused by societal progress potential ($ß_8$=.283, p=.005) and the general perceived usefulness ($ß_9$=.230, p<.001).

On the downside of potentials, none of the theoretical concerns reached significance as respondents did not expect them to stop smart glasses from finding wide adoption. Still, respondents showed significant animosity towards use as they feared the loss of social cohesion caused by smart glasses ($ß_{10}$=-.170, p<.001) and a tendency towards losing of their anonymity in public ($ß_{12}$=-.137, p=.081). Expectedly, anticipated success also showed a significant impact on the desired success ($ß_{13}$=.211, p<.001).

	Overall sample		*Group comparisons*								
			Gender			*Familiarity*			*Google Brand Attitude*		
	Mean	*SD*	*M*	*F*	*p*	*low*	*high*	*p*	*low*	*high*	*p*
Societal Benefits											
Societal Safety Improvement Potential	3.77	1.28	3.79	3.75	0.82	3.74	3.80	0.63	3.61	3.94	*0.01*
Societal Progress Potential	3.53	1.22	3.67	3.42	*0.06*	3.45	3.62	0.20	3.32	3.77	0.43
Societal Perceived Usefulness	3.28	1.42	3.38	3.21	0.27	3.18	3.40	0.15	3.00	3.60	*<0.01*
Societal Risks											
Societal loss of social cohesion	4.59	1.54	4.26	4.84	*<0.01*	4.77	4.39	*0.02*	4.83	4.32	*0.01*
Societal loss of awareness	5.54	1.32	5.24	5.77	*<0.01*	5.70	5.35	*0.01*	5.65	5.41	*<0.01*
Societal loss of privacy in public	5.45	1.35	5.37	5.51	0.35	5.44	5.46	0.87	5.71	5.15	*<0.01*
Dependent Variables											
Desired Success for Google Glass	2.48	1.42	2.95	2.12	*<0.01*	2.32	2.66	*0.02*	2.21	2.79	*<0.01*
Anticipated Success for Google Glass	3.59	1.62	4.11	3.19	*<0.01*	3.30	3.91	*<0.01*	3.50	3.68	0.28
Control Variables											
Google Brand Attitude	4.63	1.62	4.25	4.91	*<0.01*	4.75	4.49	0.13	N/A	N/A	N/A
Familiarity with Google Glass	4.80	2.41	5.30	4.42	*<0.01*	N/A	N/A	N/A	4.87	4.72	0.47
Age	22.62	2.41	22.87	22.43	*0.09*	22.36	22.92	*0.03*	22.71	22.51	0.43
Gender	0.57	0.50	N/A	N/A	N/A	0.46	0.66	*<0.01*	0.50	0.65	*0.01*

Notes: N/A - average values were not calculated for the split variables
Values for gender represents percentage value of females.
Familiarity and Google Brand Attitude were grouped based on a median split.
F: female; M: male, SD: Standard Deviation; p-values based on F-test.

Table 1: Mean values and comparison of means

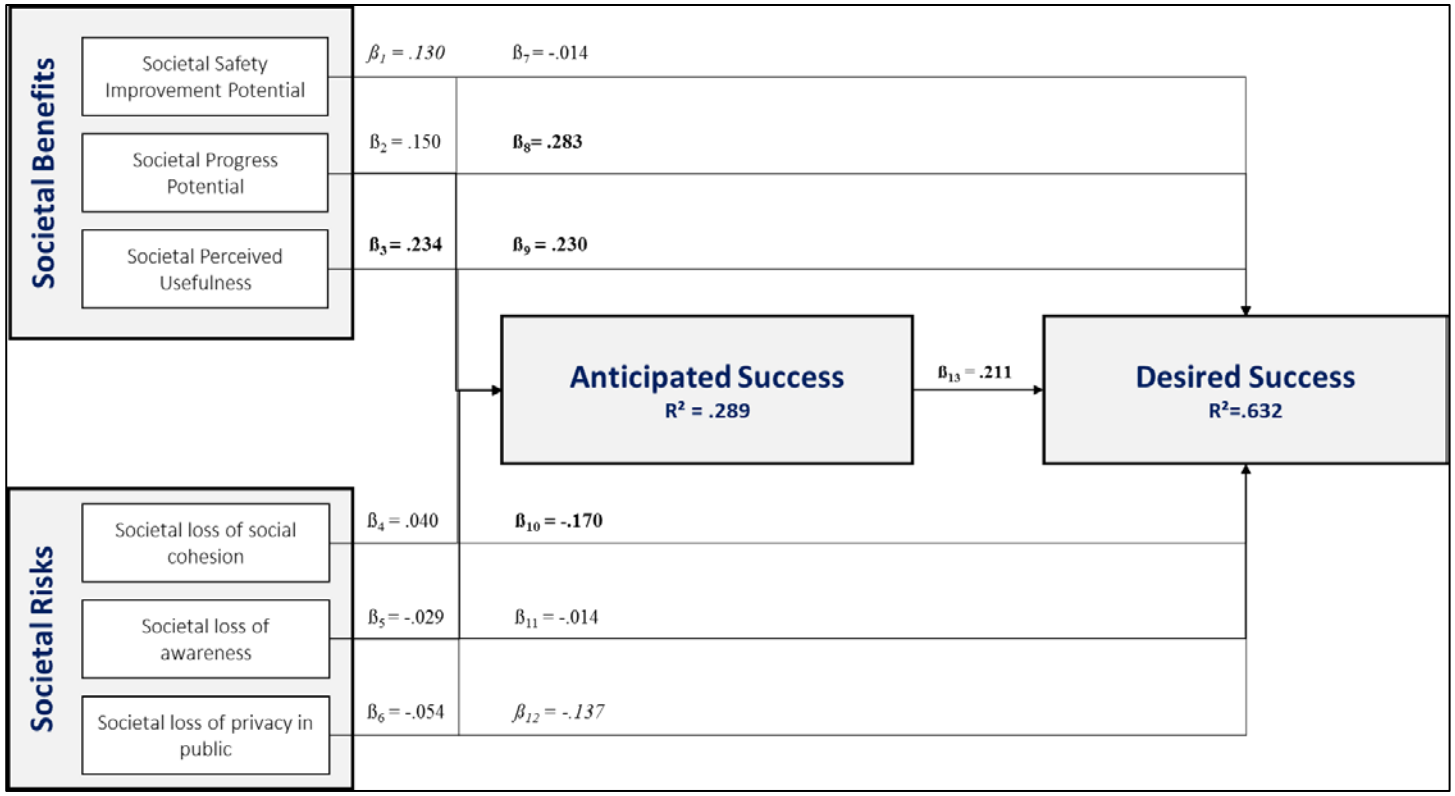


Image 1: SEM results; note: bold letters: p<.05; italics: p<.10; only standardized coefficients reported

Independent Variables	**ß**	**p-values**
DV: Anticipated Success		
Societal Safety Improvement Potential	.130	*.097*
Societal Progress Potential	.150	.210
Societal Perceived Usefulness	.234	**.002**
...Societal loss of social cohesion	.040	.642
...Societal loss of awareness	-.029	.712
Societal loss of privacy in public	-.054	.574
DV: Desired Success		
Societal Safety Improvement Potential	-.014	.830
Societal Progress Potential	.283	.005
Societal Perceived Usefulness	.230	***
...Societal loss of social cohesion	-.170	*.017*
...Societal loss of awareness	-.014	.828
Societal loss of privacy in public	-.137	*.081*
Anticipated Success	.211	***
Control Variables	**ß**	**p-values**
DV: Anticipated Success of Google Glass		
Google Brand Attitude	.002	.973
Familiarity	.088	*.073*
Gender	-.229	***
Age	.041	.434
DV: Desired Success of Google Glass		
Google Brand Attitude	.040	.366
Familiarity	-.002	.952
Gender	-.149	***
Age	.096	**.021**

notes: *** = p<.001 ; n = 364; standardized coefficients reported only; coding gender: o=male, 1=female.

Table 2: Estimates, Significances and Controls

Discussion

Recent forecasts predict that smart glasses have the potential to transform media behavior. Yet, little research has been conducted to understand this new technology. Published research has exclusively looked at adoption factors on a company level (Hein & Rauschnabel, 2016) or user level (Rauschnabel, Brem, & Ivens, 2015), or applications in various contexts (e.g. Albrecht et al., 2014; Muensterer et al., 2014; Tomiuc, 2014). Potential consequences for societies as a whole, however, remains an under researched area. Consequently, with this research, we now provide a first attempt to fill this research gap. Using the example of Google Glass, we identified three societal risks and three societal benefits of smart glasses: the risk of loss of social cohesion, the risk of loss of awareness, the risk of loss of privacy in public, the societal safety improvement potential, the societal progress potential and the overall societal

perceived usefulness. We then integrated these factors in a theoretical model to explain both anticipated and desired success of smart glasses given the example of Google Glass.

Implications for Scholars

Technology adoption research has come a long way since its beginnings towards the end of the 1980s. Much adjustment has been made in order to cover for changes of technologies that original models were applied to (e.g. Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh et al., 2012). However, it is not just the technologies that change, it is the consumers that have changed with them, as technology has dissolved into the daily lives of their users (Brenner et al., 2014), with researchers today discussing even the "Internet of Things" (Porter & Heppelmann, 2015). With UTAUT2 covering aspects discussed above, research has been provided with a tool accounting for properties of many new technologies. However, it does not cover changes in the consumerscape technology finds itself in – the far-thinking consumer, the ethical one, who projects and extrapolates his consumption behavior into the far future and onto entire societies, often even the global society. This ethical consumer asks himself: am I pushing society (respectively humanity) into a desirable direction? Or to resemble the Kantian moral imperative even clearer: is my adoption behavior one of which I can wish to be the general rule for all consumers (in my society)? However, these are questions posed on a daily basis by consumers who have developed a sense of (sometimes global) consumer citizenship. We suggest this as consumer landscapes in many industrialized countries have developed distinct cultures of ethicality (Newholm & Shaw, 2007), in which the call for short-term economic efficiency and utilitarian effectiveness has been replaced by long-term perspectives and a turn towards social values (Freestone & MacGoldrick, 2008; Shaw, Grehan, Shiu, Hassan, & Thomson, 2005). The growing importance of social norms in UTAUT2, especially among smart glasses (Rauschnabel et al., 2015; Rauschnabel & Ro, 2016) already accounts for this tendency to take the preferences and needs of others into consideration. Yet, we argue that consumer citizenship at work supersedes the construct of social norms. In fact, we propose the moral norm of ethically motivated consumers to extend the concept of social norms, as social and subjective norms are relative to the particular society they are exercised in. Ethically motivated users may consider people involved into their decision making as being part of a larger group than just their direct social environment, giving their decisions in the most extreme case an element of universality. Further research could focus on the question of where ethically motivated consumers draw the line, and how different groups of these consumers operationalize the "in-

group" they feel responsible for with their behavior. Regardless of whether consumers feel a universal or a conservative obligation toward their own or a global society, the rise of wearables and other consumer electronics that have the potential to alter entire societies must be addressed accounting for the existence of consumer citizenship. Incorporating a factor into applied acceptance models that covers the aspect of this hypothesized norm users turn to when pondering technology adoption can serve this aim. Questions to include may cover if "people will lose sympathy for each other if this technology becomes adopted widely," "people will stop paying attention to each other if this technology becomes adopted widely," "a society without secrets is good/bad place to live in" or "if this technology is adopted widely, society will change for the better/worse". Some of these items are included into our exploratory study. Apparently, these items have to be adjusted to the context of respective technologies, yet we propose that they cover a new construct at the edge of technology adoption and consumer research. This construct needs further research with regard to its dimensionality, its scope, formalization and orientation. Scale development efforts could begin at this point, with the ultimate aim of updating the current technology acceptance literature, as the reality in which technology adoption takes place has massively shifted.

Implications for Managers

The expectations of consumers regarding how smart glasses are about to alter society through their widespread use has several implications for managers. If managers, for instance, would like to promote smart glasses and have them promoted via word-of-mouth, this is only going to happen if consumers observe the technology in a benevolent way rather than fearing it. Therefore, managers need to tackle issues related especially to the loss of social cohesion, which showed the largest impact on the desired success. This fear especially possesses a positive counterpart: the societal progress enabled by smart glasses. Contents of communication strategies thus should focus on applications that use smart glasses to deepen existing relationships and create new ones.

However, concerns regarding a loss of privacy in public and having citizens' rights infringed, respectively infringing those of others is a concern to be tackled differently. Still, these issues should be addressed in corporate communication

Managers from other industries should observe carefully the development of smart glasses. Given the right regulation, market research based on eye-movement - nowadays a costly, yet highly effective service to order (Lohse, 1997) - could experience a similar democratization like survey-based research (Pieters, Rosbergen, & Wedel, 1999; Waclawski, 2012).

Presumably, the entire field of customer management will undergo a massive change, as new possibilities of approaching customers and reaching their attention may pop into existence. Some of the troubles connected to push marketing based on location-based services that aim at smartphone-usage could become obsolete through the introduction of smart glasses, achieving higher acceptance by users and opening doors to new revenue potentials (Bruner & Kumar, 2007).

Implications for Policy Makers

With regard to risks, it is the legislature's turn to regulate smart glasses like any new emergent other technology in order to protect citizens' rights and safety. Smart glasses possess the advantage of having some properties and causing the same concerns like cameras built into cell-phones that are linked to social networks. These, too, offer the possibility to snap photographs of people without them knowing and posting their images online. Thereby, people's privacy rights are potentially at risk whenever a person comes into the device's line of sight. Thus, regulation can rely on already achieved and implemented regulation, like rules that apply to the case of public CCTV surveillance. However, policy makers should also account for situations in which sensitivity is needed when weighing different interests against each other: should there be exemptions to strict regulations about information rights in emergency cases? How are these cases defined? Which property or potential of smart glasses or emergency cases may justify such an exemption? Likewise, rules for daily application need to be freedom-oriented enough that innovation does not become unattractive. Empirically, regulation was shown to have ambiguous effects on innovation – sometimes hindering it, like in the case of internet-neutrality (Ehrlich, Eisenach, & Leighton, 2010), sometimes fostering it, like in the case of eco-innovations (Ghisetti & Pontoni, 2015; Jaffe & Palmer, 1997) and sometimes leading to innovation that is set to meet regulators' expectations while keeping productivity stable (Rubashkina, Galeotti, & Verdolini, 2015). These examples illustrate that legislature needs a slow hand when designing the rules to be applied onto users of smart glasses if economic and societal progress potentials shall develop.

Finally, like any other technology that, in the past, has proven useful to make work more efficient, smart glasses stand to adoption by officials and authorities. Advantages in disaster management can be a justifying motivation (Alvear et al., 2013; Sime, 1999).

Limitations and future research direction

As with any study, this research has limitations. For example, using cross-sectional, self-reported student data and focusing on google glass (rather than various other devices) might

limit the external validity and generalizability of the findings. Moreover, the benefits and risks included in this study may not reflect all potentially relevant societal benefits and risks.

Future studies should address these gaps. For example, qualitative in-depth research with consumers and experts could be used to identify a large pool of societal benefits and risks. These factors could then be analyzed on various consumer and expert samples. Case studies and longitudinal research designs could also provide more details in the dynamic nature of these factors. For example, people might adjust their behavior in order to avoid these consequences. This could be grounded in balance theory and its extensions. For example, if an innovator of early adopter perceives that using smart glasses might make the world more unsocial but on the other hand could personally benefit from utilitarian benefits, he/she might adjust this negative societal evaluation. Likewise, equity theory may help explain if and how acceptance of smart glasses is dependent upon whether the judging person himself is wearing such a device, potentially cancelling out any disadvantageous information asymmetry. Evidence that can be interpreted as implying this has been found by Rauschnabel, Brem & Ivens (2015) who showed that people that expect smart glasses to become endemic in their social environment are more likely to adopt them.

Finally, scholars could be inspired by our research to develop a more holistic adoption theory. This theory could include both personal and societal evaluations of a technology and conceptualize them as antecedents to adoption.

General Conclusion

In this study, we have shown that consumers use certain society related variable to evaluate new technologies – smart glasses. We hope that these findings inspire policy makers and other scholars to include these findings in their work.

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Table 3: Construct composition and Reliability Measures

Construct (Source)	Items	alpha	AVE	C.R.
Google Brand Attitude (adapted from Park, MacInnis, Priester, Eisingerich, & Iacobucci, 2010)	I think Google is a good brand. I like the brand Google. I have a positive attitude towards Google.	.94	.85	.95
Familiarity	I did not know the information at all - I already knew the information.	n/a		
	When some day many people use Google Glass, …			
Societal Safety Improvement Potential	...crimes can be prosecuted more effectively. ...security in our country will increase. ...disaster relief forces can work more efficiently. ...lives can be saved in emergency cases, as disaster relief forces can be coordinated in a better way.	.94	.75	.86
Societal Progress Potential	...the world will partly grow together. ...our society will become more modern. ...jobs will be created.	.83	.41	.68
Societal Usefulness	For society, Google Glass is very useful. For society, Google Glass is a useful invention.	.92	.86	.92
Negative consequences for	...the world will become an antisocial planet. ...life quality of people will go down. …mankind will be unhappier. … people will have a lot less real friends.	.89	.66	.89
Negative consequences by loss of awareness	… many people will be distracted and put others at risk. … people will be less cautious in their daily lives.	.90	.81	.90
Negative consequences for society level privacy	…freedom rights of people will be violated more often. … there will be no more privacy.	.73	.58	.74
Desired Success for GG	I hope, Google Glass will prevail in the market. I would be happy if Google Glass soon would become an established product.	.94	.88	.94
Anticipated Success for GG	I expect Google Glass to prevail in the market. I expect Google Glass to become an established product soon.	.94	.89	.94

Note: CFA measures: χ^2=261,97; p<.001, df=173; CFI=.98; TLI=.98; NFI=.95; RMSEA=.038

Table 4: Sample Description

Gender		
	Male	43.1%
	Female	56.9%
Age		
	Under 20	20.1%
	21-22	31.8%
	23-25	35.7%
	26-30	12.3%
	Average age (SD) in years	22,6 (2,4)
Degree		
	Undergraduate	61.7%
	Graduate	33.6%
	n/a	.8%
Monthly income		
	below 500€	26.4%
	501€ - 1.000 €	41.5%
	1.001€ - 1.500€	8.0%
	above 1.500€	10.4%
	n/a	13.7%

Note: student sample with n = 364 respondents