

Online Consumer Reviews as a Means of Social Influence: Theory and Empirical Evidence

A Dissertation

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***I nic nie wiem, i nic nie rozumiem,
I wciąż wierzę biednymi zmysłami,
Że ci ludzie na drugiej półkuli
Muszą chodzić do góry nogami.***

Julian Tuwim, „Nauka”

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Introduction

Imagine that you are looking for a hotel for a trip of your dreams, or you are trying to decide which movie to watch on a Saturday night. Most probably, you will open your favorite search engine and check what other people think. You will read some reviews about how good or bad the stay in some hotels is or how interesting or boring some movies are. It will take some reviews to read and you will spend some time on that, but sooner or later you will have it – the perfect choice for your trip or evening. All that based on opinions of people, who you have (most probably) never seen and will never meet in your life. Have you ever wondered, what made you choose this particular place to stay or a movie to watch? Was it the content of the reviews you have just read? Or maybe the reputations of the reviewers? Or both?

The literature about online consumer reviews received much research attention in recent years. With their first appearance on the Internet in the late 90's, online reviews offered a possibility to express an opinion and rate products or services. Nowadays it is possible to search the Internet and find opinions about almost everything, from products and hotels (Cheung et al. 2008; Litvin et al. 2008; Ye et al. 2009), through books (Chevalier and Mayzlin 2006) and movies (Chakravarty et al. 2010; Duan et al. 2008; Khare et al. 2011), to even university professors (Otto et al. 2008) or MDs (López et al. 2012; Segal et al. 2012). But why do online reviews persuade individuals to perform certain behaviors? Is this a new phenomenon that emerged with the appearance of online reviews?

Persuasion is one of the inseparable elements of human communication. It is true also when the communication process is done with the mediation of technology, like in the case of online reviews. In the last years, online communication has evolved significantly, but persuasion is still one of its central elements. The importance of research on computer mediated persuasion has been noticed by many researchers (O'Keefe 2004), who admitted that research about persuasive technology and design is very interesting and important topic (Benbasat 2010), and it should be further investigated, to understand its methods and patterns better (Torning and Oinas-Kukkonen 2009). What is more, in recent years we could observe a boom of persuasive technologies. Devices like Fitbit, Misfit, BitBite or Pavlok are introduced to the public more and more often. In case of online consumer reviews, individuals are persuaded because they think that the reviews are written by other people – random

first-hand users of a product or a service, maybe even similar to them (Steffes and Burgee 2009; Zhang 2015). For this reason they trust them and often prefer them to similar but commercially-created messages (Chakravarty et al. 2010; Chen et al. 2016; Dou et al. 2012). In fact, online reviews are one of the most trusted media for advertising and for recommendations (*Global Trust in Advertising and Brand Messages. 2013, Global Trust in Advertising and Brand Messages. 2015*). 80% of individuals trust them as much, as if they were personal recommendations (“Local Consumer Review Survey” 2015). Individuals read them for different reasons from obtaining information to building relations in an online community, but no matter the motivation, online reviews affect the behavior of a reader (Burton and Khammash 2010; Hennig-Thurau et al. 2003). Thus, researchers widely agree that online reviews influence decision-making processes and affect individuals’ performed behaviors (Cheung et al. 2008; Duan et al. 2008; Hong and Park 2012; Kumar and Benbasat 2006; Litvin et al. 2008). It is understandable, that considerable part of the contemporary researchers takes inspiration from classic psychology and communication studies to understand the persuasive effects of online reviews, trying to explain what are the elements, which make the biggest impact on individuals’ decision-making processes and behaviors.

Characteristics of persuasive communication

Already in ancient times philosophers and thinkers like Corax of Syracuse, Cicero, Quintilian and many others discussed the process of persuasion and tried to understand its mechanisms (Dillard and Pfau 2002, p. ix). One of the most known concepts of persuasion was introduced by Aristotle as a main objective of rhetoric (Aristotle, B. I, Ch. 2). According to the famous philosopher, by using the art of rhetoric we are able to observe all possible modes of persuasion and convince others to our arguments. To achieve this goal, one has to be aware of three existing elements of spoken persuasion noticed by Aristotle. The first element – ethos, is a personal character of a speaker. Today we would call it credibility or trustworthiness of a person who tries to persuade somebody. According to the second element – pathos, it is important to put the audience in a certain emotional frame. They must be emotionally ready to follow the speaker’s thoughts and to yield to the persuasion. The last element of persuasion – logos, is the strength of the arguments. It is not how the speaker formulates his view, but what he says.

Already in ancient times, Aristotle noticed that persuasion is a mix of three elements. In modern literature, we find many concepts, which confirm Aristotle's view to some point. One of the first modern concepts presented persuasion as a resultant of credibility and trustworthiness of a source of communication (Hovland and Weiss 1951). It stresses the importance of ancient *ethos* and shows that the persuasion depends mostly on the messenger.

Other researchers highlight the importance of the message receiver and the strength of the message in the process of persuasion. For example, the concept of involvement puts the focus of persuasion on the receivers' interest in the topic of the message. Increasing interest in a topic makes it more probable that one's motivation to process information will increase. Under such conditions, the persuasive effect will either increase or decrease, depending on both, the level of involvement and the strength of the argument (Petty and Cacioppo 1979). By that we can understand that people who are highly involved in a topic are more focused on the quality of arguments, while those who show lower involvement tend to pay more attention to the quantity of arguments (Petty and Cacioppo 1979, 1986).

Dual process models like Elaboration Likelihood Model or Heuristics Systematic Model extend this assumption and explain mechanisms of persuading different types of individuals. According to the Elaboration Likelihood Model (ELM), people process messages in two ways (Cacioppo et al. 1985; Cacioppo and Petty 1984; Petty and Cacioppo 1986). The main assumption of the model is that people want to hold the correct attitude. Yet, not all are capable of deciding or judging which attitudes are correct in particular situations. In other words, they are not able to elaborate well. Thus, elaboration likelihood affects the way of persuading people. Authors distinguished between two ways of persuasion – central and peripheral cues. Yet, under certain circumstances, individuals will engage in both types of message processing (Guadagno and Cialdini 2005). In the case of people less likely to elaborate – less interested in a topic or having worse analytic abilities – a better way to persuade will be to use peripheral cues. These are factors which 'trigger primitive affective states' (Petty and Cacioppo 1986). In the context of persuasion through indirect communication, we can imagine that the design of a medium may be a source of such peripheral factors. For example, a website design may be equivalent to the attractiveness of the source. On the other hand, when there is a bigger likelihood to elaborate a message, we

can expect to persuade somebody by central cues. Such a person will pay more attention to the strength of arguments and to the gist of the message. Although it is usual that both central and peripheral cues are responsible for the change of beliefs or behavior, in the situation where there is no direct interaction between agent and target of persuasion (like in the online communication), there is a tendency toward central processing of the message (Guadagno and Cialdini 2005). Thus, in the study of online persuasion, we can consider both cues of persuasion being used simultaneously, as explained by the Heuristic-Systematic Model of persuasion (Chaiken 1987).

[Evolution of persuasion in the context of online communication](#)

The development of computers and interactive technologies brought new ways of communication and persuasion. Nowadays, communication is very often supported by technology, and may differ from traditional face-to-face communication (Kiesler et al. 1984; Thorne 2008; Walther 1996). Therefore, also the ways of influencing people's behaviors evolved. Even if main mechanisms of persuasion are the same as before (Nass 2010), the ways and means of persuasion process changed. We do not need to exchange persuasive message with our audience personally. Nowadays, it is possible to create a technology, which will act as an agent of persuasion. Such a persuasive technology is defined in the literature as an interactive technology that changes person's attitudes or behavior and is a focus of computer-mediated persuasion studies (Fogg 1998, 2003). In addition, a persuasive tool based on textual opinions posted online may be considered as part of computer-mediated persuasion as well.

As the term says, an online review is an example of a particular kind of communication, which takes place in virtual reality. Reviewers publish their messages on a website and in this way, they communicate with other people, who read their text. In the literature, such a web-mediated communication is understood as an exchange process of social interaction between firms and customers, mediated by a website, and a virtual community for the exchange of information (Suh et al. 2003). Definition created by Suh, Couchman and Park is not ideal, as it limits the phenomenon only to firms and customers, forgetting about the communication between peer users. Yet, it highlights the important process of information exchange mediated by a website. In other words, it defines a process, where persuasion may happen in the 'online' world.

Some researchers tried to explain what the new patterns of persuasion are, by comparing strategies of existing online service providers (Fogg and Eckles 2007). They identified a three-phase behavioral chain, which explains how web service providers try to persuade people to use their service. Firstly, they try to inform potential users about the service and let them 'discover' the service. Then, they use methods to start or try the service, which creates a superficial involvement. The last step is to create a 'true commitment' to receive loyal and returning users. The model was a step forward in explaining the rules of web-mediated persuasion, but it works only for online service providers. It leaves a gap by not considering the role of online reviews, as well as not including some cases when online communication serves only to inform potential clients about the offer but the main service is executed later in the real world (e.g. in the case of hospitality industry).

Even if the role of the online communication is growing, it is still visible, that individuals still tend to favor realistic communication. The literature proves that there is a correlation between perceived reality of settings or behavior of virtual communicator and the level of influence and social interactions of web users (Guadagno and Cialdini 2005; Suh et al. 2003). This shows that there is still a difference between online and real interactions. McKenna and Bargh (2000) identified four important aspects of online communication, different from the real-world communication, which can also affect the process of persuasion. First, greater anonymity on the Internet gives an opportunity for individuals to behave in an unusual way, so they can involve in topics they would not do in real life. Second, physical appearance is far less important than in face-to-face communication, what confirms the tendency towards the central cues. Third, physical distance is no longer a barrier for interacting with others, so the audience of persuasion may be wider than in the face-to-face communication. Finally, individuals have greater control over time and place of interactions, which means that they, and not the agent of persuasion, decide when they receive the message. These four aspects are important when designing persuasive content online. They all may lower the strength of the influence, as the social cues of communication – like eye contact or voice tone – are absent and the information about the message recipients is limited. Thus, it is important to understand why online reviews are persuasive and which elements strengthen their persuasiveness (Hong and Park 2012). The literature streams about computer mediated persuasion and online reviews are gaining more importance and research about using online

persuasion in different situations of everyday life, like the use of online reviews, should be considered as valuable.

Objectives and organization of the thesis

The objective of this PhD dissertation is to summarize the current knowledge of online reviews persuasion and to provide directions for future research in this area, as well as to give a new perspective on the topic with some empirical studies. In doing so, I try to answer the question how online reviews persuade individuals to perform a particular behavior. I also want to understand why some characteristics of online reviews affect individuals' behavior stronger than others.

The thesis consists of three separate papers. All together, they create a coherent work about the online reviews persuasiveness. The following part of the thesis is organized as follows. First, in a paper titled *The Influence of Online Reviews on Individuals' Decision-Making Process and Behavioral Intention – A Literature Review* I present a summary of the existing literature and offer directions for future research. New persuasive factors of online reviews were identified and merged into a theoretical framework. The model extends previous research by systematizing more works, adding new elements and extending the understanding of the previously identified ones.

Second, the paper *The Role of Heuristics in the Mechanisms of Decision-Making Process Based on Online Reviews* explains what are the logic and mechanisms behind the decision-making process of individuals, who read online reviews. In contrast to previous studies I do not present the motivations to read online reviews, but explain how the process of the use of online reviews works, what the mechanisms driving this process are and why they occur. Based on a qualitative study, I show how people use online reviews to make decisions and why they use specific mechanisms to make a decision.

Finally, the thesis concludes with a paper titled *Presentation Format and Online Reviews Persuasiveness: The Effect of Computer-Synthesized Speech* – a result of a lab experiment, in which an effect of a new presentation format of online reviews on their persuasiveness is presented. The current standard of online reviews presentation is the written text accompanied by images and numerical ratings. In this work, I contribute to the emerging stream of literature on the effect that voice interactions with computing devices have on user

performance. Specifically, I focus on the effect of computerized speech on the persuasiveness of online consumer reviews. The results show that varying the message presentation method from text to computer-synthesized speech may improve the persuasiveness of online reviews under some conditions, by engendering stronger trust beliefs, attitudes toward the subject of the review and purchase intention.

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The Influence of Online Reviews on Individuals' Decision-Making Process and Behavioral Intention – A Literature Review

Abstract

With their first appearance on the Internet, online reviews offered a possibility to express an opinion about almost everything, from products and services such as books and hotels, to professionals like university professors or medical doctors. Since then, online reviews have become an important element of individuals' decision-making processes. People rely on peer-generated opinions posted online and use them to make more accurate and more efficient choices. Thus, it is not surprising that online consumer reviews received much research attention in recent years. In this work, we analyze the existing literature focused on online reviews persuasion. Our work offers three main contributions. First, it synthesizes previous work identifying the key constructs researchers have investigated and provides coherent definitions for them. Second, it identifies gaps in the current coverage of the literature and identifies critical unanswered questions, thus suggesting directions for future research. Specifically, we introduced the notion of two levels of online reviews content-based persuasiveness and two dimensions of context-based persuasiveness. Third, we highlight and discuss an important gap in the literature. There is remarkably little research in information systems focusing on the influence of technology design and presentation of online reviews on persuasion.

Introduction

The online consumer reviews literature received much research attention since their first appearance on the Internet in 1999. Online reviews allow individuals to express an opinion that is available to anyone connected to the Internet. Today online reviews cover almost everything, from products and services (Cheung et al. 2008; Litvin et al. 2008; Ye et al. 2009), to professionals (López et al. 2012; Otto et al. 2008; Segal et al. 2012). Online reviews are peer-generated evaluations posted on a company or third party websites (Mudambi and Schuff 2010). Individuals generally believe that the online consumer reviews are written by other people – random first-hand users of a product or a service, maybe even similar to them (Steffes and Burgee 2009; Zhang 2015), and for this reason they trust them more than commercially-created messages (Chakravarty et al. 2010; Chen et al. 2016; Dou et al. 2012). Commercial surveys consistently corroborate this finding (*Global Trust in Advertising and Brand Messages*. 2013, *Global Trust in Advertising and Brand Messages*. 2015) showing that 80% of individuals trust them as much as personal recommendations (“Local Consumer Review Survey” 2015).

It is widely accepted that online reviews influence decision-making processes and affect individuals’ performed behaviors (Cheung et al. 2008; Duan et al. 2008; Hong and Park 2012; Kumar and Benbasat 2006; Litvin et al. 2008). Thus, considerable literature focuses on the persuasive effects of online reviews, trying to explain what are the review elements that affect individuals’ decision-making process and behavior. The increasing use of online reviews and the ever-growing role of technology mediation in everyday activities (Yoo 2010) makes this line of inquiry central to the Information Systems field.

While reviews are central to individuals’ decision-making when searching for a product or service (Hinckley 2015), the proliferation of the reviews and the review platforms is forcing users to spend less time reading them. In the years from 2011 to 2013, the number of people reading seven or more online reviews halved (from 44% to 22%), while the number of individuals reading fewer reviews increased (Anderson 2013). Thus, when the influence of online reviews on decision-making is growing and the decision-making process based on online reviews is faster, understanding the role of online reviews as a source of influence and behavior modifications is even more important (Hong and Park 2012).

The latest work synthesizing the online review literature examines a total of 15 articles in the 2000 – 2010 timeframe. Our work, focusing on the 2005 – 2016 timeframe, identified 620 articles of potential relevance. Our effort both extends and improves previous literature reviews. Specifically, we concentrate on the determinants and processes of persuasion through online reviews with the objective of providing coherent construct definitions and organize extant knowledge to provide a springboard for future work.

The article is organized as follows. First, we present the foundations and boundaries of the literature review – we explain the notion of online reviews and delineate the scope of the research. Next, we present the methodology and results, including a new framework of online reviews persuasion. The paper concludes with a discussion of the findings and propositions for future research and practice.

Foundations and boundaries

Online reviews

As peer-generated evaluations posted on a company or third party websites (Mudambi and Schuff 2010) online reviews can be any positive or negative evaluative statement, made by potential, actual, or former customers, which is available to a multitude of people and institutions via the Internet (Stauss 2000).

Online reviews are often presented as an “electronic form of word of mouth,” abbreviated as eWOM. Yet, this label and the hinted similarity to “physical” word of mouth (WOM) is conceptually questionable (Hart and Blackshaw 2006; Park et al. 2007; Sparks and Browning 2011). WOM is transmitted directly from a source to a receiver, often among small groups of friends or family members. Moreover, the receiver typically knows the sender personally and has therefore a lot of contextual information to draw upon when interpreting the opinion. Conversely, online reviews are available to anyone who has access to the Internet and wants to read them. In fact, the overwhelming majority of readers are strangers (Cheung and Thadani 2012). Thus, online reviews are more akin to a broadcast medium than a bilateral computer-mediated conversation. Moreover, they lack one of the key characteristics of WOM communications – social ties. Finally, WOM is a volatile type of information exchange – there is no permanent record of it and it evolves over time. Conversely, online reviews are written and permanent. While their ranking amongst other reviews may change over time, old reviews do not disappear and cannot typically be edited. For the above reasons, we will not

use the eWOM label in this work, and in fact we urge future research to use the 'online review' label exclusively.

Persuasion

Persuasion is the process of changing individuals' mental states – attitudes and beliefs, (O'Keefe 1993). Persuasion, the precursor of actions and behavioral changes, often happens under the influence of arguments and reasoning directed towards the behavioral change (Toulmin 2003). The process of persuasion has fascinated researchers as early as the treatises of Corax of Syracuse (Dillard and Pfau 2002, p. ix) and Aristotle (Aristotle, B. I, Ch. 2). The first modern model of persuasion is Hovland's Yale model of persuasive communication (Hovland et al. 1953). The model presents the factors affecting the likelihood of attitude change. These are:

- Author (Source) – characteristics of the person who transmits the communication,
- Message – information transmitted from author to audience,
- Audience (Reader) – characteristics of the individual who responds to the communication.

The combination of these three factors influences the process occurring in the audience's minds. The three composites of this process – attention, comprehension, and acceptance – build a more general, composite activity of the cognitive process. Since Hovland's early work the persuasive literature has grown significantly. The original Yale model received critiques (Petty and Cacioppo 1996; Shrigley and Koballa 1992) and numerous extensions that solidify its place in contemporary literature (Cameron 2009), and its influence on the online reviews persuasion works (Chang and Wu 2014; Cheung and Thadani 2012).

First, Hovland focuses primarily on the source of persuasive communication (Hovland and Weiss 1951). In the times the model was created, the source was understood as a person. Yet, nowadays people communicate not only with other people, but also with machines (Nass and Moon 2000) and through digital mediating devices (Yoo 2010). A stream of more recent literature examines the role of persuasive technology on individuals (Fogg 2003; Fogg and Nass 1997; Torning and Oinas-Kukkonen 2009) as humans can communicate with computers or through the use of computers almost as efficiently as with other humans (Nass 2010). Thus, the source is not only a person but can be any piece of technology, being able to communicate or to mediate communication between people (Fogg 2003). In the context of online reviews,

we should understand the source wider, not only as a person but as a person mediated by computers, mobiles or other technology transmitting them to a reader.

The Yale model does not take into consideration the differences between readers. More recent additions to the literature like Elaboration Likelihood Model or Systematic-Heuristics Model focus on the effect of audience characteristics on individual's elaboration process, recognizing the importance of involvement or cognitive capabilities of message receivers (Cacioppo et al. 1985; Chaiken 1980). Depending on these characteristics, different elements of arguments, source or context of the communication may persuade a recipient (Petty and Wegener 1999). Based on this phenomenon, several empirical studies focused on the effect of context variance and source characteristics on the persuasiveness of online reviews (Cheng and Loi 2014; Chin-Lung et al. 2011; Dou et al. 2012; Park et al. 2007; Park and Kim 2008; Park and Lee 2008; Sher and Lee 2009; Sparks et al. 2013; Xie et al. 2011). shows our organizing framework.

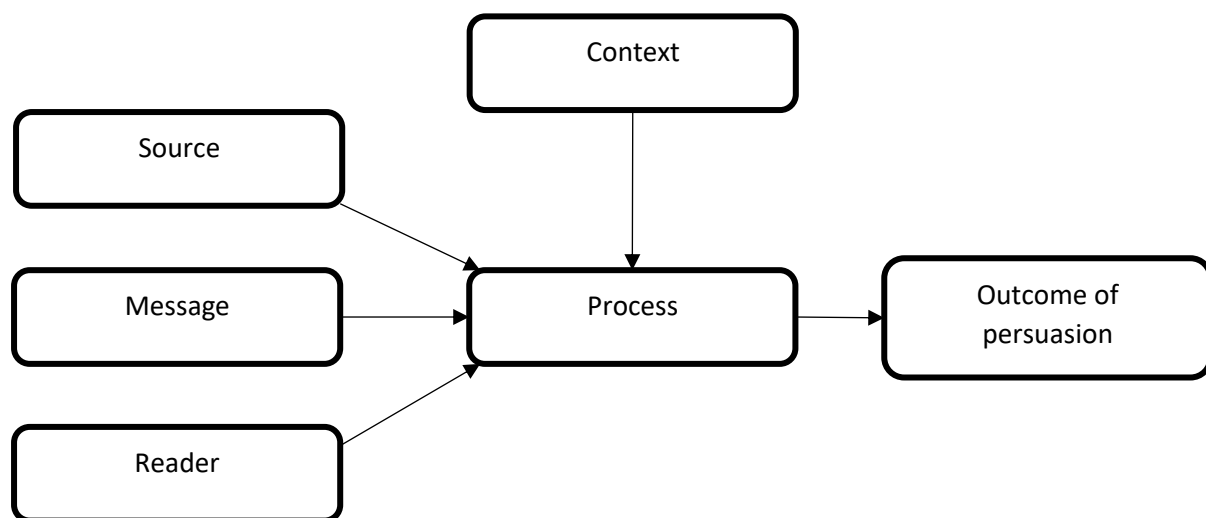


Figure 1 Organizing framework of persuasion

Behavioral intention

We focus on behavioral intention as the primary outcome variable of persuasive online reviews. Following the theory of reasoned action - TRA (Fishbein 1979) and its extension – the theory of planned behavior (Ajzen 1991) – we consider behavioral intention the strongest indicator of one's readiness to perform the behavior (Fishbein and Ajzen 2011). The core element of both theories is that "Intentions are assumed to capture motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform a behavior" (Ajzen 1991, p. 181).

Thus, the stronger the intention the more likely the performance. This process happens also during commercial activities – individuals form purchase intentions under the assumption of a pending transaction. As such, behavioral intention is an important indicator of a future purchase (Chang and Wildt 1994). Purchase intention is the outcome variable in several empirical studies of online reviews in commercial settings (van der Heijden et al. 2003; Yan et al. 2015; Kern Z. K. Zhang et al. 2014). For example, van der Heijden et al. (2003) suggest that perceived trust and perceived ease-of-use of the online vendor website increase purchase intention. Several studies focused also on finding a relationship between online reviews and behavioral intentions. Elements of online reviews influence individual's purchase choices but may have a different effect, depending on the product type, platform of communication or other 'external' factors. For example, more detailed reviews increase the behavioral intention for search products, but not for experience products while a higher level of reviews' comprehensiveness positively affects behavioral intention for both search and experience products (Jiménez and Mendoza 2013). In a similar way, behavioral intention depends on the interaction between stimulus and reader's characteristics. For example, individuals with higher cognitive personalization capabilities might be more influenced by the reviews, because the level of cognitive personalization is positively correlated with the level of behavioral intention (Xia and Bechwati 2008). Also, the knowledge of the readers influences their interaction with online reviews and their effect on behavioral intention. For 'expert' readers, attribute-centric reviews have more effect in comparison to benefit-centric opinions. In the case of 'novice' readers, behavioral intention increases with a larger number of reviews.

Scope

This literature review concentrates on online reviews. We therefore do not examine other types of online commercial messages (blogs, forums, ads, SNS etc.). Specifically, we focus on online reviews as an instrument of persuasion and the process by which they influence behavior. Specifically, it concentrates on the behavioral intention as a response to online reviews, which is widely used in this research stream.

Our focus on persuasion does not limit us to only examining works that use theories of persuasion (e.g., Elaboration Likelihood Model, Heuristic-Systematic Model). Rather, our search through the literature is guided by the stated aim of the articles. We included all works

seeking to understand influence and behavior change via online reviews, regardless of the methodology or theory employed.

Methodology

Given the diversity of online reviews research, we conducted a systematic interdisciplinary literature review (Webster and Watson 2002). We performed an exhaustive search in information systems, human-computer interactions, management, marketing, consumer behavior, hospitality management, e-commerce and retailing (see APPENDIX 2 – Selection of papers for analysis). We investigated a total of 40 peer-reviewed journals over the 2005 – 2016 time span. Using the AIS Electronic Library, Web of Science, ScienceDirect, JSTOR Archive, and INFORMPubs archives we searched the following keywords: “online reviews,” “online consumer reviews,” “influence,” “persuasion,” “eWOM,” “electronic Word of Mouth.” Our search yielded 620 articles of which we examined titles and abstracts. Following the concept-driven approach we filtered articles based on the scope and framework introduced earlier (Webster and Watson 2002). We included all the works that focused on persuasion and change in behavioral intention as an effect of online reviews persuasion (273 remaining). Next, we excluded all the articles not focused specifically on online reviews but on other forms of user-generated content (e.g. blogs, discussion forums, recommendations agents, messages in social network services, sponsored content etc.). We also filtered out non-empirical studies. A total of 39 articles remained after this stage. Additionally, after a backward and forward search we included three highly cited conference articles. The review findings stem from the 42 articles remaining at this stage. We categorized and analyzed each one using concept matrices (Webster and Watson 2002). Table 1 summarizes the methodology of the studies, with experimentation being predominant.

METHOD	NUMBER OF STUDIES
Experiment	34
Survey	5
Quasi-experiment	2
Meta-analysis	1

Table 1 Methodologies summary

Table 2 summarizes the conceptual elements and domain of each article we reviewed, thus providing an overview of the findings.

PAPER	METHOD	Element of the theoretical framework					Reviewed Object Type						
		MESSAGE	READER	COMMUNICATOR	COGNITIVE PROCESS	CONTEXT	Hotel	Product	Service	Movie/Book	Restaurant	Vendor/Brand	Other/General
(Chen et al. 2016)	Survey		x	x								x	
(Cheng and Loi 2014)	Quasi-experiment				x	x	x						
(C. Cheung and Lee 2008)	Experiment	x			x	x						x	
(Chin-Lung et al. 2011)	Experiment	x	x					x					
(Doh and Hwang 2008)	Experiment	x	x										x
(Dou et al. 2012)	Experiment			x	x					x			
(Elwalda et al. 2016)	Survey	x			x								x
(Flanagin and Metzger 2013)	Experiment	x		x						x			
(Hamby et al. 2015)	Experiment	x			x	x		x					
(Huang and Chen 2006)	Experiment	x		x						x			
(Jensen et al. 2013)	Experiment	x	x	x				x					
(Jeong and Koo 2015)	Experiment	x		x				x					
(Jimenez and Mendoza 2013)	Experiment	x				x		x					
(Jin et al. 2014)	Experiment	x				x		x					
(Ketelaar et al. 2015)	Experiment	x	x					x					
(Khare et al. 2011)	Experiment	x	x		x					x			
(Kwon and Sung 2012)	Quasi-experiment	x	x		x		x	x					
(Kwon et al. 2015)	Experiment (crowdsourced)	x						x					
(Lee and Koo 2015)	Experiment	x	x		x			x					
(Lee and Lee 2009)	Experiment survey	x			x	x		x					
(Lee and Shin 2014)	Experiment	x			x	x		x					
(Lee et al. 2011)	Experiment	x		x	x	x		x					
(Mauri and Minazzi 2013)	Experiment	x				x	x						
(Park and Kim 2008)	Experiment	x	x		x			x					
(Park and Lee 2008)	Experiment	x	x			x		x					
(Park et al. 2007)	Experiment	x	x			x	x						
(Plotkina and Munzel 2016)	Experiment	x	x	x		x		x	x		x		
(Purnawirawan et al. 2012)	Experiment	x					x						
(Purnawirawan et al. 2014)	Experiment	x		x		x					x		
(Purnawirawan et al. 2015)	Meta-analysis	x				x		x					
(Schlosser 2011)	Experiment	x		x						x			
(Sher and Lee 2009)	Experiment	x	x					x					

PAPER	METHOD	Element of the theoretical framework					Reviewed Object Type						
		MESSAGE	READER	COMMUNICATOR	COGNITIVE PROCESS	CONTEXT	Hotel	Product	Service	Movie/Book	Restaurant	Vendor/Brand	Other/General
(Sparks and Browning 2011)	Experiment	x				x	x						
(Sparks et al. 2013)	Experiment	x		x		x	x						
(Tian et al. 2014)	Survey	x	x		x								x
(Tsao et al. 2015)	Experiment	x	x				x						
(Xia and Bechwati 2008)	Experiment/Regression	x			x	x		x	x				
(Xie et al. 2011)	Experiment	x			x	x	x						
(Zhao et al. 2015)	Survey	x		x			x						
(Xu et al. 2015)	Experiment	x				x		x					
(Zhang 2015)	Experiment		x	x							x		
(Kern Z. K. Zhang et al. 2014)	Survey	x	x		x						x		
COUNT		38	17	13	16	19	10	20	2	5	4	2	3

Table 2 General overview of the literature

Literature review

We identified 45 concepts grouped in five categories. Each concept represents a characteristic of a review, reader, source, context or cognitive process, having an influence on the persuasiveness of online reviews. The literature focuses on seven subjects of online reviews: products, hotels, movies and books, restaurants, general services, brands.

The literature uses the following outcome measures: behavioral intention, purchase intention, consumption intention, booking intention, overall preference, willingness to buy or buying intention. They are contextual variations of the behavioral intention construct and they operationalize persuasion.

Following our organizing framework, we report how the literature has investigated each element and the interactions between them. We leverage our analysis of the literature to identify important gaps in our understanding of how online reviews persuade users.

Message

A message is information transferred from the source of communication to the audience. It is a stimulus that triggers a change of attitudes or behavior. In the context of this work, an online review represents a message that a communicator sends to a reader to stimulate the

persuasion. This element, and its varied characteristics, is the most studied in the literature. We group this research in two streams based on the level of aggregation of reviews:

- a) research on the characteristics of individual reviews, examining the persuasive effect of specific characteristics of a single review;
- b) research on the aggregated effect of a cohesive set of reviews describing the same target (i.e., a product, a service).

Table 3 presents the concept matrix for the research focused on the message characteristics, both at the single review and aggregate levels.

Individual review persuasiveness

Valence

Considerable work has studied the valence of the reviews (15 studies). Valence is an evaluative direction of a review text, which can vary from negative (unfavorable), through neutral, to positive (favorable) (Hamby et al. 2015; Jeong and Koo 2015; Purnawirawan et al. 2012). There is consensus about the fact that valence, a positive or negative sentiment in the review text, affects individuals' intentions and, consequently, exerts persuasion (Jeong and Koo 2015; Lee and Koo 2015). 14 articles confirm the effect of valence and one partially confirms it, this is the most stable finding in the literature. Further, some research claims that it is the most important element of online reviews, explaining 70% of their persuasiveness (Purnawirawan et al. 2015). Despite the importance of valence, there is no agreement on the impact of its directionality on persuasion. In other words, it is unclear whether positive or negative reviews have a stronger effect on individuals' behavioral intentions. Recent work shows that negative valence influences behavioral intentions stronger than the positive (Jeong and Koo 2015; Ketelaar et al. 2015). These authors explain the results based on humans' tendency to pay more attention to negative stimuli so as to avoid risks related to a decision (Kahneman and Tversky 1979). Others show that positive reviews are more persuasive and exert a stronger influence on behavioral intention because they build more positive attitudes towards the object of the review (Lee and Shin 2014). In case of a big volume of coherent reviews, negative reviews might even have no effect on individuals' behavioral intention (Khare et al. 2011). One of the main limitations of the research on valence, and a possible explanation for these conflicting results, is that strength (strong/weak emotions) and direction (favorable vs. unfavorable) are not explicitly measured. For example, in the

commercial context, behavioral intention may be affected by negative or positive emotions expressed in the text, but also by the way in which these emotions are expressed. A possible solution to avoid this ambiguity is to distinguish between the strength of influence and the direction of influence, when conducting a research about the valence of online reviews.

Message framing

Eight articles focus on message framing as a way to increase persuasiveness of online reviews. Message framing refers to the organization and the structure of the message. It does not focus on the content of a review or its arguments, but it examines how the message is written and if its format affects the decision-making process. For example, an argument expressed with affective vocabulary will be more persuasive than the same argument expressed with less emotional words. The way a message is written and perceived by the reader, increases or decreases its persuasiveness by matching or violating (positively or negatively) their language expectancy (Jensen et al. 2013). Six studies found a significant effect of message framing on behavioral intention and one did not confirm the effect. For example, the attribute framing of a message (focusing on the features of a product) has different strength of persuasiveness in comparison to a simple (benefit) framing (focusing on how good is the product), depending on the source characteristics (expertise), the context (product type), and individual's perception of the message (Park and Lee 2008). The literature identifies several types of framing of online reviews, each of which has a different effect on the reader and interacts with different elements of the framework. Table 4 presents a full list and a summary of the framing types identified in the literature.

PAPER	Individual effect											Aggregate effect	
	Valence of a review	Message framing	Argument quality	Message usefulness	Review Sidedness	Review credibility	Level of details/comprehensive	Informativeness	Time of publication	Primacy	Volume/Quantity of reviews	Valence distribution	Variance of reviews/ambivalence
(C. Cheung and Lee 2008)	x												
(Chin-Lung et al. 2011)			x								x		
(Doh and Hwang 2008)												x	
(Elwalda et al. 2016)				X									
(Flanagin and Metzger 2013)	x										x		
(Hamby et al. 2015)	x	x											
(Huang and Chen 2006)												x	
(Jensen et al. 2013)		x			x								
(Jeong and Koo 2015)	x	x			x								
(Jimenez and Mendoza 2013)						x	x						
(Jin et al. 2014)	x								x				
(Ketelaar et al. 2015)	x												
(Khare et al. 2011)	x										x		x
(Kwon and Sung 2012)		x											
(Kwon et al. 2015)											x	x	
(Lee and Koo 2015)	x			X		x							
(Lee and Lee 2009)													x
(Lee and Shin 2014)			x										
(Lee et al. 2011)										x			
(Mauri and Minazzi 2013)	x												
(Park and Kim 2008)		x									x		
(Park and Lee 2008)		x						x			x	x	
(Park et al. 2007)			x					x			x		
(Plotkina and Munzel 2016)	x												
(Purnawirawan et al. 2012)				X						x		x	
(Purnawirawan et al. 2014)												x	
(Purnawirawan et al. 2015)	x											x	
(Schlosser 2011)	x				x								x
(Sher and Lee 2009)			x								x		
(Sparks and Browning 2011)		x										x	
(Sparks et al. 2013)			x									x	
(Tian et al. 2014)			x								x	x	
(Tsao et al. 2015)	x										x		
(Xia and Bechwati 2008)	x	x		X									
(Xie et al. 2011)						x							x
(Xu et al. 2015)				X		x							
(Kern Z. K. Zhang et al. 2014)													x
(Zhao et al. 2015)	x			X			x		x		x		

Table 3 Overview of message characteristics

Type of message framing	Effect	Papers
Level of details/comprehensiveness	More detailed reviews increase behavioral intention. However, the effect is not significant for experience goods, because in this case readers tend to assess the whole set of reviews and focus more on the coherence between them. The level of details can be a good diagnostic of behavioral intention for search goods.	(Jimenez and Mendoza 2013; Zhao et al. 2015)
Objectivity of text	Objectivity of a message affects the perception of a source and message credibility – it is a strong covariate, which strengthens the influence of online reviews persuasiveness. Therefore, it changes readers’ behavioral intention. For example, there is no significant difference in perception of peer-generated reviews and marketer reviews when the message is objective. As well, when the reviews are objective, the platform does not affect the behavioral intention. On the contrary, these differences exist for less objective reviews.	(Jeong and Koo 2015)
Attribute vs. benefit framing	Attribute framing of a message is based on the characteristics of an object of the review (a product or a service). It focuses on its functionalities. On the other hand, benefit framing focuses on the advantages from using the object. This type of framing interacts with readers’ knowledge in a way that attribute framing increases behavioral intention of expert readers while benefit framing increases intentions of novice readers.	(Park and Kim 2008)
Negative and positive framing	This framing type is related to the valence, but focuses on the format of writing and not on the arguments. It interacts with an overall valence of a set of reviews, but only for negative framing. It has an explanation in the prospect theory.	(Sparks and Browning 2011)
Experiential features of text	Experiential features in the review content increase reflection process of a reader and strengthen the intention to try a product.	(Hamby et al. 2015)
Higher affect intensity	The emotions expressed in the text of a review enforce cognitive personalization, which is a predictor of a higher behavioral intention.	(Xia and Bechwati 2008)

Table 4 Message framing

Argument quality

Argument quality represents the persuasive strength of a message, which is structured to be relevant, timely, accurate, and comprehensive (Lee and Shin 2014). A well-structured argument makes the message more reasonable and makes people more willing to accept it (Toulmin 2003). Six out of seven studies confirmed that this rule is valid also in the context of

online reviews. High-quality arguments influence behavioral intention more than low-quality arguments, because they affect reviewer's evaluations of a review and of a website positively (Lee and Shin 2014). In general, a well-structured and detailed argument of a review affects decisions more favorably than vague arguments (Sparks et al. 2013) and it increases the behavioral intention by affecting both emotional and cognitive trust (Tian et al. 2014). However, the effect of the quality of online reviews on behavioral intentions is stronger on high involved readers (while quantity affects low-involved individuals) (Park et al. 2007) or readers with a high need of cognition (Chin-Lung et al. 2011). These findings are consistent with the Elaboration Likelihood Model, as the perception of argument quality changes with readers' characteristics. Also other characteristics interact with argument quality. For example highly skeptic readers are not affected by argument quality change, while low skeptic individuals are more affected by quality than quantity of the reviews (Sher and Lee 2009).

A particular category of argument quality is its sidedness. Review sidedness indicates the extent to which the review is one-sided or balanced. Two-sided reviews are more persuasive unless the ratings are extreme (Schlosser 2011) due to the consistency between reviews and rating. A two sided review is more objective and, as mentioned before, objectivity has a positive effect on behavioral intention (Jeong and Koo 2015). Two-sided reviews are also more likely to positively violate the language of a review, thus, to increase behavioral intention, as posited by Language Expectancy Theory (Jensen et al. 2013).

Review quality interacts also with review usefulness and increases behavioral intention (Lee and Koo 2015; Zhao et al. 2015). Usefulness of the review mediates the effect of regulatory mode orientation (Lee and Koo 2015) and the effect of cognitive personalization on behavioral intention (Xia and Bechwati 2008). As a result, cognitive processes affect the way usefulness affect behavioral intention (see more in the *Cognitive process* section).

Aggregate persuasiveness of an online reviews set

The effect of the above-mentioned characteristics of individual reviews strengthens when they repeat within a set. The variance of reviews in a set or the ambivalence of opinions affect persuasiveness. Individuals prefer sets of reviews which are consistent and present rather coherent opinions (e.g., all positive or all focusing on the same issue). When the reviews in a set are similar the whole set is perceived as more credible and the behavioral intention increases (Xie et al. 2011).

Thus, analysis of valence distribution is one way to predict persuasiveness of a set of online reviews. The issue of variance is related also to the valence distribution of a set. 10 articles found that, similarly to the effect of individual reviews, the aggregated valence of a set influences behavioral intentions. A positively balanced set –where most reviews are positive, increase behavioral intention (Huang and Chen 2006). On the other hand, when the reviews are negatively distributed, individuals perceive a lower information overload because they ignore some information and focus on the negative reviews, as explained by prospect theory. As a result, the intention changes in the direction implied by the message (Kwon et al. 2015). Additionally, the distribution of valence interacts with source expertise in a way that the balance of valence may change the perception of a product and affect individuals' behavioral intention (Purnawirawan et al. 2014). In a similar way, the usefulness of a set mediates also the effect of the valence of a set on behavioral intention (Purnawirawan et al. 2012). However, there is no clear evidence of interaction between individual's prior knowledge, involvement and the valence balance of a set (Doh and Hwang 2008).

One of the most natural characteristics of a set of reviews is the number of online reviews. Nine articles found significant effect of quantity of reviews, while two could not support this claim. According to the majority, the number strengthens the effect of valence on behavioral intention and it increases the trust as individuals feel that it is a more credible set of opinions. Volume is also an indicator of product popularity and as such it affects the low-involved individuals, acting as a peripheral cue (Park and Lee 2008). On the contrary, highly involved individuals are more persuaded by the aggregated informativeness of online reviews. Perceived informativeness of a set affects behavioral intention and it is stronger for attribute-framed reviews (Park and Lee 2008).

Reader

The importance of the message receiver in the process of persuasion was recognized already in the Aristotelian model of rhetoric, claiming that it is important to put the audience in a specific emotional condition to achieve the goal of persuasion. The online review literature focuses on the characteristics of the reader, understood as an individual who responds to the communication. From 14 out of the 17 articles focused on readers' characteristics, we can draw a conclusion that the actual impact of the information received from online reviews may

vary from person to person. Particular characteristics of the reader change their perception of a message and the way online reviews persuade them.

One stream of research examines the role of readers' characteristics from the perspective of Elaboration Likelihood Model, focusing on two elements – involvement and prior knowledge (expertise) of the reader. Individuals' involvement and expertise (previous knowledge about a product) interact with the content, changing its perception and its persuasiveness (Doh and Hwang 2008). It is not clear if behavioral intention of highly involved readers increases under the influence of more informative reviews, while low-involved ones prefer higher popularity of a product (e.g. expressed by a higher number of reviews). Only one out of four studies confirmed this effect (Park et al. 2007; Park and Lee 2008). The situation is clearer in the case of readers' expertise and the need for cognition. Four out of five studies accepted that, as predicted by ELM, expert individuals focus more on argument quality (Flanagin and Metzger 2013; Ketelaar et al. 2015; Park and Kim 2008; Purnawirawan et al. 2015). These results were backed by Chin-Lung et al. (2011) who confirmed that also the individuals with the low need for cognition pay more attention to the quantity, while those with the high need for cognition focus more on the quality of arguments.

Researchers focus also on the contribution of the specific elements of personality to the process of persuasion and decision-making. For example, according to the regulatory focus theory, independent and interdependent construal focus, as well as promotion and prevention focus determine the perception of a message and trust building process. In the context of online reviews, if individual's construal focus matches with the framing of online reviews, the behavioral intention is higher. For example, promotion-focused individuals respond more to the promotion-focused reviews. (Kwon and Sung 2012; Lee and Koo 2015; Tian et al. 2014). Table 5 summarizes other characteristics of a reader presented in the literature.

Reader's characteristic	Description	Papers
Innovativeness	It is a tendency of an individual to try or to introduce something new or different. Innovative individuals demonstrate higher purchase intention for new products. According to the literature, online reviews influence only the low-innovative individuals. However, there is a lack of support for the hypothesis that online reviews do not influence highly-innovative individuals.	(Plotkina and Munzel 2016)
Susceptibility	It means being likely to be influenced or affected by something. Individuals with a high level of susceptibility are persuaded more by online consumer reviews than by other sources of recommendations, while there is no big difference between perception of other sources (brand created, neutral sources). It is thought to happen due to a high social pressure that affects susceptible individuals.	(Chen et al. 2016)
Skepticism	It refers to an attitude of questioning or doubting everything. Highly skeptic individuals are not influenced by quantity nor quality of online reviews, while both influence the low-skeptic.	(Sher and Lee 2009)
Social power	It is a feeling of having an influence over other individuals or having a high social position. It makes people less prone to be persuaded by online reviews. The effect decreases when the perceived similarity of the source is high	(Zhang 2015)
Conformity	It is an attitude of following and complying with the socially accepted rules and conventions. It may refer also to a non-conformists' need for a bigger number of online reviews, while for conformists it is enough to have only a small amount of them. Also, the effect of valence is stronger on conformists. Similar characteristic – need for uniqueness, lowers behavioral intention. Individuals are disinclined to be influenced by others' opinions.	(Khare et al. 2011; Tsao et al. 2015)

Table 5 Reader's characteristics

Some characteristics of readers show no effect or no clear effect on behavioral intention. There is no significant effect of gender as a moderator between the valence or regulatory orientation of online reviews and behavioral intention (Lee and Koo 2015, Kem Z. K. Zhang et al. 2014). There is significant difference in the perception of online reviews based on the cultural background (Purnawirawan et al. 2015). However, the study focused only on comparing US-based subject with foreign subjects as a general.

PAPER	Involvement	Expertise/Prior knowledge	Personality type	Gender	Innovativeness	Susceptibility	Skepticism	Social power	Cultural background	Conformity	Need for uniqueness	Need for cognition
(Chen et al. 2016)						x						
(Chin-Lung et al. 2011)			x									x
(Doh and Hwang 2008)	x	x										
(Flanagin and Metzger 2013)		x										
(Jensen et al. 2013)	x											
(Ketelaar et al. 2015)		x										
(Khare et al. 2011)											x	
(Kwon and Sung 2012)			x									
(Lee and Koo 2015)			x	x								
(Park and Kim 2008)		x										
(Park and Lee 2008)	x											
(Park et al. 2007)	x											
(Plotkina and Munzel 2016)					x							
(Purnawirawan et al. 2015)		x							x			
(Sher and Lee 2009)							x					
(Tian et al. 2014)			x									
(Tsao et al. 2015)										x		
(Zhang 2015)								x				
(Kem Z. K. Zhang et al. 2014)				x								

Table 6 Overview of reader's characteristics

Source

Traditionally, source refers to the person who produces a message and transmits the communication to the reader. In the context of online reviews, most typically the source is the author of a review. In some works, source refers to a platform, which communicates the reviews to an audience. In recent studies, researchers focused only on four source characteristics – credibility, source type, expertise and perceived similarity. Source credibility and source type received most of research attention. Seven studies claim that high perceived credibility of a source has a positive effect on behavioral intentions - similarly to classic persuasion theories. This holds true for both the original source (author) and the visible source (platform) (Dou et al. 2012). Peer authors or other consumers are perceived as more trustworthy than the experts and exert more influence on behavioral intention (Huang and Chen 2006). The same happens when trust in the platform as a source is high (Lee et al. 2011). However, the language of the review (and its comprehensiveness with reader's expectations)

does not affect source credibility. Thus, according to Jensen et al. (2013), it does not affect behavioral intention.

Source type refers to the difference between the perception of consumer reviews and other types of authors of the reviews. Five studies show that reviews written by peer consumers are more persuasive than reviews written by experts (Dou et al. 2012; Flanagin and Metzger 2013; Huang and Chen 2006; Zhang 2015). Yet, there are some exceptions. One study found that individuals tend to discount the expert reviews because they are considered less trustworthy (Purnawirawan et al. 2014). However, there is no significant difference between consumer and marketer generated reviews when information in the review is perceived as objective (Jeong and Koo 2015). Others do not detect the influence of source type on the persuasiveness, particularly on purchase intention (Plotkina and Munzel 2016). In fact, some claim that source type affects attitudes rather than behavioral intention (Purnawirawan et al. 2014). One explanation suggests that the influence of each source depends on reader's susceptibility. Low-susceptibility readers do not see the difference between sources, while high-susceptibility are influenced more by different types of peer-generated messages than by other sources (Chen et al. 2016). Thus, objectivity appears to have a stronger influence than the source type and the judgment of a source is more dependent on the reviewer.

Third characteristic, 'source expertise' does not refer to the type of the source, but to its knowledge. Many platforms offer some information about authors of the online reviews, such as a number of written reviews, their usefulness etc., which are available to the readers. Reviewer's expertise has a direct influence on readers' behavioral intention. The perceived expertise of a peer author may be equal to the perceived expertise of 'expert' authors (Dou et al. 2012; Plotkina and Munzel 2016). What is interesting, expertise influences the persuasiveness, but user expertise is not perceived as lower than marketer reviewer expertise (Flanagin and Metzger 2013). Thus, all sources are evaluated equally in terms of expertise.

The last element, about which there are no clear results, is perceived similarity of a source. According to Zhang (2015), it affects both attitudes and behavioral intention of a reader, but the research about it is still limited and should be extended. However, the limited work in the online review context is in line with similar research in marketing or other forms of peer-generated communication.

PAPER	Source credibility	Source type	Expertise	Perceived similarity
(Chen et al. 2016)		x		
(Dou et al. 2012)	x	x	x	
(Flanagin and Metzger 2013)		x	x	
(Huang and Chen 2006)	x	x		
(Jensen et al. 2013)	x			
(Jeong and Koo 2015)	x	x		
(Lee et al. 2011)	x			
(Plotkina and Munzel 2016)		x	x	
(Purnawirawan et al. 2014)		x	x	
(Schlosser 2011)	x		x	
(Sparks et al. 2013)				
(Zhang 2015)	x			x
(Zhao et al. 2015)			x	

Table 7 Overview of source characteristics

Context

The context of online reviews publication refers to a variety of cues that are present within and beyond an online review and are associated with its environment like the online reviews platform itself. These elements do not depend on the source or the reviewer and are less subjective, which is, in our opinion, what makes them more reliable in measuring persuasiveness. More importantly, understanding the design and influence of the review platform is uniquely defining to the Information Systems discipline. We distinguish two dimensions of the context. The first one is the context of the object (11 works) - a product or a service described in the review, like product type or popularity. Neither the source nor the reader has an influence on that dimension but it interacts with other elements of the framework. The second dimension is related to the message delivery format (15 works). It should be particularly interesting from the point of view of information systems studies because it focuses on the elements of technology and design of online reviews systems. However, even if there are more than few studies about the presentation context, surprisingly little attention is put to the influence of technology and presentation of online reviews.

Object context

Product type does not depend on the review content, but it affects the way the readers perceive the review and the way the review influences the readers. There is a consensus (eight

studies) that it influences behavioral intention. Product type mediates the effect of contextual characteristics of a review on behavioral intention (Lee and Shin 2014). The same characteristics of a review (e.g. argument quality, valence) have a different effect on the intention, depending on the product category (Lee and Lee 2009). For example, reviewers prefer detailed reviews when they look for a search product, while they turn to reviewers' agreement and coherence of the reviews when they look for experiential products (Jimenez and Mendoza 2013). The presence of product experiential features in the text increases the intent to try it (Hamby et al. 2015). However, the effect of product type does not translate to a direct effect on behavioral intention (Plotkina and Munzel 2016; Purnawirawan et al. 2015; Xia and Bechwati 2008; Xu et al. 2015).

Also the perceived product popularity (expressed by the number of reviews) affects behavioral intention, especially when readers' involvement is low (Huang and Chen 2006). It is visible even more when strengthened by comprehensiveness (reviewers' agreement), which influences behavioral intention. As mentioned before individuals prefer comprehensive sets of reviews to the ambiguous, also because comprehensiveness gives a better view on product popularity. However, the ambivalence of a set has a stronger effect on consumers with the negative pre-purchase disposition and when the reviews are written by experts (Purnawirawan et al. 2014).

Presentation of online reviews

The presentation of online reviews is the way they are displayed on an online review platform (or another website). We use the term 'presentation' for both presence of other-than-reviews elements like 'excellence certificates' (Sparks and Browning 2011) or response from managers (Cheng and Loi 2014)) and presentation format of online format (Xu et al. 2015), as they both matter in the persuasion process. Several studies confirmed that different elements of the presentation of online reviews interact with other elements of the framework and affect behavioral intentions (Sparks and Browning 2011).

Most of the researchers, who focused on the topic of presentation, focus on the design of the platform and elements supporting the online reviews. The element that comes first in mind is the numerical or a 'star' rating. In contrary to common thinking, there is no significant evidence that the presence of rating changes the persuasive effect of online text reviews (Sparks and Browning 2011). Yet, there are other design elements that seem to be more

studied in relation to online text reviews. For example, many online review systems include a response from the manager as a credibility assurance element. However, there is no clear evidence that a response from managers increases credibility or affects behavioral intentions as there is a negative correlation between the two (Mauri and Minazzi 2013), no matter if the content of the response is financial or other forms of compensation (Cheng and Loi 2014). On the contrary, author’s personal identification information changes the way readers perceive online reviews and in this way, it affects their decisions. For example, the photo of a reviewer makes the judgment more systematic but it is not known why it happens (Lee and Shin 2014). Also, the order of the information on a website affects individuals’ decision-making. The literature highlights the effect of primacy or the order of presenting information. In theory, things that we see as first, are more persuasive. However, the primacy effect in the context of online reviews is weak (Purnawirawan et al. 2012), and has less influence on behavioral intention than other factors e.g. trust or source type (Lee et al. 2011). What matters more is the time frame of the review publication. It affects reviewers’ decisions, especially when considered together with valence. For example, recent negative reviews are stronger than old negative reviews.

The literature devotes surprisingly little attention to the role of technology in the presentation of the reviews. The first attempt to compare the text with the video as a method of presentation shows the difference between influence on behavioral intentions of the two (Xu et al. 2015) and opens a new domain for the research about online reviews.

PAPER	Product type	Product popularity	Presentation	Response	Reviewers’ agreement	Personal Identifying Information	Platform type	Purchase timeframe	Language expectancy violation
(Cheng and Loi 2014)				x					
(C. Cheung and Lee 2008)			x						
(Hamby et al. 2015)	x								
(Huang and Chen 2006)		x							
(Jensen et al. 2013)									x
(Jeong and Koo 2015)							x		
(Jimenez and Mendoza 2013)	x				x				

PAPER	Product type	Product popularity	Presentation	Response	Reviewers' agreement	Personal Identifying Information	Platform type	Purchase timeframe	Language expectancy violation
(Jin et al. 2014)								x	
(Lee and Lee 2009)	x								
(Lee and Shin 2014)	x					x			
(Lee et al. 2011)			x						
(Mauri and Minazzi 2013)				x					
(Park and Lee 2008)		x							
(Park et al. 2007)		x							
(Plotkina and Munzel 2016)	x								
(Purnawirawan et al. 2014)					x				
(Purnawirawan et al. 2015)	x								
(Sparks and Browning 2011)			x						
(Sparks et al. 2013)			x						
(Xia and Bechwati 2008)	x								
(Xie et al. 2011)					x	x			
(Xu et al. 2015)	x		x						
(Zhao et al. 2015)								x	

Table 8 Overview of contextual characteristics

Cognitive process

We add a new element to the framework of online reviews persuasiveness, which is the cognitive process. The literature, particularly the most recent one, focuses not only on what is presented on online reviews platforms, but also on the process of information perception and analysis, and their influence on behavioral intention. In this context, the cognitive process is understood as the performance of some composite cognitive activity; an operation that affects mental contents. We identified 16 articles, out of which 11 found significant effect of the cognitive process on persuasion. Nine studies tried to explain this process, by using psychological theories and matching them with other elements of the framework. In this review, we included studies, which focus on any kind of cognitive activity, which affected individuals' behavioral intention. Most of the studies theorize about what happens, but it is difficult to measure it with variables. There are only few studies trying to explain it using quantitative methods.

Cognitive process type	Explanation	Papers
Trust building process	Trust building process is one of the most important processes in persuasion according to many authors. Message credibility and author trustworthiness have a significant effect on behavioral intention. There are several types of trust (like emotional or cognitive) and different ways how the trust building process happens and how it affects the behavioral intention. The level of trust in reliability and intentionality increases the level of behavioral intention. Trust depends also on source type and reader's expertise. There is also a relation between ease of use (as described in TAM) and trust building process. The ease of use, together with usefulness build trust and influence behavioral intention both directly and indirectly.	(C. M. K. Cheung and Lee 2008; Kern Z. K. Zhang et al. 2014).
Self-regulation mode	It refers to the control of one's beliefs and actions, in order to achieve some goal. Self-regulation mode research in the context of online reviews is focused on two types of self-regulation. First, promotion and prevention modes moderate the effect of trust on behavioral intention and arguments on trust. Promotion-oriented individuals focus on positive reviews, while prevention-oriented on negative reviews and their quantity. Second, locomotion and assessment modes interact with valence. Negative reviews influence stronger the assessment-oriented individuals and positive reviews influence locomotion-oriented ones. Additionally, usefulness mediates the effect of self-regulation modes.	(Kwon and Sung 2012; Lee and Koo 2015; Tian et al. 2014)
Pre-commitment	It means making a preliminary decision in order to limit the number of options. In the context of online reviews, it increases the strength of behavioral intentions by interacting with valence and review credibility.	(Khare et al. 2011; Xie et al. 2011)
Cognitive fit	It is a process in which a message fits with preferences and expectations of a reader. There is an interaction between readers' expertise and message framing. Readers with low expertise increase behavioral intention under the influence of benefit-centric reviews, while high expertise users are triggered more by attribute-centric reviews.	(Park and Kim 2008)
Cognitive personalization	Cognitive personalization is a process in which individual perceive situations described in a message as if they happened to them. This process is affected by: valence (stronger by negative reviews), affect intensity, and review framing (especially experiential cues). Its effect is mediated by perceived usefulness of a review.	(Xia and Bechwati 2008)
Reflection/ Transportation	Transportation is a feeling of being somewhere else, caused by a message. Reflection is related to analyzing the message content arguments. Narrative message framing increases transportation. Story-like arguments make it easier to feel as if an individual was somewhere else. Transportation is increased by the negative valence and it influences reflection, together with product the type. Reflection influences behavioral intention directly.	(Hamby et al. 2015)

Table 9 Cognitive process

PAPER	Trust building process	Product evaluation process	Self-regulation	Pre-commitment	Cognitive fit	Cognitive personalization	Reflection/ Transportation
(Cheng and Loi 2014)	x						
(C. Cheung and Lee 2008)	x						
(Dou et al. 2012)	x						
(Elwalda et al. 2016)	x						
(Hamby et al. 2015)							x
(Khare et al. 2011)				x			
(Kwon and Sung 2012)			x				
(Lee and Koo 2015)		x	x				
(Lee and Lee 2009)		x					
(Lee and Shin 2014)		x					
(Lee et al. 2011)	x						
(Park and Kim 2008)					x		
(Tian et al. 2014)	x		x				
(Xia and Bechwati 2008)						x	
(Xie et al. 2011)				x			
(Kern Z. K. Zhang et al. 2014)	x						

Table 10 Overview of cognitive process

Interactions

Besides the effects of particular elements of the framework, also the interactions between them change the way online reviews affect behavioral intention. 28 articles examined 42 interactions, of which 35 were confirmed or partially confirmed. Interactions occur between elements from different categories (e.g. valence x source type) and within the same category (e.g. valence x quantity of reviews). Valence and quantity are present in the most researched interactions (respectively 11 and eight). The number of interactions of each element is presented in Table 11. APPENDIX 3 summarizes all the identified interactions.

Category	Name	Number
Message	Valence	13
	Valence ratio	5
	Volume/quantity	10
	Argument quality	10
	Message framing	7
	Credibility	3
	Coherence	3
	Two-sidedness	1
	Primacy	1
Source	Source type	4
	Perceived similarity	1
	Personal identification	1
Reader	Involvement	4
	Expertise	3
	Personality	3
	Conformity	2
	Pre decision	2
	Skepticism	2
	Culture	1
	Innovativeness	1
	Need for cognition	1
Context	Product type	6
	Presentation format	3
	Presence of rating	3
	Platform type	1
Cognitive process	Product evaluation	3
	Trust	1

Table 11 Number of interactions with each element of the framework

New framework

The above-mentioned elements are the elements of the improved framework of online reviews persuasiveness. The main element influencing the behavioral intention is the stimulus. It is, however split into two levels. Based on the literature review, we recognize that there are two levels of influence of online reviews message – the individual and the aggregate

reviews. Both of them should be included in the research about the topic. Also, the context of online reviews persuasiveness splits into two dimensions. The first is related to the object of the review (a product or a service). The second is related to the presentation of online reviews – the technology or layout of the communication platform. The two dimensions are different, but they can influence the behavioral intention simultaneously. Thus, more research is needed to understand the relationship between them. Finally, we introduce the cognitive process to the framework. We treat it as a mediator of the relation between reader’s characteristics and the context, as well as a mediator of the relation between the reader’s characteristics and the effect of the stimulus on behavioral intention. Several studies focused on different types of cognitive process, but more empirical research is needed to understand its role better.

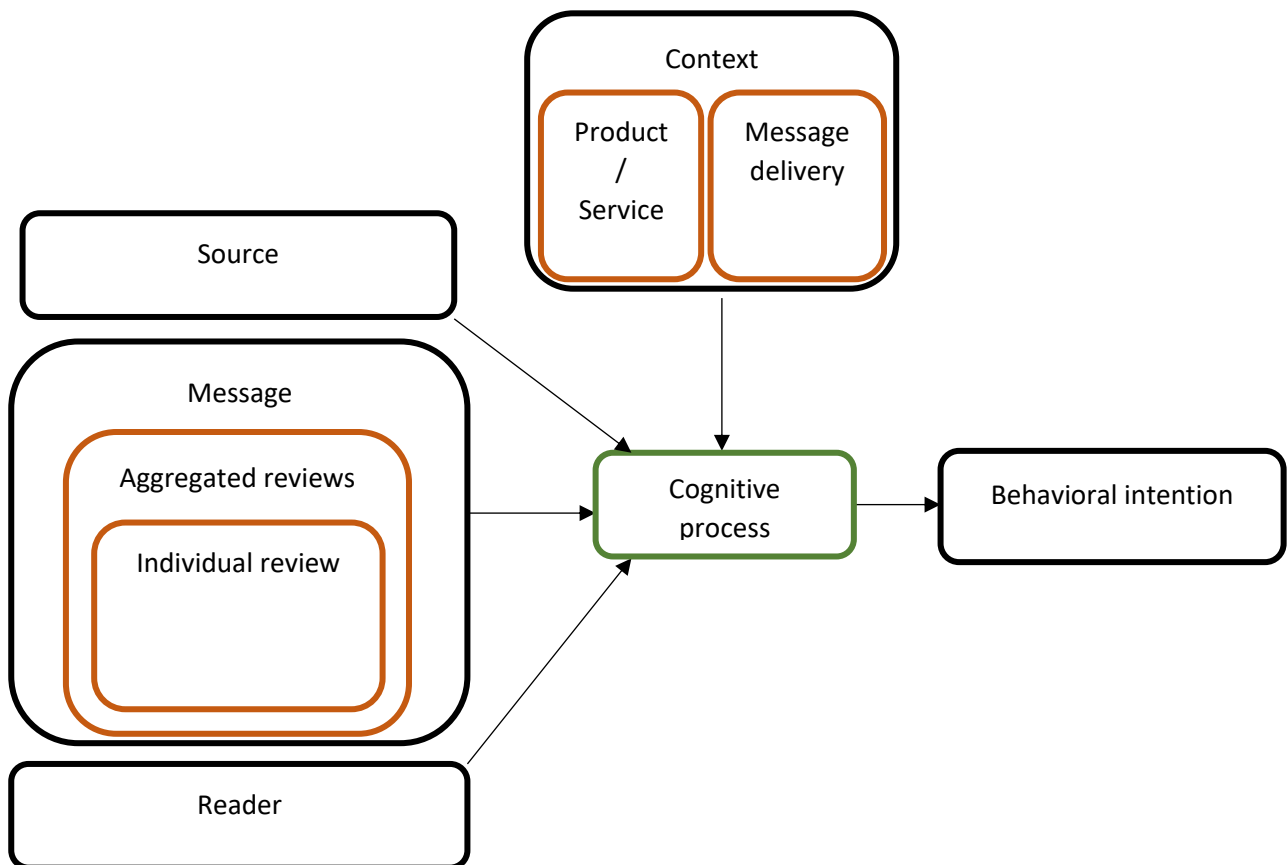


Figure 2 New framework of online reviews persuasion

Discussion

Our review has several implications for the theory. First, it extends the understanding of the online reviews persuasiveness and offers an improved theoretical framework. We summarized the existing research in a form of an extended framework and term matrices. Second, we introduced a new construct of cognitive process, placing it in the framework as a

mediator of other elements. We also presented the view on stimulus and context through new lenses, introducing two levels of stimulus persuasiveness and two dimensions of the context of online reviews. Additionally, we uncovered a surprising lack of research about the role of the technology on persuasiveness of online reviews and little apparent interest in the topic from information systems scholars. Neither of the major IS journals focused on the influence of platform's design on individuals' behavioral intentions. Understanding the influence of technical and social design on behavior of individuals is crucial to information systems research (Silver and Markus 2013) and IS scholars have called for research attention to persuasive design (Benbasat 2010). However, while we found plenty of insights about content, source or author characteristics, the literature fails to answer the crucial IS question on what the role of the technology is in the context of online reviews and how it affects individuals' behavior.

The most important objective of this literature review is to find recommendations for future research. We offer several suggestions on the focus of future works. First of all, authors of future research should rethink the unit of analysis. They should focus on both levels of online reviews persuasiveness. The same review characteristic may have a different effect when applied to an individual review or to a set of them, where the effect may be strengthened or weakened by different configurations of the persuasive characteristics. This configuration of characteristics might be the explanation of why some features of online reviews influence stronger than others and why there are different results between studies. Thus, when introducing new concepts, scholars ought to focus on both individual and aggregated levels of reviews' persuasiveness. Future research may harness the existence of these two levels of online review persuasiveness to present a more complete view of the phenomena.

Second, reader's characteristics are in great majority based on the dual process persuasion models. Most of the researchers try to explain the difference between two routes of persuasion, as illustrated in Elaboration Likelihood Model or Heuristic-Systematic Model of persuasion. Several authors focused on other, personal characteristics of a reader. These elements are very useful in understanding persuasion of online reviews. However, future research can collate these characteristics with the cognitive process. A relatively new element of the research about online reviews focuses on the performance of readers' cognitive activity. The cognitive process can change the perception of persuasive elements of online

reviews. The way the cognitive process works is related to individuals' characteristics, but more empirical research is needed to understand it. Thus, researchers focusing on the characteristics of a reader should look at them through the prism of the process. As well, the researchers, who focus on the process should start the discourse from the reader of online reviews. Challenging remains the measurement of the process, as it requires an understanding of psychology and mental processes.

Third, regarding the source, current literature focuses the most on the aspect of source credibility and expertise. It is understandable, especially when we look at the traditional definition and models of influence, where these characteristics are the main factors of persuasion (Hovland and Weiss 1951). Future research should extend the understanding of the role of the source characteristics in the process of online reviews persuasiveness. However, this particular task might be challenging, because the role of the source is different in the Web communication, due to anonymity and lack of traditional social ties on the Internet.

Finally, the most surprising result of the review is the lack of research interest from the information systems journals. The traditional thinking of persuasion as an element of communication between individuals, might be one cause of this gap. However, persuasion is nowadays an element of technology mediated communication between individuals. Moreover, recent developments of persuasive technologies (e.g. FitBit, Pavlok) demonstrate that technology is not only the mediator of communication and persuasion, but it can act as a communicator and persuasion agent itself. Persuasive online reviews are one of the elements of such a persuasive communication. Yet, only one notable example (Xu et al. 2015) explained the role of technology of online reviews presentation format (video) on individuals' behavior. Thus, more focus should be put on the issue of technology mediating the processes of online reviews persuasiveness (e.g. the role of presentation format, device type [mobile/desktop], design [color, shapes] etc.). Nowadays, many technologies could be used to present online reviews. With the growing role of mobile in comparison to the desktop, rising popularity of voice interfaces and new human-computer interaction formats being announced every few months (Amazon Echo, Google Home), we have a big piece of undiscovered knowledge, which is just waiting for more research attention. For example, from Piccoli and Ott (2014) we know that the way, in which online reviews are created and

published via mobile differ from those published via desktop. But would they influence individuals in a different way too? Besides Xu et al. (2015), studying the difference of influence between the text and the video reviews, there is no research explaining what is the role of technology in the persuasiveness of online reviews. IS scholars should focus more on the role of presentation mode, trying to investigate elements like new forms of communication with computers (voice interfaces, computer-synthesized speech), design of the review (colors, layouts etc.) or display (mobile vs. desktop). With the development of video or voice based interactions it is important to expand this branch of research.

Conclusions

The current literature about online reviews persuasiveness explains the phenomenon from different perspectives. In our review, we presented a literature review of online reviews influence on behavioral intention. From the initial number of 620 publications, we identified 42 which fulfilled our selection criteria. The analysis allowed to create an improved framework of online reviews persuasiveness. The framework uses behavioral change as a dependent variable. It is affected by other constructs which we introduced or extended:

- Message – a factor that causes a change or a reaction. Basically, it refers to the content of online reviews. The effect is split into two levels – individual and aggregated reviews
- Reader – an individual who receives the stimulus – reads the review. Their characteristics affect the way the reviews influence them.
- Source – the author of a review. Their characteristics influence the way, in which readers perceive the reviews.
- Context – all the objective cues within the reviews and in the environment. It is split into two dimensions – product related and design related.
- Cognitive process – it refers to all the cognitive activities, which affect the outcome of persuasion. It mediates the relationship of the reader and stimulus characteristics

We suggest several directions for the future research. First, the unit of analysis should include both levels of stimulus and both dimensions of source characteristics. Second, research should extend the knowledge about the reader and the source in the process of persuasion, paying attention to the place and the role of cognitive process. Finally, we urge for more focus on the context of online reviews. Particularly, new and innovative forms of presentation of online reviews should find interests in the future research. We believe that researchers can

find these recommendations useful and will improve the understanding of online reviews persuasiveness and decision-making processes based on online reviews in the future.

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APPENDIX 1 – Theories used in the literature

THEORY	SHORT DESCRIPTION	PAPERS
Attribution theory	Explains how individuals make causal inferences and what their consequences are. There are two types of attribution. Internal attribution is the process of assigning the cause of behavior to an internal characteristic, like personality or beliefs. External attribution is the process of assigning the cause of behavior to events uncontrollable by an individual, like the environment or the society.	(Dou et al. 2012; Huang and Chen 2006; Jeong and Koo 2015; Schlosser 2011; Tsao et al. 2015)
Category-diagnostics theory	Individuals judge and categorize others as good or bad, when forming impressions of them. The judgement and final impression depend on individual's goals.	(Ketelaar et al. 2015)
Cognitive fit theory	A message objective (task, goal) and its information presentation format should correspond or "fit" to achieve a superior performance. In the context of persuasion, a better fit message will lead to higher persuasion.	(Park and Kim 2008; Xu et al. 2015)
Costrual Level Theory	The theory explains the conceptual distance between an object and people's thinking about it. The more distant is an object, the more abstract will be individuals' thinking about it.	(Kwon and Sung 2012; Lee and Koo 2015; Tian et al. 2014)
Dual Process Theories	In the dual process theories, there are two processes or paths, which affect the process of persuasion.	
Elaboration Likelihood Model	In the ELM, there are central and peripheral cues of persuasion. Central cues are followed by more involved people e.g. experts and they are related to quality of arguments. Peripheral cues are followed by less involved or knowledgeable people and they are based on other-than-arguments elements. (Cacioppo et al. 1985)	(Cheng and Loi 2014; Chin-Lung et al. 2011; Dou et al. 2012; Park et al. 2007; Park and Kim 2008; Park and Lee 2008; Sher and Lee 2009; Sparks et al. 2013; Xie et al. 2011)
Heuristic-Systematic Model	In the HSM, there are two paths of persuasion – heuristic and systematic. Less involved people tend to follow heuristics when assessing a message, while more involved people tend to follow systematic method. However, in contrary to ELM, both methods do not exclude each-other. (Chaiken 1987)	(Sparks et al. 2013; Kern Z. K. Zhang et al. 2014)
Evaluative-cognitive consistency	The theory highlights the importance of the consistency between abstract evaluation of an object and the evaluative beliefs about the object.	(Schlosser 2011)
Incidental similarity	A casual, not relevant association between two subjects (the same name, similar address) might cause a sense of attraction, which can lead to more favorable evaluation of others. Incidentally similar others might be more persuasive than non-similar individuals. (Burger et al. 2004)	(Lis 2013; Zhang 2015)
Language expectancy theory	The language is a rules-based system. People develop certain norms of appropriate language usage. These norms are expected in given situations. Unexpected linguistic usage can affect the receiver's behavior in negative or positive manner. (Burgoon et al. 1975, 2002)	(Jensen et al. 2013)
Motivate reasoning theory	Individuals are motivated by two types of goals when processing information: <ul style="list-style-type: none"> • accuracy goals; • precommitment goals. 	(Ketelaar et al. 2015)
Narrative persuasion	Narrative persuasion differs from argument-based persuasion. Individuals receiving a narrative message depict characters in a setting described in a message. Persuasion happens through inferences about cause-and-effect relationships that exist in the message.	(Hamby et al. 2015)
Prospect theory and Negativity bias	Individuals tend to avoid risks stronger than they seek gains. Thus, they focus more on negative message and may be persuaded more by such a message.	(Cheng and Loi 2014; C. Cheung and Lee 2008; Jeong and Koo 2015; Khare et al. 2011; Xie et al. 2011)

Primacy effect	The order of receiving information affects the process of how information persuades the receiver.	(Lee et al. 2011)
Regulatory Focus Theory & Regulatory Mode theory	There are two types of individuals' personality, which constitutes the way they process information: <ul style="list-style-type: none"> • prevention-centered / interdependent self – focuses on preventing losses that would interfere with assimilation with significant others; • promotion-centered / independent self – focused on individual achievement and excellence relative to others. (Higgins 1997)	(Kwon and Sung 2012; Lee and Koo 2015; Sparks et al. 2013; Tian et al. 2014, Tsao et al. 2015)
Regulatory fit theory	A correspondence between a task and an information presentation format leads to superior performance of an individuals. Individuals engage stronger in what they are doing when there is the cognitive fit between the task and the message (Vessey 1991). Consequently, evaluative reactions can be intensified by this fit experience and can increase the persuasiveness of a message.	(Lee and Koo 2015)
Signaling theory	The theory argues that certain signals of online information sources are most reliable for assessing this information quality and source expertise. Particularly, the signals that are difficult to fake are more credible.	(Flanagin and Metzger 2013)
Social Influence	Social influence occurs when individuals change their attitudes, beliefs and actions under the influence of others. There are two types of social influence mentioned in this literature set: <ul style="list-style-type: none"> • normative – conforming to expectation of others; • informational – accepting information received from others as indicator of reality. 	(Huang and Chen 2006)
Social power	The degree of influence that an individual or organization has among their peers and within the society as a whole.	(Zhang 2015)
Technology Acceptance Model	Perceived usefulness and perceived ease of use determine individual's behavioral intention of using a system and the actual use of the system (Davis Jr 1986).	(Elwalda et al. 2016)
Theory of planned behavior (<i>reasoned action</i>)	The core element is an assumption that an intention to behave in a certain way is a prime determinant of actual behavior. Check section Behavioral intention for details.	(C. Cheung and Lee 2008; Elwalda et al. 2016; Lee and Shin 2014; Sparks et al. 2013; Tian et al. 2014; Kern Z. K. Zhang et al. 2014)
Warranty principal	It suggests that individuals' judgments of information obtained online (in the context where personal information is missing and false personalities are easy to create) are based more on the type of information that cannot be easily manipulated by its source.	(Flanagin and Metzger 2013)

APPENDIX 2 – Selection of papers for analysis

Publication title	Original search	Focused on behavioral intention	Selected papers
<i>Computers in Human Behavior</i>	59	18	5
<i>CyberPsychology & Behavior</i>	6	1	1
<i>Decision Support Systems</i>	59	14	2
<i>Electronic Commerce Research and Applications</i>	35	13	2
<i>Information & Management</i>	16	4	1
<i>International Journal of Electronic Commerce</i>	28	26	2
<i>International Journal of Hospitality Management</i>	40	18	3
<i>International Journal of Human-Computer Interaction</i>	4	3	1
<i>Internet Research</i>	22	17	2
<i>Journal of Business Research</i>	36	15	2
<i>Journal of Consumer Psychology</i>	6	2	1
<i>Journal of Interactive Advertising</i>	19	10	1
<i>Journal of Interactive Marketing</i>	31	10	3
<i>Journal of Management Information Systems</i>	10	5	1
<i>Journal of Retailing</i>	14	6	2
<i>Journal of Retailing and Consumer Services</i>	19	7	1
<i>Journal of Travel & Tourism Marketing</i>	30	24	1
<i>Social Behavior & Personality: An International Journal</i>	3	2	2
<i>Tourism Management</i>	36	9	2
<i>Academy of Management</i>	0	0	0
<i>ACM Transactions on CHI</i>	1	0	0

<i>AIS Transactions on HCI</i>	1	1	0
<i>Business & Information Systems Engineering</i>	4	1	0
<i>Communication of AIS</i>	1	0	0
<i>European Journal of Information Systems</i>	1	1	0
<i>European Journal of Marketing</i>	12	10	0
<i>Information Sciences</i>	6	1	0
<i>Information Systems Research</i>	8	4	0
<i>Information Technology and Tourism</i>	10	5	0
<i>International Journal of Advertising</i>	15	15	0
<i>International Journal of Information Management</i>	20	6	0
<i>Journal of AIS</i>	16	7	0
<i>Journal of Consumer Research</i>	8	0	0
<i>Journal of Marketing</i>	1	0	0
<i>Journal of the Academy of Marketing Science</i>	3	2	0
<i>Journal of Travel Research</i>	2	0	0
<i>Management Science</i>	4	2	0
<i>Marketing Science</i>	4	0	0
<i>MISQ</i>	13	2	0
<i>Organizational behavior and human decision processes</i>	0	0	0
<i>Others</i>	17	12	0
TOTAL	620	273	42

APPENDIX 3 – Interactions overview

PAPER	Interactions	Description
(Chin-Lung et al. 2011)	argument quality x need for cognition	The effect of argument quality is stronger on individuals with high level of cognition, while the effect of quantity is stronger on the individuals with low need for cognition.
	quantity x need for cognition	
(Doh and Hwang 2008)	involvement x valence ratio	Individuals with high involvement prefer more balanced sets of reviews while those, who are less involved prefer less balanced sets.
	prior knowledge x valence ratio	Individuals with prior knowledge (expertise) prefer more balanced sets of reviews while those with no expertise prefer less balanced set.
(Flanagin and Metzger 2013)	quantity x source type	While the source of more reviews seems more credible, the effect does not transfer to behavioral intention.
(Jeong and Koo 2015)	objectivity x valence x platform type	Individuals do not have preference for a particular platform type, as long as the reviews are objective
(Jimenez and Mendoza 2013)	Level of details x coherence	There is no significant effect of interaction between the coherence and the level of details of online reviews.
	level of details x credibility	High credibility increases the effect of level of details on purchase intention.
	coherence x credibility	There is no significant effect of credibility on the effect of reviews coherence on behavioral intention.
	X product type	The above interactions proved to be significant for experience goods, but not for search goods.
(Jin et al. 2014)	valence x timeframe	The more recent the reviews, the stronger the effect of the valence of a review.
(Ketelaar et al. 2015)	valence x reader expertise	Negative online reviews influence the novice readers stronger than the expert readers.
(Khare et al. 2011)	valence x volume x coherence	Volume increases the effect of the message valence in both favorable and unfavorable directions. It is further increased when the reviews are coherent.
(Kwon and Sung 2012)	Personality x message framing	Promotion-framed reviews influence stronger the individuals characterized by independent self-costrual.
(Lee and Koo 2015)	valence x personality	Valence influences purchase intention, no matter the personality of a reader.
(Lee and Lee 2009)	product type x valence x product quality x preference	In the case of quality goods, the increase in valence decreases the influence of perceived product quality on purchase intention, while in the case of preference goods the influence increases. The effect is opposite in the case of valence ratio.
(Lee and Shin 2014)	argument quality x product evaluation	Product evaluation process mediates the effect of review argument quality on purchase intention.
	X product type	Product type increases the indirect effect of argument quality on purchase intention.
(Lee et al. 2011)	review type (presentation) x trust in the shopping mall	When trust in an online shopping mall is weak, the difference between presentation methods is insignificant.
(Park and Kim 2008)	Message framing x expertise	Expert readers are influenced more by attribute-centric reviews, while novice readers are persuaded more by benefit-centric reviews.
(Park and Lee 2008)	review quality x quantity	The quantity of the reviews increases the effect of their quality.
(Park et al. 2007)	quantity x argument quality;	The interaction between the quantity of reviews and their quality is significant and it is enforced by readers' involvement. In a three-way interaction, it was confirmed that low-involved readers are persuaded more by the
	quantity x argument quality x involvement;	
	quality x involvement,	

PAPER	Interactions	Description
	quantity x involvement;	quantity, while high-involved are persuaded more by the quality of arguments. The latter was confirmed also in the two-way interaction, while the interaction between quantity and involvement was not confirmed.
(Plotkina and Munzel 2016)	product type x innovativeness	Online reviews about novel products persuade innovative readers more than non-innovative.
	review source x valence	Positive reviews written by experts are more persuasive than positive consumer reviews. Negative consumer reviews are more persuasive than negative expert reviews.
(Purnawirawan et al. 2012)	valence ratio x sequence	Set of negatively balanced reviews, starting and finishing with negative reviews is more persuasive than a set of positively balanced reviews, starting and finishing with positive reviews.
(Purnawirawan et al. 2014)	valence ratio x source	For a negatively balanced set of conflicting reviews, purchase intention is stronger when the reviews are written by peer consumers.
	valence ratio x coherence	There is no significant evidence that for a negatively balanced set of conflicting reviews, purchase intention is stronger when the reviews are coherent.
(Purnawirawan et al. 2015)	valence x product type	Product type influences the indirect effect of valence on behavioral intention.
	valence x culture	There is no evidence for the effect of interaction between reviews valence and cultural background.
(Schlosser 2011)	rating extremity x argument	Two-sided reviews together with moderately favorable rating are more persuasive than combinations with one-sided reviews or extreme ratings.
	rating extremity x valence x arguments	Review valence has no significant effect on the above-mentioned interaction.
	rating extremity x review content	Extreme ratings are more persuasive when the reviews are focused on the same attributes.
(Sher and Lee 2009)	argument quality x skepticism	There is no evidence of the interaction between argument quality and reader's skepticism.
	quantity x skepticism	Readers with low skepticism tend to be persuaded by the quantity of the reviews.
(Sparks and Browning 2011)	valence: x message framing (core features or customer service) x message framing (positive or negative) x rating presence	Behavioral intention is stronger when the valence and framing of the message are both positive. There is no evidence for the interactive effect of framing (core feature vs customer service) or rating presence.
(Tsao et al. 2015)	valence x quantity	The quantity of reviews increases the effect of the valence of the reviews.
	valence x conformity	Highly conformable individuals are persuaded stronger by positive reviews than by negative reviews.
	quantity x conformity	Highly conformable individuals can be persuaded even by a small number of reviews, while more reviews are needed to persuade less conformable individuals.
(Xia and Bechwati 2008)	Message framing (level of personalization) x valence	An experientially framed message is more persuasive when its valence intensity is higher, while there is no significant difference for a factually framed message.
(Xie et al. 2011)	personal identification x pre-decision	There is no evidence for interaction between presence of source's personal information and reader's pre-decisional state.
(Xu et al. 2015)	presentation format x product type	Product type moderates the effect of presentation format on the persuasiveness of online reviews.
(Zhang 2015)	similarity x perceived state of power	The similarity cue increases persuasion effect on individuals in powerless condition.

The Role of Heuristics in Online Reviews Users' Decision-Making Processes

Abstract

Online reviews play an important role in shaping an individual's intentions — be it for selecting the next product to buy, the next movie to see or the next hotel to visit. The literature has acknowledged that online reviews have an impact on an individual's decision, but to date it has failed to map their exact influence on the various stages of the decision-making process. More importantly, the socio-technical design artefacts that are an inherent component of online review Web sites have not been studied for their influence on decision-making.

Using a mix of controlled observations in combination with scenario simulation and in-depth interviews, we show that individuals utilize design elements of the online review system at various times and to varying degrees. We also uncover six heuristics triggered by the contents of the review and by the design elements of the Web site itself. Individuals apply these heuristics in an effort to improve the efficiency and quality of their decision-making. Our findings provide an in-depth view of how the decision-making process is influenced by the presence of artificially created system elements.

Introduction

In recent years, online reviews have become an integral part of decision-making processes. They play an important role in shaping the behavioural intentions of online shoppers (Amazon, Yelp), movie-goers (RottenTomatoes, IMDB), travellers (TripAdvisor, Booking.com) and individuals in a variety of situations. As more and more people utilize online opinions to make their decisions, scholars have paid close attention to drivers and motivators of their use. They found that individuals rely on online reviews to obtain purchase related information, to feel part of a community, or to learn how to use a product (Burton and Khammash 2010; Hennig-Thurau et al. 2003). They pay attention to the quantity of reviews provided (Park and Lee 2008), their valence (Flanagin and Metzger 2013), the quality of their content (Chin-Lung et al. 2011), their affective content (Xia and Bechwati 2008), and the context in which they were written (Sparks et al. 2013). Individuals are also more persuaded by negative reviews than positive ones (Cheung and Lee 2008).

Previous work, however, fails to examine the impact the design of an online review system has and its specific influence on individuals' behaviour (Bartosiak 2016). Furthermore, scholars have called for research that advances our understanding of the mechanisms and heuristics of online reviews usage and decision-making process (Zhang et al. 2014, 2009). We respond to this call. We do not focus on why online reviews are useful, the subject of much previous work, but we explain the logic and mechanisms behind the decision-making process of individuals who rely on online reviews. We conceptualize online review systems as a sociotechnical (ST) artefact and we focus on understanding "the full complement of consequences" of its use (Silver and Markus 2013, p. 84). Specifically, we answer the following research questions through a mix of observations and in-depth interviews:

RQ1. What is the decision-making process of individuals using an online review platform?

RQ2. What design elements of the ST artefact influence the decision-making process?

RQ3. How do these design elements of the ST artefact influence the decision-making online?

The paper is organized as follows. First, we present supporting literature background on motivations to use online reviews and their role in user decision-making. Second, we present the methodology and procedures used in the study. Finally, we present and interpret the

results – the collection of insights, followed by the directions for the future in this stream of research.

Literature background

Influence of online reviews on individuals' behavior

Online reviews are peer-generated evaluations posted on a company or third party website (Mudambi and Schuff 2010). The reasons why individuals read online reviews vary from obtaining information and learning about new products, to determining their social position and building relations in an online community (Burton and Khammash 2010; Hennig-Thurau et al. 2003). Yet, the focus of scholarly research has been on the change of buying behaviours (Hennig-Thurau et al. 2003). Individuals read online reviews to reduce search time and to obtain buying related information; based on this activity they make decisions and change their behaviours (Cheung et al. 2008; Duan et al. 2008; Hong and Park 2012; Kumar and Benbasat 2006; Litvin et al. 2008).

While the role of reviews on the decision-making process seems well understood, the influence of the review system is not. The variety of elements that go into the design of online review platforms may also affect how individuals perceive the object of a review. For example, the existence of positive ratings and multiple reviews for a product modifies an individual's attitudes about a product (Hong and Park 2012, p. 906) and influences her buying decisions (Goldenberg et al. 2001).

Previous research focuses mainly on presenting the persuasive elements, but not on how the process of persuasion occurs. Many scholars focus on influencing factors such as argument quality of reviews (Chin-Lung et al. 2011; Schlosser 2011), valence (Jeong and Koo 2015), and other text characteristics (Cheung et al. 2008; Yin et al. 2014). The persuasion literature highlights the importance of message content, in which argument quality is theorized as a central driver of influence (Bhattacharjee and Sanford 2006; Petty and Cacioppo 1986; Toulmin 2003). When the content of an online review is of high quality and it lacks non-verbal cues, people build trust beliefs on the basis of the review text (Racherla et al. 2012).

However, according to the Elaboration Likelihood Model (ELM), argument quality is only one of possible ways to persuade an individual (Petty and Cacioppo 1986; Petty and Wegener 1999). The other is based on other elements of the message and its context (e.g., images,

ranking, authors information), like the design elements of the IS artefact. This is particularly germane to online reviews that are multimedia and often include contextual information. Thus, readers' persuasion will follow two possible routes, depending on the individual's ability to elaborate information. The central route is based on the textual content of the message and is generally preferred by individuals who have the cognitive ability and knowledge to process it. The peripheral route is a 'shortcut' that is based on non-textual elements of the message, like the author, the images available, and the like. In the context of online reviews, the peripheral route is implemented through the design elements of the online review system. Based on the dual nature of the persuasion process, recent literature claims that individuals build their judgments of online reviews not only on reasoning and analysis of all the available arguments but also that they employ heuristics to make decisions (Zhang et al. 2014). It follows that analysing the effect of design elements of online reviews is a central research question in this area.

[The role of heuristics in online reviews persuasion](#)

Heuristics are simplified models of reality that reduce the complex tasks of decision-making to simpler mental activities, usually based on previous experiences in similar situations (Tversky and Kahneman 1975). They help humans overcome their limited information-processing abilities. Heuristics allow individuals to adapt to the complex environment by reducing the cognitive load spent on searching for a solution and sacrificing the optimal solution for a satisfactory one (Simon 1957).

The Heuristics-Systematic Model (HSM) is another dual process persuasion model, which explains the role of heuristics in the process of persuasion (Chaiken 1987). It posits that there are two ways in which individuals make decisions under the influence of persuasive communication. The first approach – systematic – is based on an analytical judgment of a message. Systematic decision-making requires cognitive ability and capacity. However, according to (Chaiken 1987), many individuals are remiss in investing cognitive efforts to validate the persuasive message. They instead use heuristics in the persuasive process. These individuals may base their judgment on a superficial assessment of "other-than-arguments" cues. Unlike ELM, HSM posits that both approaches may be employed at the same time.

To date, the limited work on heuristics applied in the context of online reviews has identified three types of simplified models (Zhang et al. 2009):

- Single-criterion-stopping rule: individuals search for particular information using one criterion and stop when they feel that they have found enough information that satisfies the criterion
- Credibility heuristics: individuals judge the credibility of information based on the credibility of its author
- Consensus heuristics: individuals evaluate the coherence of positive information found on different websites as a positive indication to retain a recommended product selection

The literature on online reviews' persuasiveness identifies also other elements, which might be used in heuristic models. For example, the type of author (Dou et al. 2012), the number of the reviews (Flanagin and Metzger 2013), and the presentation format (Xu et al. 2015).

Methodology

Given our focus on the interaction between individuals and the online review system, we adopted a variety of research techniques. We use scenario simulations, along with controlled observations and in-depth interviews, to map an individual's decision-making process. We pay particular attention to the manner in which the design elements of the review systems contribute to the decision process and outcome. The context of our work is the search for a hotel in one of the dominant online review systems in the industry – TripAdvisor.

Participants

We used convenience sampling to recruit 22 participants - 10 females and 12 males. All of them were students of an international master's program in a large public European university. All participants reported that they liked traveling and use online reviews when planning a trip with TripAdvisor as their main source. This was important as they were familiar with the website's layout and learning bias was not an issue. Before starting the task, each participant signed an informed consent form and was briefly introduced to the study. We indicated that the study pertained to the hotel industry, but did not reveal the research questions to not bias their behaviour. Every participant was free to stop the study and withdraw at any point in time.

Procedure

First, in order to discover the mechanisms of online reviews usage, we conducted a real scenario simulation, along with observations (Pan and Fesenmaier 2006; Zhang et al. 2009).

Participants were asked to imagine that they were going for a short stay to a touristic destination in Switzerland to simulate a natural hotel search process (see APPENDIX 1). Subjects were informed that one of the participants, randomly chosen, would win a trip to the hotel they chose. Because the study was focused on the design elements of the online reviews system, we wanted to avoid biases caused by income inequality. Therefore, we asked participants not to pay attention to the price. Since the winning participant would not have to pay for the hotel, this was a realistic scenario.

Subjects were limited to exclusively use TripAdvisor. No time constraints were given. We asked the subjects to narrate their actions and their thought process as they were carrying out the task. We recorded all their words and actions with screen-recording software and an audio recorder. During this phase, the interaction between researcher and subjects was limited to observation only and reminders about narrating their actions.

In the second phase, just after the participants had chosen a hotel, we conducted interviews to surface motivations for their action and to explore causality. We used semi-structured interviews and a laddering technique to find subconscious motives, rather than what subjects thought the motives were. We used an interview protocol (see APPENDIX 2), but adjusted questions to each subject and each situation. After the interview, each participant was debriefed about the real objective of the study.

Data analysis

We analysed, transcribed, cleaned and coded all the records (Miles and Huberman 1994). We gathered a total of 83 pages of transcribed documents and 17 hours and 32 minutes of video.

First, we read each transcript, tagging all relevant information. We did not focus on the opinion about the content of the reviews. Our objective was to identify design elements of the online review system that participants used as part of the decision-making process. These elements were used to tag the transcripts. In this phase we adopted a method of stacking of comparable cases (Miles and Huberman 1994).

Second, we wrote up each case using the same set of variables, coding the information in the form of a partially ordered meta-matrix. When the full list of tags was identified, we iterated the process to find further information that could be coded under the tags but was missed in

the first round of coding. We analysed the matrix to understand how the subjects used online reviews platforms elements to make decisions.

Based on the actions of the participants and the elements of the online reviews platform they paid attention to, we identified different approaches to the decision-making process. We analysed the transcripts and the matrix further for repeating patterns and for quotes evidencing our findings. We also looked for alternative explanations to the findings in the transcripts and the literature. After we made sure that no alternative explanations existed, we conducted a composite sequence analysis (Miles and Huberman 1994) to discover the phases of the search process and to identify actions belonging to each phase.

As a last step, we collated our findings with the existing literature on psychology and influence of online reviews to find explanations for observed behaviours. When we decided that a heuristic explained faithfully the observed behaviour, we matched it with the tags and adopted it as a higher order theme.

Findings

[The decision-making process and the role of online reviews](#)

We identified three phases of the process of online reviews usage in the context of hotel search. All three are in line with the traditional phases of the customer decision-making process – information search, evaluation of alternatives and product choice (Solomon et al. 2013). Figure 1 illustrates the full process of online reviews based decision making.

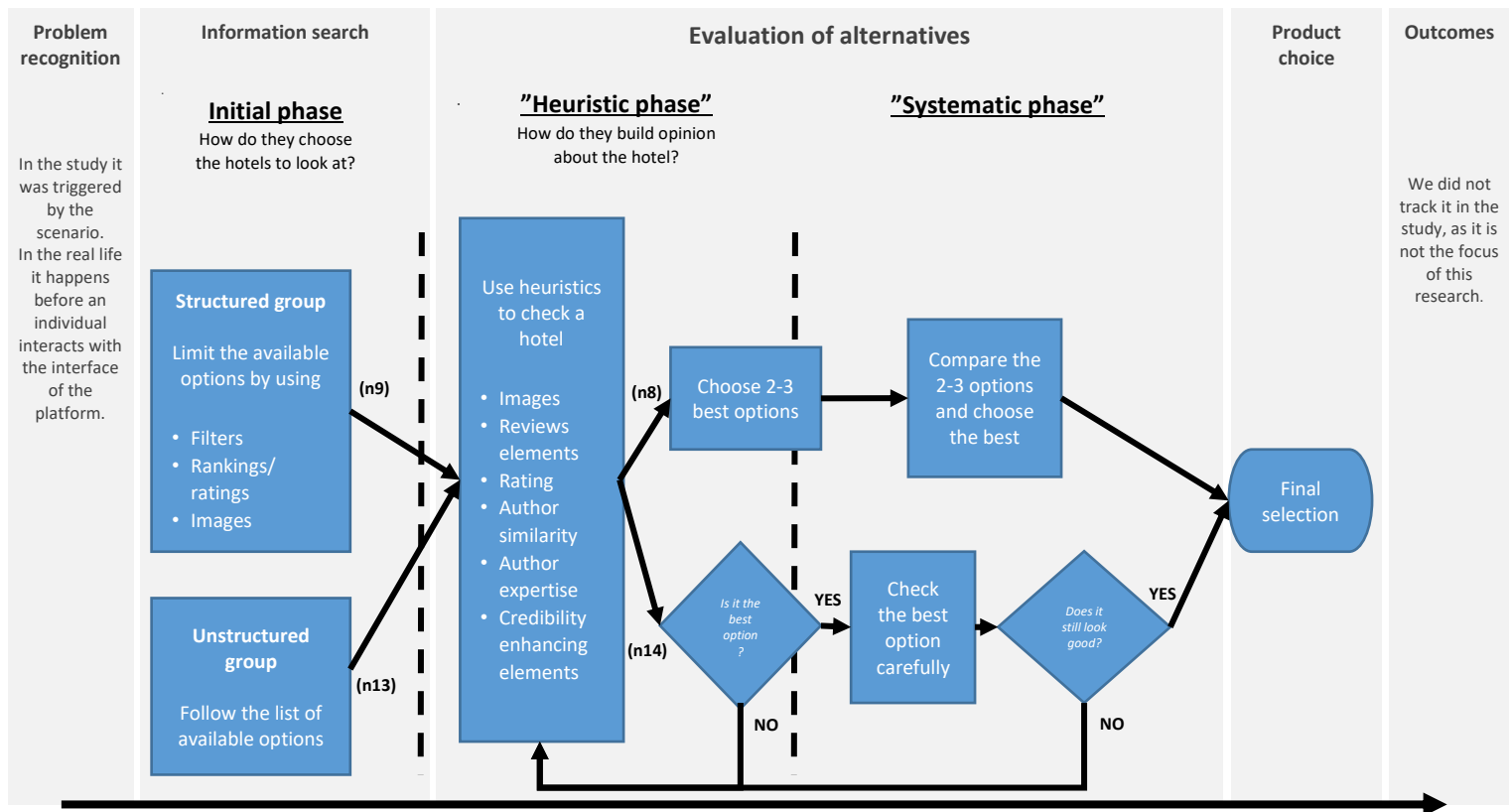


Figure 1 Online reviews search process

Phase 1: Initial search phase

In the initial phase, participants made a preliminary decision about the approach towards the search. Two approaches surfaced during the initial search about the offer: structured and unstructured. Nine subjects, adopting the structured approach, had an idea of the type of the hotel they would like to stay at. These participants knew what characteristics to look for, and they focused on finding them. Those subjects used filters, rankings, ratings, or images to segregate the hotels in the initial phase and to look for an option matching their ideal scenario. Their approach is represented by the following quote:

“Basically, I know what I like and I know what I don't like, so I don't need a lot of time and overthinking.”

Thirteen subjects, adopting the unstructured approach, had no preliminary idea or an ‘optimal’ scenario for their trip. Their initial choice was directly guided by the online review system. While following the scenario given by the researcher, they often claimed that they

did not “have an ideal hotel they would like to stay in.” As a result, they followed the cues provided by the displayed list of offers, hotel ratings, and images:

“I have the impression that TripAdvisor leads me [...]. I have to, in some way, follow the path that they give me.”

These participants employed a more heuristics-based approach and did not look for an a priori “ideal” stay, as one of them expressed:

“I don’t care so much [about the facilities]. I just want to have a shower. I don’t care if there is any pool or anything in particular.”

Despite this difference, we made an interesting observation in both groups – all participants, no matter the initial strategy, skipped the sponsored offers displayed on the top of the page and moved immediately to the organic list of hotels. They trusted them more than paid offers:

“The advertisements are not a good thing. I always skip them.”

Phase 2: Heuristic phase

The second phase began when the subjects started formulating opinions about the hotels displayed on their screen. Participants checked the hotels’ characteristics, not paying much attention to the details and not focusing on a deep analysis of each offer, as shown in the following quote:

“I don’t read all the reviews. I only take a look, trying to get some important information.”

On average, they paid more attention to diverse elements of the design of the online reviews’ provider’s website. We called this phase a ‘heuristics phase,’ because participants generated a diverse set of heuristics to simplify their decisions (as discussed later).

There were two different outcomes of the second phase that did not depend on the approach employed in the initial search phase. One group of participants (eight subjects; three from the structured and five from the unstructured group) limited their final choice to a shortlist of two to three hotels. The reason to do so was to reduce the time of the search and to simplify the decision, as described by (Simon 1957). One of the participants in this subgroup summarized this approach as follows:

“I usually don’t have time to check all the existing hotels. I prefer to limit my search to two or three hotels that match with my expectations instead of looking for the perfect hotel for ages.”

The other group (14 subjects; six from the structured group, eight from the unstructured group) followed the list displayed on the screen. Using the same elements, they chose the best possible option. If another hotel better matched their expectations, it took the position of their top choice and the previous top hotel was discarded. The difference between the two groups was their approach to the final choice in the next phase.

Phase 3: Systematic phase

In the third and final phase, the systematic phase, individuals from both the structured and unstructured groups applied a more detailed analysis. They all methodically evaluated the hotels they were interested in by carefully analysing the reviews and summaries of the ratings. However, they fell into two further categories – regardless of their initial search approach. In the first, the “comparative” group, participants carefully evaluated the hotels in the choice set relative to one another and proceeded to select one. The following quote is representative of their process:

“So, I will start analyzing the three chosen ones. So, we have two similar hotels, talking about the price. This one is better. The quality is surely better. Rooms are big, nice. It’s near the lake. This one – the rooms are minimalistic, but I like them. There are a lot of pictures, but I like it. [...] think I would choose the cheaper one. Not only by the price, but also, I liked it more. The photos. The reviews - everybody said it’s excellent. So, I think that’s the best option I’ve found.”

In the “sequential” group, participants analysed their chosen hotel more systematically. If the current option did not meet their expectations, they iterated the heuristic phase and looked at other hotels. The quotes below are representative of their approach:

“Actually, I really like the hotel [name]. Let’s check travelers’ photos... They are not so convincing. [Opens a new hotel] Ok. I am looking again at the travelers’ photos. And reviews. "A little bit of paradise". Wow. Hmm. Maybe I will change my idea. The photos are very suggestive. Ok... This is good.”

If the offer was still appealing, they proceeded further:

“This hotel has 4,5 stars and the price is fine. I will open it to look for the reviews. I am looking at the reviews. They are very good. All of them are around 4 and 5 points. I will keep in mind this hotel. It has 73 excellent reviews and 0 poor. So, it is very good. I will see the pictures to have an idea of how is the hotel. It looks very modern. The location is good as well. The rooms are very nice. Also, the bedroom. Ok. I like it.”

The majority in the “sequential” group (nine participants) did not change their decision. Figure 2 displays the routes of the search process applied by the participants representing both search approaches.

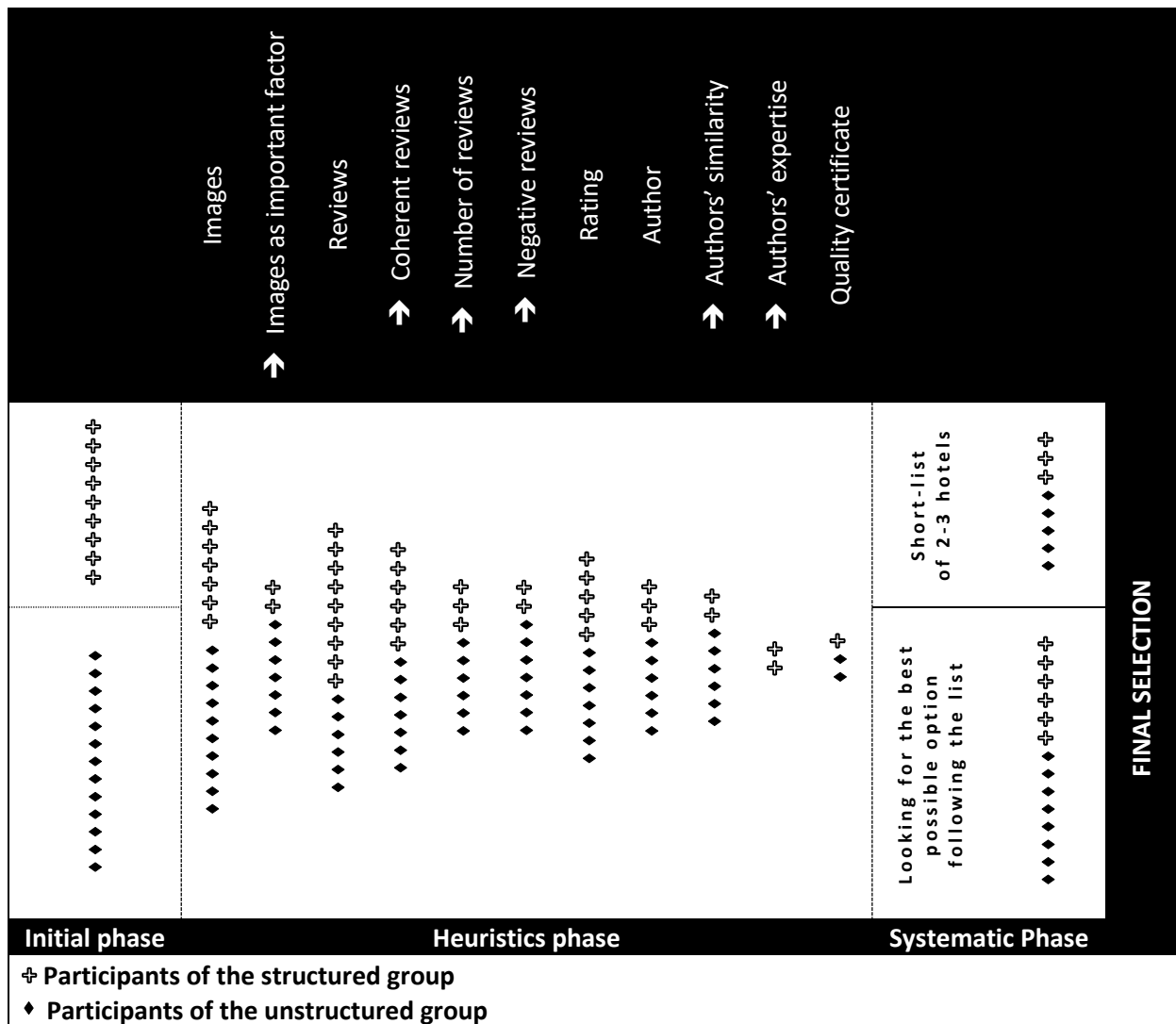


Figure 2 Distribution of participants with different search approach in each phase of the process

Elements of online reviews and heuristic models

During the heuristics phase of the decision-making process, participants focused on several elements of the online reviews platform to generate their respective heuristic models. Building on the notion of information design, we classified these elements and identified eight

elements that appeared in the decision-making processes of more than one participant (see Table 1).

ELEMENTS	NUMBER OF SUBJECTS WHO USED THE ELEMENT
Images	17
→ <i>Images as primary factor</i>	9
Reviews	15
→ <i>Coherent reviews</i>	13
→ <i>Number of reviews</i>	9
→ <i>Negative reviews</i>	9
Rating	12
Author	9
→ <i>Author's similarity</i>	8
→ <i>Author's expertise</i>	2
Quality certificate	3

Table 1 Online reviews platform design elements.

The Influence of Images

Most subjects (17) relied on images when making a decision, and nine stated that the images were very important, if not the most important, elements of the online reviews provider's website. For these participants, the pictures played a role in two phases of the decision-making process. First, during the initial information search phase they relied on the pictures when making an initial choice, comparing this to the "first impression" in human communication:

"For me, the initial picture is a big, big thing. [...] it gives me a certain feeling. What environment I will be in."

Second, six participants used pictures as the main source of information. Three out of the six looked solely at the pictures in the heuristic phase of the decision-making process. These participants relied only on the images of the hotel, skipping the text reviews or numeric ratings. Pictures showed them the place more directly than the text. Interestingly, only in three cases the participants changed the initial picture-based opinion during the systematic phase of the decision-making process – a testament to the power of "first impressions."

Influence of the Textual Content and Coherence of Reviews

Fifteen subjects used the text of reviews as an element to generate their heuristic model. Further, all nine subjects from the structured group relied on elements of the review text. Noteworthy is, however, that a third of the subjects did not read the textual content of the reviews during the heuristic phase. Participants who used this design element claimed that they only glanced at the reviews initially, and only later focused on the actual content during the systematic phase of the decision-making process:

“I don’t read all the reviews. I only take a look, trying to get some important information”

Moreover, subjects who paid attention to the textual content of individual reviews during the heuristics phase agreed that those reviews affected their choices by enhancing the effect of other elements of the website:

“The pictures looked nice, but without the reviews... I don’t think I would click it. These couple of sentences drew me and that’s the reason I clicked it”

“They are kind of final push. I like these hotels equally based on the pictures. And then I go down to the reviews and this is the convincing push’n’pull”

From all the characteristics of online reviews, the coherence of a set of reviews was the most widely used in during the heuristic phase of the process. Our subjects expressed bigger trust towards the reviews and created a more convincing image of a hotel in their minds when all the reviews were in consensus about the quality of the facilities:

“I think the first reason why I trust them [online reviews] is that they all say the same things. They all agreed.”

The Influence of the Number of Reviews and Number of Negative Reviews

The number of reviews also enhanced their persuasive effect on readers. As mentioned by one of the participants:

“The more reviews you read, the more it reinforces the feeling.”

Nine subjects stated that the number of reviews gave them a feeling of trust. The more reviews they perceived, the greater their confidence in the content. However, the perception of what a large number constitutes varied significantly, from 74 to over a thousand. Not surprisingly, no one read all the reviews, but the aggregate number seemed enough to

strengthen trust. Confirming the existing literature, subjects stated that a few good reviews were simply not enough to ensure that the hotel is a good one. A higher number of reviews built trust by showing that many other peers visited the same hotel.

On the other hand, a single negative review seemed to have a strong effect. While research has shown that negative reviews have a stronger impact on perceptions about a review's helpfulness than positive ones, we found that nine subjects started the heuristic phase of their search by reading the negative reviews first. They mentioned that they placed more trust into negative reviews because they showed what could go wrong and thus helped avoiding such risks. Moreover, for three subjects the encounter of one negative review addressing an initially identified selection criterion was enough to discard the hotel outright:

“Even if I read only one bad review that matches with all my ‘must-haves’ I will skip the hotel immediately. I don’t care about the other good reviews anymore.”

In case the negative review did not address a criterion that was important to them, subjects continued to look at the hotel—even if more negative reviews existed:

“I try to understand if the characteristics of the hotel that for someone are bad are also important for me.”

Subjects only changed their behaviour if too many negative reviews iterated the same drawbacks, as shown in the following:

“[If] five bad reviews say [the same thing] then it is a red flag for me. But if its five different bad reviews [...], then I sort of think that these are just outliers.”

The Influence of Ratings and Quality Badges

Over half the subjects used the numerical (star) rating during the heuristics phase of their search process. Subjects considered the rating system as a “good, generalizable system” that helped comparing different options easily, as indicated in the following quote:

“[...] it’s a pretty generalizable system. I mean, you know that five out of five is really good and one is pretty terrible. [Star ranking] is something that anyone can relate to.”

However, neither of them made their choice based solely on the rating system. All of them turned to the content of reviews or pictures and treated the ratings as a useful aid—not as a “decisive factor.” Further, three of the participants used quality certificates, or badges, issued

by the online reviews provider as a cue, because they increased their trust in the provider, as stated below:

“I looked at the award they have posted there [Travelers’ Choice]. [...] if you have two hotels that are similar and the reviews say the same, then maybe I will go to look for other factors”

Interestingly, subjects did not know the details about the type of certificate or the procedures of awarding them to hotels. Yet the mere presence seemed to signal to some subjects to unquestionably accept these design elements as meaningful. When asked why they trusted them, subjects labelled badges as a sign of quality and evidence that other peers have chosen the same hotel.

The Influence of Author

Eight participants paid attention to the similarity of the author when compared with themselves:

“[I choose reviews] based on fitting to my lifestyle. If somebody is reviewing [from a family’s point of view] this is not something so relevant to a single guy. [...] Because they aren’t looking for the same things I would look for.”

These subjects used elements like pictures, age, lifestyle or nationality of the author to see if they were similar to their own; they also used those elements to judge if a review was credible and the hotel suited them.

Additionally, for two of the participants the expertise of an author was an important element of the decision-making process. They judged the author’s expertise by checking how many reviews she had written and by judging the quality of a review, as the following quote indicates:

“[T]his [author wrote] 70 reviews and the other one 23 reviews. So, these people might be rather experienced travelers. And they may know what the quality of a hotel might be. So, maybe I can trust them.”

The Influence of Price information

While we explicitly did not focus on price, participants reiterated the importance of price in the decision-making process. Participants knew that they should avoid paying attention to the

price. After all, the scenario was created in a way that made it clear not to worry about it. Yet, half of the participants based their decision heavily on the price perceptions or used it as one of the initial selection factors, as shown in the following quote:

“I excluded the hotels with too high price. I only considered the hotels with the right price for me. “

When asked why price was so important, they were unable to provide an answer; some stated that this was what they always did and felt secure about the price level. Even if they could have chosen a more luxurious hotel, they decided to keep the price level they were used to and continued looking at other factors through the lens of price.

Discussion

Based We confirmed that individuals conduct both a systematic analysis of the arguments and the creation of heuristic models to simplify their decision-making process when using online reviews. More specifically, we identified six heuristics employed by the subjects during the heuristic phase of the decision-making process. Figure 3 presents the mapping of design elements to these heuristics pointing to the unique nature of the decision-making process enabled by the online review system.

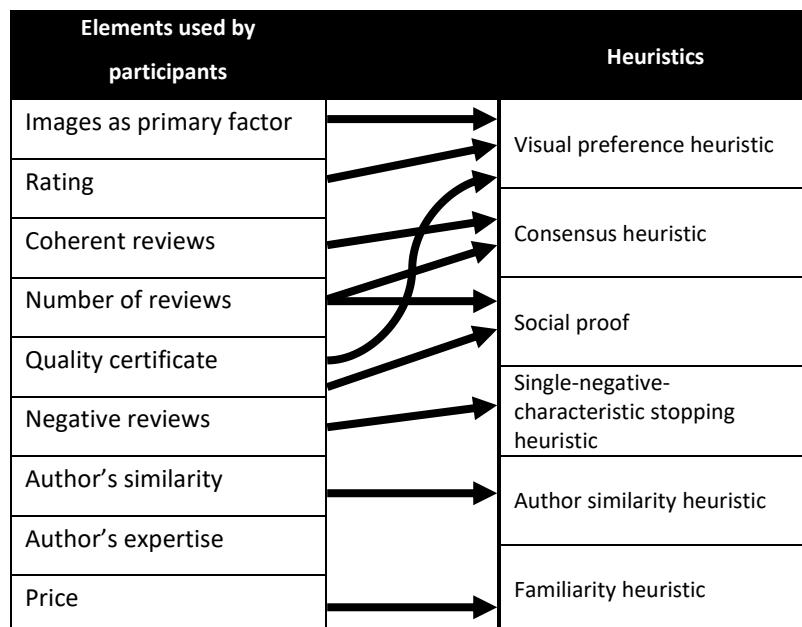


Figure 3 Mapping of design elements to heuristics

Single-negative-characteristic stopping heuristic

The very fact that subjects discarded a hotel after reading only one negative review leads us to propose a *single-negative-criterion-stopping heuristic* – individuals stop considering the product or service when they find enough negative information on a criterion that they deem important. Core to this heuristic is the match between the negative review content and a key decision criterion. We are not aware of anyone uncovering this heuristic in the context of online reviews. However, it is a specific case of the single-criterion-stopping rule (Zhang et al. 2009).

Prospect theory provides an explanation, since individuals seem to avoid risks stronger than they seek gains (Kahneman and Tversky 1979; Tversky and Kahneman 1992). The literature on online reviews suggests that individuals find negative reviews more useful than the positive ones (Sen and Lerman 2007). To strengthen the persuasive potential of online reviews, online reviews providers should consider learning about users' preferences, gathering data not only from the offered filters but also from other sources, like social media or search engines.

Consensus and social proof heuristics

Most of the subjects paid attention to the coherence and the amount of reviews. Our study confirms the existence of the *consensus heuristic* (Zhang et al. (2009). Looking at the same element – number of reviews, the subjects employed also the *social proof heuristic* – they assumed that a big number of similar actions of other people reflect a correct type of behaviour and followed their example (Sherif 1935). This is consistent with previous literature, demonstrating that social proof built on online reviews has a strong effect on electronic commerce sales (Amblee and Bui 2011).

Visual preference heuristic

The images accompanying the reviews appeared to be an important element of the search process for most participants. Their role was more important than we initially hypothesized, in part due to the limited research examining design elements of online review systems beyond quantitative evaluations and text. The subjects found pictures important because there was less space for personal interpretation, unlike the textual portion of reviews; they often started their initial search phase by looking at the photographs. Accordingly, we label this heuristic as *visual preference heuristic* (Townsend and Kahn 2014).

Individuals prefer visuals, more than any other forms of a message presentation (Holbrook and Moore 1981), when formulating their first opinion about an object. We are not aware of any literature that discusses the effect of product images on the persuasiveness of online reviews. We note, however, that the role of images may also vary with the type of product or service. Our context is hotels, a multi-faceted service where the physical space is an important element of the experience. This is very different than utilitarian search products (e.g., a digital camera). The lack of research on visual cues in online reviews is particularly troubling, given the centrality of the sociotechnical artefact's design in information systems research (Silver and Markus, 2013). The psychology literature lends some support in that visual materials are more persuasive than texts in many contexts (Joffe 2008). In the context of online review platforms, many design elements can act as visuals, such as stars, or the graphical representation of quality badges and certificates. Furthermore, the presence of visual design elements is a key differentiation of review systems as compared to traditional word of mouth. Thus, more empirical research is needed to measure their effect as an instrument of persuasion, providing fertile ground for cutting edge research that is uniquely positioned as information systems theory.

Author similarity heuristic

The perceived similarity of the source appeared to be more important than other source characteristics. Drawing on the psychology literature (Read and Grushka-Cockayne 2011), we propose an *author similarity heuristic* in the context of online reviews. It captures the fact that an individual's perceived similarity of a review source increases its perceived credibility and usefulness.

While the effect of author characteristics on the outcome of a decision in the context of online reviews is well known (Flanagin and Metzger 2013; Plotkina and Munzel 2016; Purnawirawan et al. 2014), this heuristic is surprising because the literature has yet to empirically confirm the effect of author's similarity on the perception of online reviews (Lis 2013; Zhang 2015). The fact that some subjects paid so much attention to the authors' similarity might be evidence of the fact that individuals try unconsciously to replicate physical processes in the online environment. Absent physical cues (McKenna and Bargh 2000) they turn to other available information. Far from being conclusive, our findings point to the need for more research in this area.

Familiarity heuristic

Subjects relied heavily on price information, irrespective of the fact that they were explicitly asked not to do so. One possible explanation for this phenomenon might be found in the *familiarity heuristic* (Komiak and Benbasat 2006; Metcalfe et al. 1993). Individuals tend to trust more and prefer scenarios, which are similar to what they know from past experiences. Choosing a price level could be an example of such a scenario. It is also in agreement with previous research that has looked closer at the issue of price familiarity (Mazar et al. 2010). However, this heuristic has not been previously studied in the context of online reviews. Since we do not want to challenge the foundation of rational choice theory, as recently done in behavioural economics (Ariely 2009), we highlight this issue and point it out as an interesting question for future research in the area of microeconomics and behavioural economics.

Online review systems remain a widely popular class of sociotechnical artefacts that individuals all over the world use frequently to make important decisions. Yet, information systems scholars have accumulated a surprisingly little amount of knowledge about the impact of their design on persuasion and decision-making. In this study, we contribute to this line of research and call attention to the need for further research in the area.

Conclusions

In our study, we confirmed that individuals, when using online reviews, often make their choices based on heuristics. We found that individuals conduct both the systematic analysis of the arguments and create some simplified models of reality to make their choice easier. The literature in this stream is still limited. In this article, we wanted to understand the mechanisms and heuristics employed during the use of online reviews. We believe that our findings are a useful extension of the existing knowledge about the use of online reviews. We contribute to the literature by creating the scheme of the process of online-reviews-based decision making and by identifying the heuristics used in this process. We identified three phases of this process: the initial phase – the preliminary choice, the heuristics phase when the heuristics are employed and the systematic phase when individuals analyze more details of an offer. We noticed eight design elements, to which individuals pay particular attention. Based on these elements, we identified six heuristics. Two of the heuristics – visual preference heuristic and author similarity heuristic – are particularly interesting, because they are not well studied in the literature about online reviews. Valuable knowledge is available in other

streams of the literature, but a more in-depth explanation of these effects on online reviews persuasion awaits.

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APPENDIX 1 – Hotel search scenario

Imagine that you are planning a trip to Lugano (Switzerland) with your boyfriend/girlfriend/friend. You want to stay there for two nights. You still don't know the date, but you decided to look for a hotel in which you will stay, because you like to be prepared. It is too early to look at prices, as they will change between now and the time you travel, but you should identify the hotel you'd like to stay at.

Open the TripAdvisor website and find a hotel in Lugano (Switzerland), in which you will stay during this trip. Choose a hotel that you would really book if you went to Lugano.

We are interested in your thinking process, so when you look for the place to stay, describe loudly all the actions, which you perform. Tell about the reasons and motivations which push you to perform certain actions. E.g. if you decide to open a review of a hotel X, say loud "I decided to open a review of a hotel X." etc.

When you find one hotel that you want to book, let the instructor know about your choice.

SAID BY THE INTERLOCUTOR

(Have you read the scenario? Did you understand the task?)

As a thank you gift for your participation we want to have a raffle, so that we will pay for a weekend in the hotel their chose. We will select one winner at random and attempt to arrange for a weekend there. In other words, you are going to look for a hotel, in which you may really stay, if you win. The winner will be communicated after completion of the study. We will cover hotel expenses for a weekend in Lugano. Please select a hotel you would really book if you were going to Lugano

Do you have any questions before you start?)

APPENDIX 2 – Interview scenario

Questions are designed for a laddering technique; thus, they are more a guideline than a strict protocol. They will be modified/skipped, depending on the participant's answers.

1. Why did you choose the hotel X?
2. When you looked for the hotel, what information mattered the most?
 - a. What was the first information you decided to look for?
 - b. Why was this information important?
3. You pre-selected/did not pre-select some of the hotels. Why did you do this?
 - a. How did you decide which hotel to preselect?
 - b. Why did you focus on these selection criteria?
4. How did you choose the reviews to read?
 - a. Did you look at the titles/stars?
 - b. Why was it important?
5. Did you read the text reviews or only the summary?
6. How many elements did you pay attention to?
7. What elements in the online reviews you paid attention to?
 - a. Did you pay attention to the author/content?
 - b. Did you pay attention to the parts about service/room/cleanliness/location/value?
 - c. If you had to order these elements from the most important, how would you order them?
8. Did you trust the reviews?
 - a. Which reviews did you trust?
 - b. What element made you trust this particular review?
 - c. Why these elements were important?
9. Was there a big dissonance between the reviews of the hotel you chose?
 - a. How did you feel about it?
 - b. What about other hotels?
10. Did you have any idea about a hotel you would like to stay, before you started searching?
 - a. What was this idea?
 - b. Did you look for a hotel to match with this idea?
 - c. What elements did you try to match the most?
 - d. Does the chosen hotel match?
11. Did the reviews match your expectations?
 - a. Do you feel satisfied/ informed enough by the reviews you have read?
 - b. What else would like to find in these reviews?
 - c. What else you were looking for?
12. When you read the reviews (Scale 1 – 7)
 - a. "How much were you 'transported' (i.e., felt the sensation of being somehow elsewhere) by the review?"
 - b. "How much emotion did you experience while reading the reviews?" and mental
 - c. "How much did you create mental images while reading the review?"
 - d. "How informative were the reviews?"
 - e. "How credible is this review?"
 - f. "How persuasive is this review?"

Presentation Format and Online Reviews Persuasiveness: The Effect of Computer-Synthesized Speech

Abstract

Computer-synthesized speech is emerging as a mainstream human-computer interface in post-PC devices. However, there is limited research on its effect on the user experience. We contribute to this emerging stream by focusing on online reviews persuasiveness. The current presentation standard is the text review accompanied by images and numeric ratings. We review the limited theory on the effect of synthesized speech on users and report preliminary results from a lab experiment. Our findings suggest that varying the message presentation, from text to speech, improves the persuasiveness of online reviews through stronger trust beliefs, attitude toward the subject of the review and purchase intention. However, they don't support the most intuitive explanation for why: that synthesized speech increases user perceptions of trustworthiness, expertise, credibility and similarity of the source. If confirmed, our results would call for an exciting search for the mechanisms by which speech interfaces increase the persuasiveness of messages.

Introduction

The literature about online consumer reviews received much research attention in recent years. With their first appearance on the Internet in 1999, online reviews offered a possibility to express an opinion and rate products and services. Nowadays it is possible to search the Internet and find opinions about almost everything, from products and hotels to university professors and MDs. Online reviews are peer-generated evaluations posted on a company or third party websites (Mudambi and Schuff 2010). The perception of reviews being authored by peers contributed to their popularity and their influence on users' behavior. Individuals think that the online consumer reviews are written by other people – random first-hand users of a product or a service - people like them (Steffes and Burgee 2009; Zhang 2015). For this reason, they trust them and often prefer them to commercially-created messages (Chakravarty et al. 2010; Chen et al. 2016; Dou et al. 2012). In fact, online reviews are one of the most trusted media for advertising and for recommendations (*Global Trust in Advertising and Brand Messages. 2013, Global Trust in Advertising and Brand Messages. 2015*) and 80% of individuals trust them as much as if they were personal recommendations (“Local Consumer Review Survey” 2015). While there are many effects of online reviews, we focus on persuasion because that is their main purpose – they are meant to influence users and to spur them into action. In the commercial context this action is a purchase (or not) for positive (or negative) opinions. People read reviews for varied reasons, from obtaining information to building relations in an online community, but no matter the motivation, online reviews affect the behavior of readers (Burton and Khammash 2010; Hennig-Thurau et al. 2003). Thus, researchers agree that online reviews influence decision-making processes and affect individuals' performed behaviors (Cheung et al. 2008; Duan et al. 2008; Hong and Park 2012; Kumar and Benbasat 2006; Litvin et al. 2008). The bulk of the literature focuses on the persuasive effects of online reviews, trying to explain what are the elements, having an impact on individuals' decision-making process and behavior. However, even if trust in the online reviews is clearly visible, individuals tend to favor realistic communication more and there is a correlation between perceived reality of settings or behavior of virtual communicator and the level of influence and social interactions of web users (Guadagno and Cialdini 2005; Suh et al. 2003). This shows that there is still a difference between computer-mediated and physical interactions. Thus, it would be beneficial to increase the persuasiveness of online

reviews by increasing the realism of interaction with them. One approach is to change the presentation format of the opinions (Xu et al. 2015).

The current standard of online reviews presentation is the written text accompanied by images and numerical ratings, expressed as stars or ‘bubbles.’ Previous literature focuses on persuasiveness of review content, source type and readers’ characteristics. However, little is known about the effect of presentation format on the persuasiveness of online reviews. Recent research shows that other presentation formats may increase the persuasive potential of online reviews (Xu et al. 2015). While previous work focuses only on online video, there are other emerging formats, such as speech synthesis, being popularized by the likes of Apple, Google, Microsoft and Amazon. Although computerized speech synthesis traces its roots to the early 1900s (Mattingly 1970), it is only now becoming a standard feature in consumer electronics. Computer-synthesized speech communication appears to change people’s attitude towards computers (Nass and Gong 2000; Nass and Lee 2001). Yet, knowledge about the topic is still limited and little is known about the potential effect of computer-synthesized speech in the context of e-commerce transactions. Early research focused on customer service (Qiu and Benbasat 2005) or retailer’s avatars (Wang et al. 2007), but not on computer mediated interactions between customers (i.e., user generated content and online reviews).

Our research contributes new insights about persuasiveness of online reviews presentation formats. We investigate whether computer-synthesized speech can affect the persuasiveness of online reviews and the theoretical mechanisms by which such presentation format affects individual decision-making. The results, if confirmed, may influence the design of future online reviews platforms.

Literature background

Persuasiveness of online reviews

Positive online ratings and reviews can ‘modify people’s attitudes about a product to which the online reviews pertain’ (Hong and Park 2012, p. 906) and influence consumers’ buying decisions (Goldenberg et al. 2001). Previous research focuses on persuasion by measuring the quantitative elements of online reviews (Duan et al. 2008) or secondary text characteristics such as emotions expressed in the review text (Yin et al. 2014), but not the content of the message itself. Yet, text feedback influences seller’s credibility over and above numerical ratings (Pavlou and Dimoka 2006).

While generally trusting online reviews, people spend little time on reading them and comparing different opinions. Recent survey data suggests that most individuals (67% of respondents) read less than 7 reviews when making a decision (Anderson 2013). From 2011 to 2013 the number of people reading seven or more online reviews halved (44% to 22%). In short, people increasingly trust online reviews, but they read fewer reviews. Thus, understanding what makes a persuasive review is increasingly important.

The majority of researchers focus on the effect of valence (Hamby et al. 2015; Schlosser 2011; Xia and Bechwati 2008) or volume (Chin-Lung et al. 2011; Park and Kim 2008; Sher and Lee 2009) of online reviews on many aspects of their influence and persuasiveness. More recently, researchers started focusing also on contextual elements, like platform type (Jeong and Koo 2015; Tsao and Hsieh 2015), purchase and review posting timeframe (Jin et al. 2014) or context of presentation (Lee et al. 2011; Sparks et al. 2013; Sparks and Browning 2011). What is common to all these works is the presentation format, with all studies based on text reviews. A notable recent exception (Xu et al. 2015) demonstrates that a video review was more helpful, credible and persuasive than a standard, written review accompanied by an image. While no work has investigated how presentation format affects persuasiveness of online reviews, there is evidence that presenting communication messages with avatars, (Lee et al. 2013; Qiu and Benbasat 2005) or computer-synthesized speech (Nass and Lee 2001; Qiu and Benbasat 2005) affects individuals' perception of credibility, expertise or persuasiveness of the message.

[Persuasiveness of Computer-Synthesized Speech](#)

Previous research has investigated the effects of computer-synthesized speech on human-computer interactions. People behave differently and hold different attitudes towards technology when computers deliver a message via speech versus text. Computer-synthesized speech increases credibility, conveys personality (Nass and Lee 2001) and persuades users (Joo and Lee 2014). Moreover, researchers proved that this kind of communication can change people's attitude towards computers (Nass and Lee 2001).

The psychology of speech processing is the theoretical underpinning of these findings (Nass and Gong 2000; Nass and Lee 2001). Recognition of speech, even computer-synthesized speech, is automatic and humans process it unconsciously. The presence of social characteristics in a speech makes people behave different, based on the unconscious belief

that only other human beings may produce speech-like sounds. Thus, the human brain extends the understanding of speech also to computer-synthesized speech and starts looking for social cues of communication as if it was interacting with another person. When people hear computers “speaking,” they ‘make attributions about voice systems using the same rules and heuristics they would normally apply to other humans’ (Nass and Gong 2000, p. 38). The human brain reads these implicit social cues and forms the belief that the computer is another member of the society. In response, individuals react as if the machines were another social actor (Nass et al. 1994) and start following social norms typical of communication processes between people (Cialdini and Trost 1998). Many Amazon Echo owners anthropomorphize it and refer to the device as “she” because it uses a female voice and it is addressed as “Alexa.” A similar dynamic happens to people who have a GPS navigation giving them vocal directions, but it does not occur when they interact through text interfaces or GUI. The phenomenon is unique to speech.

Empirical work finds that when individuals know that the message is delivered by a computer, there is no difference in perception of speech. That is, the effect of human voice on persuasiveness is no greater than the effect of synthesized voice (Stern et al. 2006) and in some cases of problem-solving situations, computer speech is actually more persuasive (Burgoon et al. 2000). The limited work on the role of computer-synthesized speech in computer-mediated, peer-to-peer commercial communication (Qiu and Benbasat 2005; Wang et al. 2007), confirms that even if a computer generates the voice message, speech is more enjoyable than a text message. Receivers of such a communication focus more on the content of the message than they do when they experience text and speech or text only treatments (Qiu and Benbasat 2005). It is recognized in the literature that to persuade an individual to make a decision or perform an action, one has to influence their ‘mental states’ (O’Keefe 1993). These can take form of beliefs, attitudes and behavioral intentions, which are antecedents of actual behavior (Fishbein and Ajzen 1977, 2011). Thus, to test the effect of presentation format on online reviews persuasiveness we test the effect of computer-synthesized speech on trust belief, attitude towards an object and purchase intention as proxies of persuasiveness. Furthermore, presentation of information via computer-synthesized speech leads to better long-term recall (Gathercole and Conway 1988). Persuasion occurs through a change in the receiver’s ‘mental states’ (O’Keefe 1993), the

beliefs, attitudes and behavioral intentions (Fishbein and Ajzen 1977, 2011). Thus, despite the lack of previous work, we hypothesize that the review presentation format has an effect on trust belief, attitude towards an object and purchase intention as proxies of persuasiveness.

H1a. Subjects receiving online reviews presented with computer-synthesized speech will form stronger trust belief than the subjects receiving text reviews.

H1b. Subjects receiving online reviews presented with computer-synthesized speech will form more positive attitudes towards the reviewed product than the subjects receiving text reviews.

H1c. Subjects receiving online reviews presented with computer-synthesized speech will form stronger purchase intention than subjects receiving text reviews.

Some researchers suggest that speech synthesis enhances the credibility of the message source when compared to written text (Burgoon et al. 2000; Nass and Lee 2001). Such a source is perceived as more reliable and more knowledgeable than a source of a text message. There is no agreement on why this phenomenon occurs, or even if it occurs systematically. Some speculate that it may be due to the human perception of the interface (Burgoon et al. 2000) or because of increased sociability, caused by different presentation format (Burgoon et al. 2000; Nass and Lee 2001). However, there is no systematic evidence of this phenomenon and empirical testing of these explanations awaits. Thus, we posit:

H2a. Computer synthesized speech will increase perceived expertise of a review source.

H2b. Computer synthesized speech will increase perceived trustworthiness of a review source.

The online review literature shows that perceived source credibility has an effect on and is correlated with message credibility (Cheung et al. 2012; Smith et al. 2005) Credibility is defined as the recipient's belief in message reliability and it has been shown to contribute to the review's persuasiveness (Jiménez and Mendoza 2013). Taking into consideration that written text is not the most credible presentation format for online reviews (Xu et al. 2015) and following H2a and H2b, we hypothesize that:

H3. Computer synthesized speech will increase perceived credibility of a review.

Due to the fact that individuals treat speech sounds as produced by humans, we believe that when a computer produces speech, people unconsciously treat it as more akin to them, not like a machine. This creates the effect of similarity. Since the similarity between individuals increases the persuasiveness of a communication source (Burger et al. 2004), when people start perceiving the computer as a social actor who is similar to them, they are more prone to being persuaded by its messages (Nass and Lee 2001).

H4. Computer synthesized speech will increase perceived similarity of a review source.

In current literature, valence is the most studied characteristic of online reviews. A variety of persuasive characteristics like volume, argument quality, time frame interact with valence, affecting its persuasive strength (Flanagin and Metzger 2013; Jin et al. 2014; Schlosser 2011; Zhao et al. 2015). We hypothesize a similar dynamic for computer-synthesized speech.

H5. Presentation format will interact with the valence of a review, increasing the effect of valence.

Methodology

Design

We used a 2x2 factorial design to test our hypotheses in a lab experiment. Participants were randomly assigned to one of four groups. Each group accessed only one version of the experimental website. There were two factors in this study, which served as independent variables. The first factor - review valence (VAL) with levels: positive valence or negative valence was represented by two sets of online hotel reviews. The second one was a presentation method (PRES), with levels: text or computer-synthesized speech. Control group participants read text reviews and treatment group participants listened to the reviews delivered by computer-synthesized speech. A male voice of a high-quality text-to-speech (TTS) software was used to produce computer-synthesized speech records of the reviews. The content of the reviews was exactly the same for all participants. All the non-treatment elements for each group were also exactly the same.

Variables

We used four dependent variables to measure the influence of the treatment on experiment subjects: perceived credibility, trust belief, attitude towards the hotel, and purchase intention. Each of them was measured with a scale from previous research. First, we focused

on belief, attitude and intention as indicators of persuasion (Fishbein and Ajzen 1977; Sparks et al. 2013). We measured trust belief (TRB) with a 5-item scale, attitude (ATT) towards the hotel with a 3-item scale adapted from Sparks et al. (2013), and purchase intention (PI) using a 3-item scale adapted from Xia and Bechwati (2008). We measured perceived review credibility (CRED) with a 5-item scale adapted from Cheung and Lee (2012). Additionally, we measured three variables referring to a perception of the source - perceived source expertise (SRCE) and perceived source trustworthiness (SRCT) (Ohanian 1990) and perceived similarity (Lis 2013). Reliability of all the scales was additionally tested and is high or very high. The summary is presented in Table 1.

Construct name	Source	Number of items	Cronbach's α
Purchase intention	(Xia and Bechwati 2008)	3	0,95
Attitude towards the hotel	(Sparks et al. 2013)	3	0,95
Trust belief	(Sparks et al. 2013)	5	0,78
Perceived review credibility	(Cheung et al. 2012)	5	0,77
Perceived source expertise	(Ohanian 1990)	4	0,84
Perceived source trustworthiness	(Ohanian 1990)	5	0,85
Perceived similarity	(Lis 2013)	3	0,79

Table 1 Summary of constructs used in the study

Participants

Participants of the study were university students of one Italian and one American university and received an additional course credit to increase their motivation. We employed convenient, non-probabilistic sampling and gathered 204 participants. All subjects remained completely naïve about the aims and purpose of the study during the treatment but were debriefed after the experiment.

Apparatus

First, we prepared two sets of reviews and an application representing a model hotel review website¹. The reviews for the study were extracted from a database containing 200608 real hotel reviews, posted on one of the biggest hotel review platforms. We created two sets of reviews – one negative and one positive. Based on statistics that majority of people read only 6 or fewer reviews before making a decision (“Local Consumer Review Survey” 2015), each of the sets in the study contained only 6 reviews. We matched the content of the reviews in a way that they described similar topics. Additionally, we asked a group of 4 master students to validate the valence of the reviews. On average, the selected text reviews had 87 words

¹ We produced 4414 lines of code using HTML5 (2987 lines), CSS3 (662), JavaScript (301) with AJAX (84), and PHP (470). The code is available on demand.

and the records lasted 28 seconds. To avoid the bias of extreme rating values (Senecal and Nantel 2004) we kept the star-rating icons constant between reviews in each treatment.

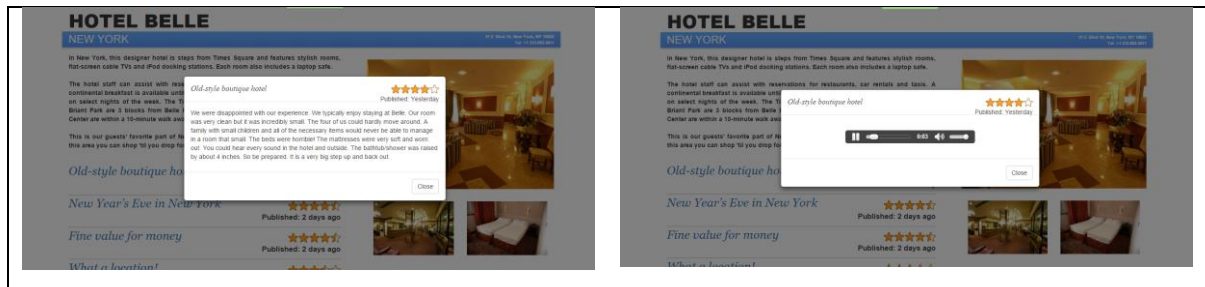


Figure 1 Two formats of reviews presentation in the experiment

After selecting the reviews, we designed four identical model websites of a hotel reviews platform (see Figure 1 for the example). Each website presented a fictional hotel name, address, phone number, description and images of hotel interiors, as well as six hotel reviews. All websites had exactly the same non-treatment content and layout design, inspired by the most popular hotel reviews platforms to increase users' familiarity with the layout and reduce potential usability errors. The difference between the treatments pertained to the valence of the reviews' content (negative vs. positive) and presentation method (text vs. computer-synthesized speech). After checking several options, we selected the most life-like commercial voice available at the moment to produce the computer-synthesized reviews. All websites tracked users' behavior such as the number of clicks, timestamps, duration of the visit, time spent on reading/listening to each review. All the data from the model websites and the survey were stored in an external database and survey instruments were administered online at the end of the study.

Procedure

The experiment took place in a computer lab. First, participants were informed about the study (without revealing the real purpose). All the participants were asked to wear headphones to provide the clear sound of computer-synthesized speech and to separate them from surrounding noise and potential distractions. After agreeing with an informed consent form and reading instructions, each participant was randomly assigned to one of the four treatments. The participants were asked to familiarize themselves with the content of the websites in the same way as if they did when preparing a trip. They were free to use all the information from the provided website. To ensure that all groups had the same conditions, participants had to click on a title of a review to display text or to reproduce sound.

They could read or listen to the reviews as many times as they wanted. We did not set any time limits on the task, so that the participants could read the reviews as they normally do. Next, every participant filled a survey about perceptions of the hotel qualities and their purchase intentions. In the end, each subject was debriefed and the real purpose of the experiment was revealed.

Pilot Study

We ran a pilot study to test the experiment application and the variables used to measure the behavior. In April and May 2015, 40 students took part in our experiment. Many of them were not motivated or focused on the study. E.g. they opened the treatment page for too short time to receive the treatment or did not display any of the reviews. Some of them did not read the questions and answered the control questions incorrectly. Out of 40, only 26 records could be considered usable. We improved the design of the application to increase its usability and to control for attentiveness and accuracy of the participants. We included two control questions in the survey, which controlled participants' attentiveness. Additionally, in order to make sure that each participant received the treatment, we made it obligatory to open the reviews before proceeding to the survey. We added also a simple hearing ability test, which each subject had to complete after having time to read or listen to the reviews. Last, we improved phrasing of some questions, which were reported as difficult to understand (e.g. hypothesis-guess question).

Preliminary results

Data cleaning

From the original 204 participants, we had a usable sample of 139 (after checking the control questions and the time spent on each treatment page). First, we removed the records of those subjects, who did not pass the control questions or the hearing ability test (179 records left). Additionally, from the pilot study we learned that many participants opened the treatment page for a short time. It was shorter than needed to read at least the titles of the reviews and it was clear that these participants did not receive the treatment. To avoid that, in this study we excluded all the participants who received speech treatment and spent less than 2,5 minutes on the page or who received the text treatment and spend less than 1,5 minute on the page. After this operation, there were 139 usable records in the dataset. Participants were randomly assigned to the treatments as presented in Table 2.

Treatment		Number	
Presentation	Valence	ITALY	USA
Speech	Negative	11	28
Speech	Positive	8	24
Text	Negative	12	30
Text	Positive	5	21
TOTAL		36	103

Table 2 Sample size of treatment groups

Sample description

The participants were between 18 and 35 years old and were university students from Italy and the USA, representing an age group, which constitutes a majority of people who always or most often use the online reviews (Short 2014). Overall, there were 54% females and 46% males. The sex ratio in each treatment was as demonstrated in Table 3.

Presentation	Valence	Male	Female
Speech	Positive	53%	47%
	Negative	44%	56%
Text	Positive	38%	62%
	Negative	49%	51%

Table 3 Gender distribution in each treatment group

In the US sub-group, there were 56% females and 44% males while in Italian sub-group 45% females and 55% males. The participants were also asked how often they shop online and travel, as well as if they use online reviews when shopping or booking a hotel. The majority of participants were online reviews users and reported that they usually rely on online reviews before performing commercial activities online. See the charts below for details.



Figure 2 Frequency of doing shopping online.

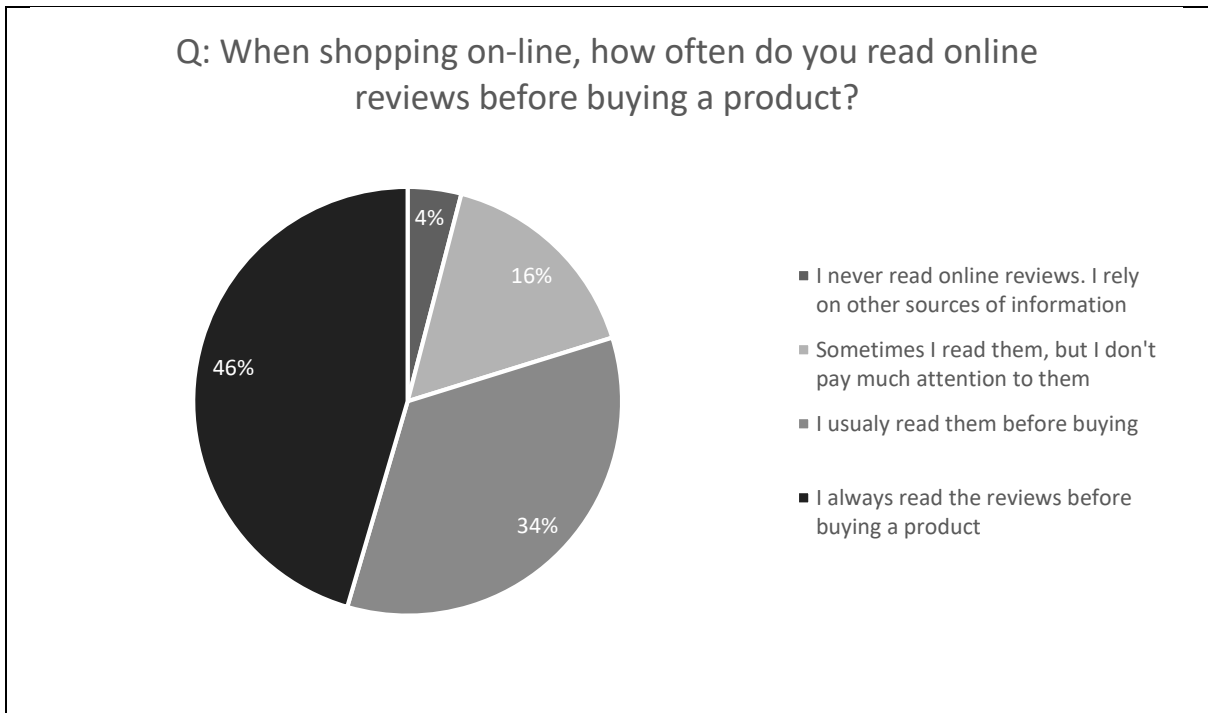


Figure 3 Use of online reviews when doing shopping online.

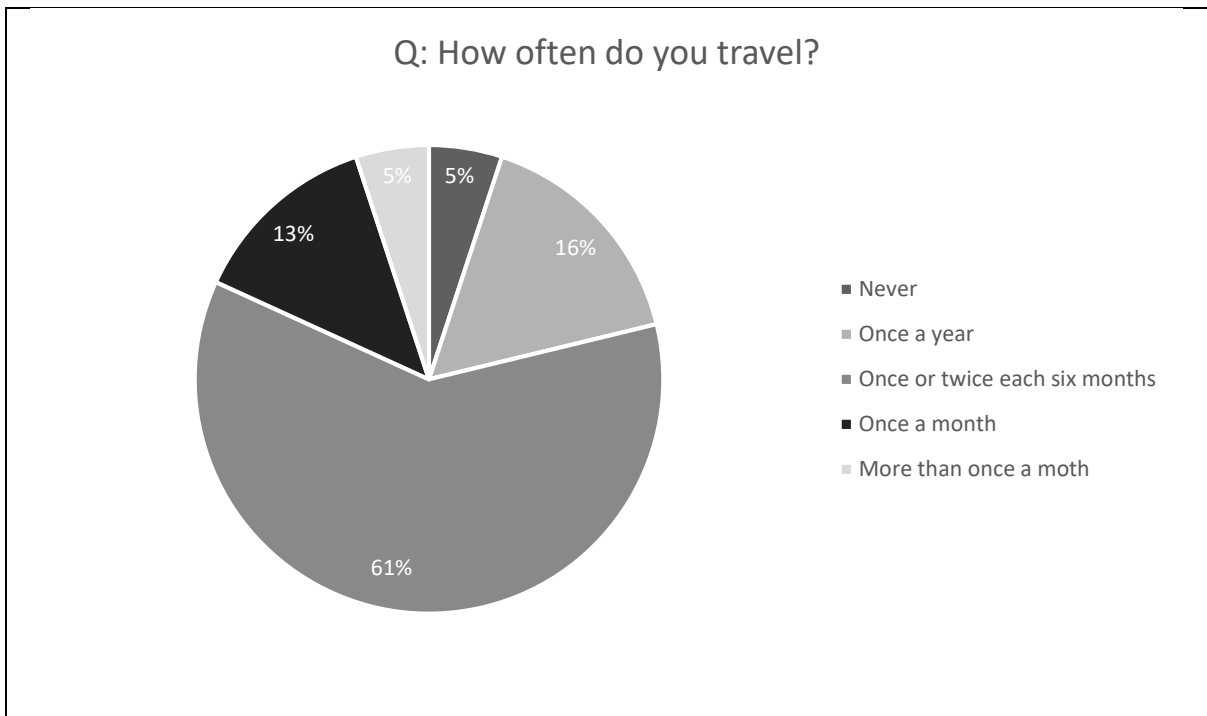


Figure 4 Frequency of traveling

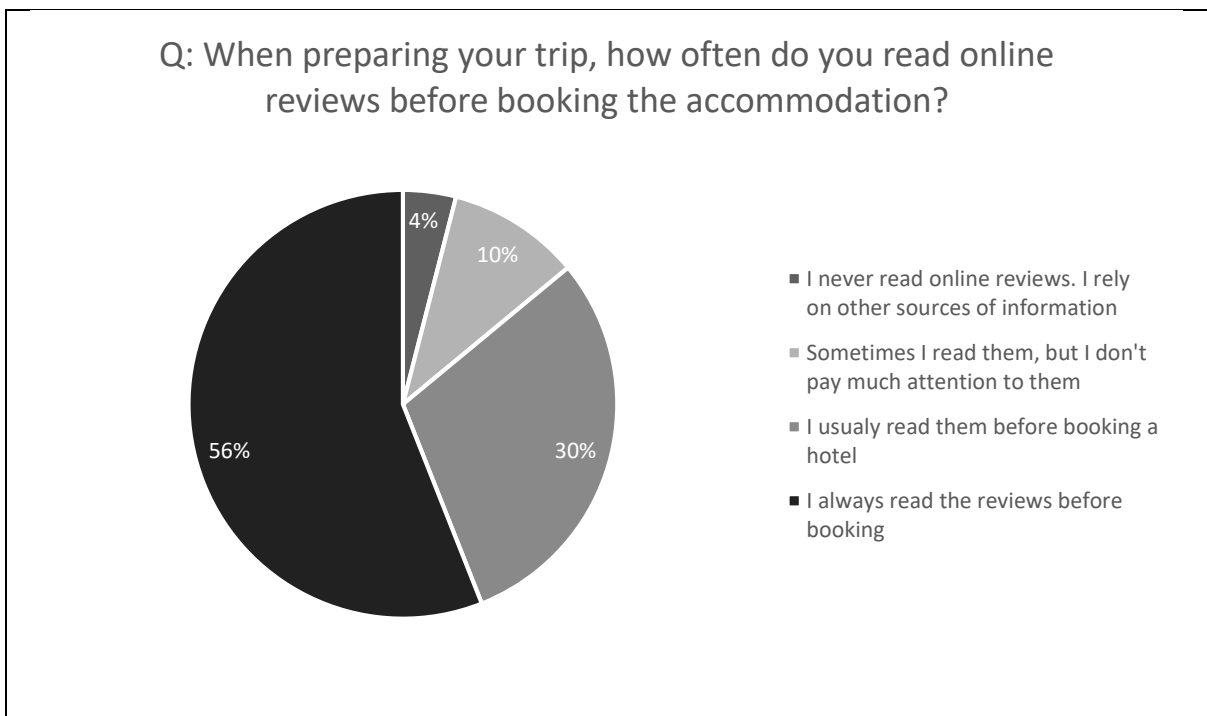


Figure 5 Use of online reviews when preparing a trip

Difference between treatment groups

Having the Likert scale answers, we calculated an average score for each construct, using the items belonging to it. Because of heteroscedasticity and little skewness of some variables, we performed a non-parametric test to see if there is any difference between treatments' effect on dependent variables. Table 4 summarizes the Kruskal-Wallis test for each of the variables measured in the experiment. We found significant differences between treatment groups

only for the three variables related to persuasiveness – purchase intention, attitude towards the hotel and trust belief. However, there is no significant difference between treatment groups for perceived review credibility, similarity, source expertise and source trustworthiness.

Variable	Chi-squared	Degrees of freedom	p-value
Booking intention	69,72	3	< 0,001 ***
Attitude towards the hotel	78,81	3	< 0,001 ***
Trust belief	76,57	3	< 0,001 ***
Perceived credibility	0,99	3	0,804
Perceived similarity	6,15	3	0,105
Perceived source expertise	1,42	3	0,701
Perceived source trustworthiness	3,87	3	0,275

Table 4 Differences of medians between treatment groups

The boxplots in Figure 6 show that there is a difference between treatment groups. It is clear that it was valence that was responsible for results of Kruskal-Wallis test, but there is no visible difference between two presentation methods.

The Wilcoxon-Mann-Whitney test confirms what is shown on the boxplots. First, the valence of the reviews causes a significant difference in all three variables. The effect size calculated for each variable is large, which is coherent with previous literature. At the same time, there is no significant difference caused by presentation method and the effect size is below the threshold of small effect. Table 5 summarizes these results.

	Purchase intention		Attitude towards the hotel		Trust belief	
	Effect size	p-value	Effect size	p-value	Effect size	p-value
Valence	0,63	0 ***	0,65	0 ***	0,67	< 0,001 ***
Presentation	< 0,1	0,66	< 0,1	0,55	< 0,1	0,48

Table 5 The effect of treatments on persuasiveness of online reviews

At this point, we cannot confirm the effect of presentation method on online reviews persuasiveness. Neither of the measured variables changed significantly under the treatment. We can only confirm the strong effect of valence, which was expected and which is well documented in the existing literature.

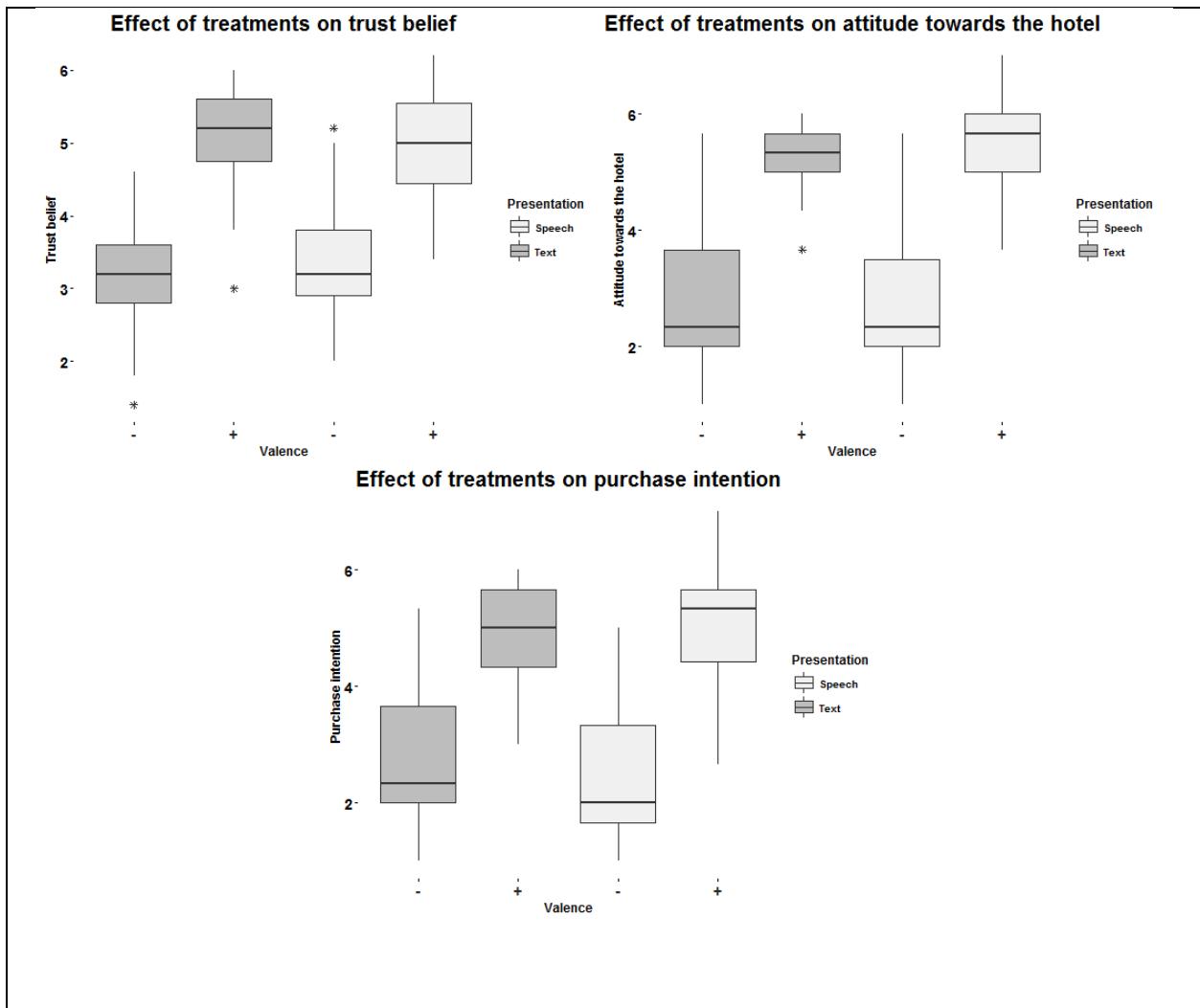


Figure 6 Effect of treatments on dependent variables

Difference between two language groups

We controlled also for the differences between two language groups. Surprisingly, we found that the effect of presentation format was different for Italians and for US-based students. While in the US group there was no significant difference between the computer-synthesized speech and the text, we found an effect in the Italian group. Figure 7 illustrates the difference between two groups.

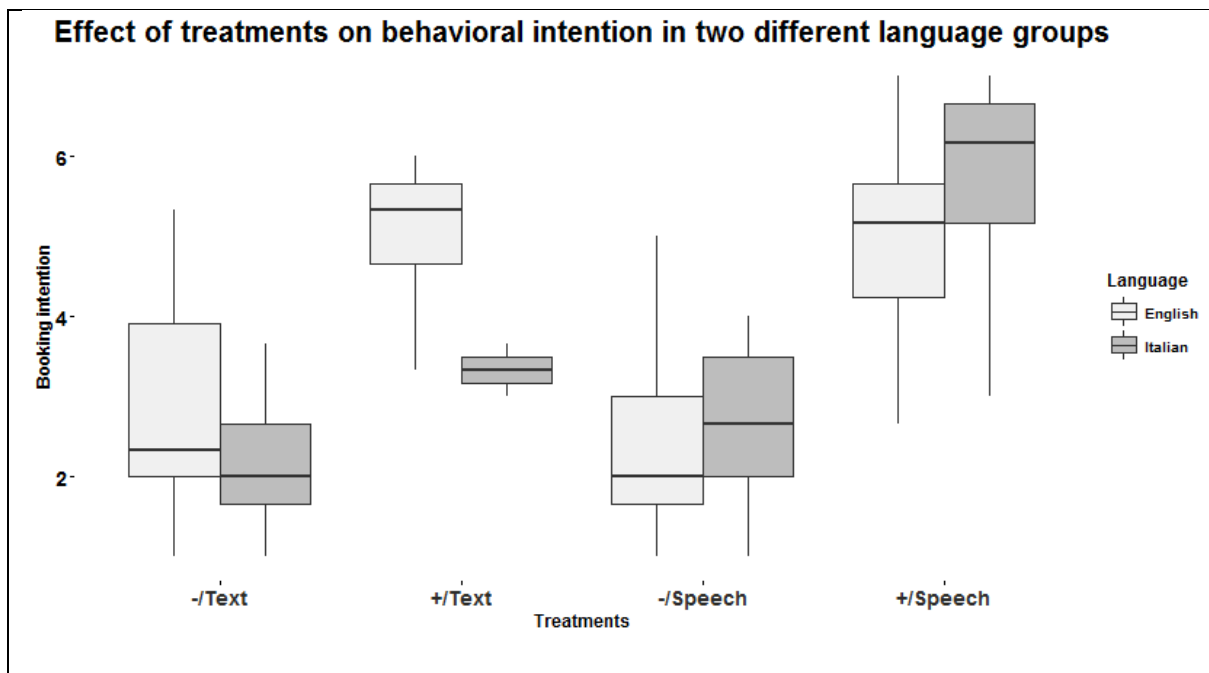


Figure 7 Effect of treatment on behavioral intention in two different language groups

The boxplots above show that there is a likely difference in booking intention between the group which read positive text reviews and the group which received positive speech reviews. The Wilcoxon-Mann-Whitney test shows that there is a significant ($p\text{-value} < 0,05$), medium effect ($effect\ size = 0,39$) of presentation format on booking intention. Similar analysis showed that there is a medium effect ($effect\ size = 0,36$) of presentation format also on the attitude towards the hotel ($p\text{-value} < 0,05$). However, there was only small ($effect\ size = 0,17$) not significant ($p\text{-value} > 0,05$) difference of trust belief between two groups. We decided to have a closer look at the Italian sample, because it showed different results than the overall outcome of the experiment.

Italian sample results

Table 6 presents averages and standard deviations for the dependent variables in each treatment group for the Italian sample. In groups in which participants received computer-synthesized speech treatment, means of all presented variables are higher than in analogous groups with text treatment.

Variable	Treatment							
	Speech / Positive		Speech / Negative		Text / Positive		Text / Negative	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PI	5.25	1.83	2.7	1.03	3.47	0.99	2.22	0.89
ATT	6	1.01	2.82	0.83	5.07	0.43	2.19	0.86
TRB	5.25	0.97	3.13	0.55	4.4	0.97	2.98	0.61
CRED	5.7	0.79	5.51	0.75	4.64	0.91	5.3	0.87
SIM	5.25	1.63	4.67	0.75	4.13	1.07	4.44	1.33
SRCE	5.03	0.88	4.59	0.74	4.4	0.72	4.48	1.06
SRCT	5.83	0.82	5.07	0.98	4.84	0.5	5.03	0.88

Table 6 Summary of dependent variables averages in each treatment group

We tested *H1* with ANOVA for each of three dependent variables related to persuasiveness and we found statistically significant differences between treatment groups for purchase intention and attitude towards the hotel at the level of significance < 0.01 and for trust belief at the level of significance < 0.05 . The results showed that the main effect size (η^2) for purchase intention was medium (0.08) and small for attitude towards the hotel (0.04) and trust belief (0.03). We make allowance for the small sample size. Hence, we cannot unequivocally support *H1a*, *H1b* and *H1c*.

Variable	F-value	Sum of squares	Effect size η^2	P-value
Purchase intention	8.615	12.57	0.08	0.006
Attitude towards the hotel	15.664	11.23	0.04	< 0.001
Trust belief	6.336	3.461	0.03	0.017

Table 7 The results of ANOVA for dependent variables

However, the results of ANOVA are promising and, if repeated with a bigger sample, they will make it possible to support the predictions about the effect of computer-synthesized speech on online reviews' persuasiveness. Table 7 summarizes the results of ANOVA for online review persuasiveness variables.

Distributions of residuals of perceived source trustworthiness was not normal for both untransformed and transformed (logarithmic and square root) data. Non-parametric Wilcoxon-Mann-Whitney test showed that there was no statistically significant difference between treatment groups (p -value = 0.06). For the same reason, we tested *H3* in the same way and found no main effect of presentation format on perceived credibility (p -value = 0.07). The distribution of residuals for perceived source expertise demonstrated normality.

However, ANOVA test did not show any significant difference between treatments (p -value = 0.29). Thus, we reject hypotheses $H2a$, $H2b$ and $H3$.

The format of presentation did not affect the perceived source similarity either. The ANOVA showed that there was no statistically significant effect of presentation format on similarity (p -value = 0.18). However, even if insignificant, there was a small effect size of presentation format ($\eta^2 = 0,04$). Thus, at this point we reject the $H4$, but acknowledge the existence of the small effect size.

The main effect of valence was significant at confidence level < 0.01 for each of three variables related to persuasiveness and demonstrated a very large effect for each of them (PI $\eta^2 = 0.33$, ATT $\eta^2 = 0.69$, TRB $\eta^2 = 0.55$), but did not show the effect on any other dependent variable. The results corroborate the existing literature. However, we did not identify any significant interaction between valence and presentation format. Hence, at this point we cannot support $H5$.

Discussion

Despite being preliminary, our study had some surprising results. It revealed that there is a difference of perception of online reviews presentation format between language groups. We find that in the Italian-speaking group individuals formulate stronger trust beliefs, attitude toward the subject of the review (i.e., the hotel) and purchase intention. In other words, simply varying the message presentation method from text to computer-synthesized speech, persuasiveness improves. This result, if confirmed in real-life scenarios, is important because it shows that decision-making in commercial settings can be influenced by the interface. On the other hand, no such effect was found in the US-based sample. Of course, we consider the sample size difference, but the difference in perception of computer-synthesized speech between two language groups was clearly visible. One possible explanation can be cultural differences in perception of voice communication with the computer, as explained by Tan et al. (2003). As we are not aware of any research about this issue in the context of online reviews persuasiveness, the explanation of this phenomenon awaits more empirical research.

Our preliminary results do not identify any effect of presentation format on individuals' message source perceptions. They also fail to detect the hypothesized perception of increased similarity with the review source. These outcomes could be due to the limited

number of subjects in the experiment. An alternative explanation could be the lack of variance in the voice of the computer synthesized speech software. This might create the impression that all the reviews are read by the same person, decreasing trust towards them. However, if confirmed when we eliminate the confounds, the hypotheses would challenge the intuitively appealing expectation that synthesized speech makes the message more persuasive because humans feel closer to computers when they produce speech. This “peripheral cue” explanation (Petty and Cacioppo 1986) suggests that the persuasion is not being affected by the processing of the content by the user, but rather by the perception of the message source. Challenging this expectation opens up a search for competing causes based on a “central cues” reasoning (Petty and Cacioppo 1986). Is synthesized speech more persuasive because people pay more attention to it? This is consistent with some work in the online education context (Gathercole and Conway 1988).

The preliminary results provide support for the basic hypothesis that synthesized speech affects the persuasiveness of online messages, but they also challenge our expectation of the process by which such persuasion occurs. There is surprisingly little theoretical guidance for those studying the effect of computerized speech synthesis. With the relentless evolution of voice interfaces in the home (e.g., Amazon Echo), in the car (e.g., navigation systems) and in everyday activities (e.g., Siri, Cortana) it is imperative that Information Systems scholars focus on this topic. We plan to contribute our complete findings to this effort.

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