

BI Norwegian Business School - campus Oslo

# GRA 19502

Master Thesis

Component of continuous assessment: Thesis Master of Science

Final master thesis – Counts 80% of total grade

Summarizing Customer Reviews: A New Way to Optimize eWOM for Better Purchasing Experience

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Start: 02.03.2018 09.00

Finish: 03.09.2018 12.00

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Hand-in date:

02.09.2018

Programme:

Master of Science in Strategic Marketing Management

*“This thesis is a part of the MSc programme at BI Norwegian Business School. The school takes no responsibility for the methods used, results found and conclusions drawn.”*

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## Summary

The prosperity of online shopping contributes to the explosive growth of eWOM. Customer reviews are considered as one of the most important types of eWOM. While assisting customers in forming comprehensive overviews of products and services, the sheer number of reviews may cause information overload and reduce customers' satisfaction with decision making and purchase experiences.

In this study, we propose a new type of decision aid tool – a feature-based review summary to address the issue. Based on theoretical and empirical work in marketing, decision making, and support systems, we develop a set of hypotheses and tests through two experiments using manipulated e-commerce websites selling cameras.

Though review summary's effectiveness in moderating the relationship between information overload and process satisfaction is not proved directly, we find that the summary increases customers' perceived review helpfulness, which subsequently increases customers' process satisfaction under conditions of limited information overload.

Our research is an interdisciplinary study that explores the role of feature-based review summary in assisting customers' purchase decision making under conditions of information overload. Theoretically, it contributes to the literature by testing the efficiency of a summary as a decision facilitating tool. Practically, it demonstrates the usefulness of feature-based summary for popular search products showing a certain level of similarity.

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## Introduction

The rise of the Internet, the increased security of e-payments and the convenience of searching and comparing products and services contribute to the growing popularity of e-commerce. With an estimated value of around \$ 1.915 trillion, e-commerce has witnessed significant growth over the past years (eMarketer (1), 2016). Alibaba broke the record for the initial public offering with an estimated value of \$25 billion (Mac, 2014). Amazon's market capitalization (appr. \$542 billion) is comparable to the GDP of Sweden (\$511 billion) (Cherney, 2017). A recent study shows that e-commerce accounts for 9% of all retail sales in the US and 23% in China in 2017 (Statista, 2018), which further proves the immense potential of e-commerce market.

With the emergence of e-retail, customers are shifting their preferences towards using online channels: their shopping routine has changed dramatically from visiting brick and mortar stores (to see and test products by themselves) to consulting others' usage experiences and evaluations before making their decisions. Generating from average people, online reviews supplement information from product descriptions and expert reviews (Mudambi & Schuff, 2010). Different from traditional WOM, electronic word-of-mouth (eWOM) are more public conversations with a wide network of people who are not acquainted with each other but share similar interests in specific products/services or topics (King, Racherla, & Bush, 2014). Customer reviews are considered as one of the most important types of eWOM. On one side, its increasing availability is beneficial as it helps customers to form comprehensive overviews of products and services and to make more informed decisions (Kostyra, Reiner, Natter, & Klapper, 2016). On the other side, the sheer number of reviews, in hundreds and thousands, could be overwhelming and complicate customers' purchase decision making processes. More reviews do not necessarily lead to customer satisfaction. Reading through reviews manually and detecting helpful reviews is time-consuming for customers as many reviews are lengthy but uninformative, worded ambiguously or obscurely, repeat identical information, show polarized attitudes towards the same products and even fake with false descriptions. Research reveals that 68% of people form an opinion about a product or service after reading between one and six online reviews (Inc., 2017). Thus, for those who only view a few reviews to make decisions, they may form biased opinions towards the products, resulting in unsatisfied purchases

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(Kangale, Kumar, Naeem, Williams, & Tiwari, 2016). While for those who devote time and energy to search for items that match with their preferences, they may experience “decision fatigue” (Tierney, 2011) and quit the purchase. 16% of customers abandon online shopping cart because they hesitate to which one to select from items in their baskets (ClickZ, 2016).

The development of e-commerce grows exponentially the amount of information presented on websites. Information format, which is how the information is presented and organized, can potentially influence the way people behave in e-commerce settings. Information systems research highlights the importance of information format for information acquisition, processing and decision-making. Product descriptions and customer reviews represent two most used information sources on an e-commerce website (Mudambi & Schuff, 2010). Retailers usually list key product features in bullet-points to assist customers’ decision making. While for reviews, it is not that straightforward due to its unstructured presentation and additional time to process and analyze is usually required.

To simplify customers’ decision-making process, many e-commerce merchants have developed mechanisms to assist customers in making purchase decisions, such as helpful votes, averaged ratings, and reviewer information disclosure (Singh, Irani, Rana, Dwivedi, Saumya, & Roy, 2017). However, the effectiveness and relevance of these attempts are questionable. For example, highly voted reviews are often the ones posted earlier, and customers’ voting behaviors often incorporate both context and a review’s personality (Sipos, Ghosh, & Joachims, 2014). Meanwhile, though average ratings are intuitively straightforward, it may distort the real distribution of customers’ evaluations and offers little use for further inquiries of a product’s specific features. Moreover, since the Internet is a relatively anonymous medium (Ku, Wei, & Hsiao 2012), it is still difficult to verify a customer’s profile even with certain user information disclosed. Though been widely acknowledged as a valuable part of customer information, unlike the above mentioned numerical and categorical data, customer textual reviews have not gained significant attention in the e-commerce literature (Kangale et al, 2016; Xu, Datta, & Dutta, 2012). Existing studies concentrate on addressing antecedents of eWOM, such as customers’ motivation to engage in eWOM (Angelis, Bonezzi, Peluso, Rucker, & Costabile, 2011; Huang, Lin, & Lin, 2009; Sun, Youn, Wu, & Kuntaraporn, 2006), delineating processing methods of review data, such as using

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conjoint experiment to evaluate review valence, volume, and variance (Kostyra et al., 2016) and using text mining approaches to generate feature-based review summary (Hu & Liu, 2004; Kangale et al., 2016; Xu, Wang, Li, & Haghighi, 2017), and investigating applications of eWOM from companies' perspectives, such as customer needs identification (Timoshenko, 2018) and new product development (Qi, Zhang, Jeon, & Zhou, 2016). Research that takes customers' perspectives and examines implications of summarized reviews on customers' purchase decision making remains scarce.

**The objective of our research** is to disentangle the effect of a novel decision aid – a feature-based review summary - on increasing eWOM efficiency and facilitating customers' product choices in online shopping environments. Specifically, we attempt to address **the following research question**: *Whether, and if so, why feature-based review summary would be an effective tool in assisting customer purchase decision making and subsequently increasing customers' process satisfaction?*

To understand the potential positive effect of a feature-based summary on process satisfaction, this study draws from information overload, customer review helpfulness and decision satisfaction theories to examine the possible impact of a summarization on user decision-making experience.

This study is expected to be helpful for both researchers and business practitioners. Academically, we aim to enrich literature on eWOM by combining computer science methodology of review summarization and marketing approaches of testing the summary in an e-commerce environment. Also, since previous experiments of choice/information overload are centered on low risk, low involvement products (Iyengar & Lepper, 2000), by using a feature-rich product, we intend to further expand the literature on information overload with a new angle. Practically, the feature-based review summarization is expected to support customers in making more satisfying choices more confidently and quickly. Such an information format could potentially decrease the shopping cart abandonment rate, increase merchants' sales and enhance customer relationships in the long term.

The thesis is organized as follows: First, we critically review the related literature on customer decision making, information overload, eWOM and perceived review helpfulness. Then, we discuss the theoretical background and the formation of hypotheses. Next, we describe the research methodology, analyze, and discuss the

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results. Finally, we conclude with theoretical and managerial implications, limitations, and further research directions.

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## Literature Review

The study explores whether and why a new decision support system will help customers decrease the feeling of information overload, increase the perceived review helpfulness and subsequently increase the satisfaction of decision-making process. For these purposes, we first investigate process satisfaction, information overload, and how the former is affected by the latter. We then highlight what characteristics a feature-based summary has in order to decrease the negative effect of information overload on process satisfaction. Lastly, we clarify what makes product reviews helpful and how a feature-based summary is able to assist customers by giving them concise factual information derived from product reviews.

### *Process satisfaction*

Customer satisfaction is a crucial factor for a sustainable and profitable business. Aiello, Czepiel, and Rosenberg (1977) found that satisfaction is not only determined by the choice outcome but also by the choice process itself. Feelings accompanying the choice process may influence judgments of overall satisfaction (Diehl & Poynor, 2010) and may cause the feeling of regret (Inbar, Botti, & Hanko, 2011). Thus, conceptually, the model of customer satisfaction can be presented as follows:

$$\textit{Purchase Satisfaction} = \textit{Process Satisfaction} + \textit{Product Satisfaction}$$

Overall satisfaction can be decomposed into a decision (choice-process) satisfaction and product satisfaction. This decomposition is important primarily because it affects different stakeholders: while lack of product satisfaction negatively affects a manufacturer, lack of process satisfaction has a negative impact on a retailer to a greater extent (Fitzsimons, Greenleaf, & Lehmann, 1997). That is the reason why research about process satisfaction in an e-commerce environment is important, especially for big online retailers like Amazon and AliExpress.

Process satisfaction is influenced by intentions and behaviors of a customer before and during the choice process. Their intentions are the motivation or goals they have before starting the choice process and their behaviors are the actions they need to make to attain their goals. According to Bettman (1979), customers have multiple goals they need to achieve during the product selection process in order to be satisfied. It is suggested that the four most important goals of purchasing process

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are: maximizing the accuracy, minimizing evaluative costs, minimizing the experience of negative effects and maximizing the ease of decision justification (Bettman, Luce, & Payne, 1998). When these goals are not met, the process satisfaction is negatively affected. Accuracy is important due to the rational choice theory of maximizing utility behavior. Rationally, humans strive to minimize the costs as their resources (both time-wise and cognitive-wise) are limited (Anderson, 2003). Emotionally, as most purchases involve trade-offs, humans also try to minimize negative effect such as the feeling of regret. Furthermore, ease of justifying the decision is crucial because of the social part of human's nature – people often feel evaluated by others or themselves (Tetlock, 1992). Every choice implies dealing with trade-offs, therefore, minimizing regret from choosing one product and forgoing the others is one of the main product choice goals (Luce, Bettman, & Payne, 1997, 2001).

The difficulty of a problem that a customer should solve (i.e. making a purchasing decision) is determined by one or more of the following factors: problem size, time pressure, attribute correlation, completeness of information, information format and comparable versus noncomparable choices (Bettman, Luce, & Payne, 1998). As information overload and review helpfulness are our research topic, we focus on problem size (amount of information to process, information overload) and information format (information presentation, information structure). These two factors affect the goals that a customer has when making a purchase decision. A decrease in accuracy is observed when consumers face an increasing amount of information per alternative (Keller and Staelin, 1987). Moreover, the more information consumers have in an unstructured format (for example, plain texts in product reviews), the more efforts they need to manage the analysis, which has been proved by Slovic (1972) when he established the “concreteness” principle: decision-makers tend to use information that is explicitly displayed as it minimizes cognitive efforts. Information overload is negatively related with customer satisfaction. In the next section, we will have a close examination of its role and its impact.

### ***Information overload***

Information overload is closely related to customer purchase process satisfaction. This section reviews the literature on information overload and specifically in the context of online shopping environments. Information overload is “usually taken to

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represent a state of affairs where an individual's efficiency in using information in their work is hampered by the amount of relevant and potentially useful information available to them" (Bawden & Robinson, 2009). Jacoby, Speller and Berning (1974) claim that information overload varies with the number of options in a choice set and occurs when the volume of information supply exceeds humans' information processing capacity. Tushman and Nadler (1978) indicate that both volume and relevance of information are important – only when the information needed to complete a task exceeds an individual's ability to process can information overload occur. Schick, Gordon and Haka (1990) suggest that information overload is an effect caused by time constraint – the available time to process information is shorter than the demand on time to perform interactions. Keller and Staelin (1987) expand the scope of information overload and posit that apart from information quantity, information quality also has a stake in causing information overload. Their findings suggest that an increase in information quantity negatively affects decision accuracy and customer confidence when holding information quality constant while an increase in information quality positively affects decision accuracy to a degree when holding information quantity constant. Haksever and Fisher (1996) point out that individuals' subjective states should be considered when evaluating information overload – it happens when a person experiences increased pressure in processing information and reduced efficiency in using information to an extent that they believe they cannot handle.

As customer reviews represent a large volume of data constantly being generated, they are considered as a big data challenge primarily for customers (Chen, Shang, & Kao, 2009). Without a standard format for customers to post reviews online, each review is different from others. The accelerated generation of reviews and their huge amount may overwhelm customers and disengage them as the information input exceeds their processing capacity (Grisé & Gallupe, 1999). To handle this situation, customers may choose to read some reviews carefully and the others cursorily, which results in reduced confidence, reduced satisfaction, and increased confusion of their purchase experience (Lee & Lee, 2004; Park & Lee, 2008). Similar to this concept, dealing with information that surpasses the handling capacity may weaken customers' ability to set priorities and adverse judgmental decisions (Chen et al., 2009; Greifeneder, Scheibehenne, & Todd, 2010).

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Although previously negative effects of information overload for process satisfaction has mainly been documented for relatively cheap products (e.g. exotic jams, Iyengar & Lepper, 2000), we are more interested in understanding how information overload will affect process satisfaction in case of feature-rich durables (digital camers, mobile phone, laptops, etc.). On the one side, customers are more discreet when making big purchases, tend to spend longer time inspecting product related information and value more of the availability of online reviews (Hoffmann, 2014), but on the other side, retailers may enjoy significantly higher customer loyalty building on satisfied purchase with durables (Newman & Werbel, 1973). Therefore, we hypothesize that:

**Hypothesis 1: Information overload will negatively affect the process satisfaction for feature-rich products.**

In this study, we consider information overload in two dimensions: the number of alternatives available and the number of reviews. Previous research states that the more information a customer has to process on one product, the smaller the number of product alternatives he can analyze (Jiang & Punj, 2010). Vice versa, the less efforts a person needs to process one alternative, the more alternatives he will be able to compare. When dealing with high quantity of options, a decision support system that organizes the unstructured information (such as a feature-based review summary) may help with relieving customers' perceived information overload. The decrease in efforts for processing one alternative will increase the total number of alternatives that a person is able to handle, thus enhancing the shopper's confidence in his choice and satisfaction with the decision process.

Online reviews are one of the sources for customers to make choices and attain decision-making goals in an online environment. As been explained, if customers try to minimize the efforts to analyze reviews, the accuracy of choices will be compromised. A recent study (BrightLocal, 2017) suggests that customers read 7 or less than 7 reviews to form an opinion of a business. Hence, if a useful review is not in the top 7 list, a customer may miss the necessary information to support her choice. Previous studies also show that review sentiments affect product sales directly (Li & Wu, 2010; Liu et al., 2013; Schumaker et al., 2012). The summary we propose depicts the sentiment score of each product feature. As customers tend to perform mental assessments of positive and negative characteristics of each item in their choice sets, the available sentiment score would be helpful in reducing their

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cognitive efforts and minimizing their time to search for information on e-commerce websites. Though customers believe that the more efforts they put into the choice process, the higher the likelihood they make a good decision (Johnson & Payne, 1985), they want to minimize the mental efforts (Beach & Mitchell, 1978). Thus, customers welcome decision-aid systems that will perform part of the information processing task for them and will increase the efficiency in using information. As Bechwati and Xia (2003) concludes, the higher the amount of efforts saved by a person, the more satisfying is the purchasing experience. Making key information from reviews visible (and thus, helpful) to customers is important for online retailers to attract customers as reviews allow customers to overcome information asymmetries that pervade in traditional customer markets (Rezabakhsh, Bornemann, Hansen, & Schrader, 2006). Thus, we hypothesize that:

**Hypothesis 2: Feature-based review summary will moderate the negative effect of information overload on process satisfaction by decreasing cognitive efforts necessary for information analysis.**

### *Online customer reviews*

Unlike offline stores where customers can physically touch and examine the products and interact with sales assistants to identify their preferences, online shopping embeds more uncertainty as it provides limited possibilities to directly test the product before purchase. Customers usually take a critical view regarding merchant-provided product descriptions and consider customer reviews, based on previous customers' personal experiences, to be more trustworthy and credible (Chen & Xie, 2008; Kangale et al., 2016). The perceived anonymity encourages customers to share their opinions freely while the distant relationships between sellers and customers motivate the generation of more objective reviews (Park, Lee, & Han, 2007).

As a powerful form of eWOM communication, customer reviews are composed of quantitative and qualitative reviews (Sridhar & Srinivasan, 2012). Quantitative reviews show in a form of rating or grading and is often a summary statistic that averages customers' ratings. Most websites adopt a five-star rating scale in which customers may evaluate their overall experience of a purchased object (Lee & Yang, 2015). Qualitative reviews offer a user-oriented written description with granular information about product features, the usage experience and the related services. Compared to quantitative reviews, qualitative reviews grant customers

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much freedom to decide which to describe and evaluate and how to present their arguments and therefore is a more reliable source of customer information (Dellarocas, 2003; Kostyra et al., 2016).

From organizational perspectives, online reviews allow companies to promote products and boost sales, especially for those with low brand equity (Kostyra et al., 2016) and new products (Qi et al., 2016) to improve products and to exploit market potential. From customers' perspectives, online reviews serve as a good proxy for overall WOM and an assistance tool that reduces decision risk. A recent research found that 85% of customers trust online reviews as much as a personal recommendation (BrightLocal, 2017).

Helpfulness of product reviews is a distinct feature that can bring benefits, such as increased sales, to companies (Chevalier & Mayzlin, 2006; Clemons, Gao, & Hitt, 2006). Amazon's use of the question "Was this review helpful to you?" helped it gain an additional revenue of \$2.7 billion (Spool, 2009). Therefore, understanding ways to increase review helpfulness would help retailers gain a winning ticket in the e-commerce era.

### ***Perceived review helpfulness***

Due to the increasing influence of customer reviews on e-retailers' sales (Kats, 2017), more and more research is focused on examining metrics that can increase customer reviews' efficiency. The utility of a review is commonly measured through "perceived helpfulness", which is the extent to which customers perceive a review's role in assisting their purchase decisions (Filieri, 2015; Mudambi & Schuff, 2010).

Filieri (2015) proves that quality of information is the primary factor that influences review helpfulness. He proposes that information quality in e-WOM can be measured from the dimensions of information depth, breadth, factuality, relevance, and credibility. Credibility can be categorized as source credibility (who is writing the review, customer or the expert?) and content diagnosticity (information related to the specific characteristics of the product). Content is diagnostic if customers perceive it to be helpful for understanding and evaluating the quality and performance of certain products that are sold online (Jiang & Benbasat, 2004). The online retailer's task is to help a customer to overcome the barrier of lacking physical inspection of a product and to increase her ability to sufficiently evaluate the true quality of products. Thus, the more clues are provided for that, the higher the

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perceived information diagnosticity. Mengxiang Li and his team (2013) found that customer-written reviews that were less abstract in content and highly comprehensible result in higher helpfulness. Online reviews that are accurate, based on facts and relevant to customer needs are perceived as more helpful in facilitating customers' selection of products (Fileri, 2015). A feature-based summary is expected to have an impact on content diagnosticity, factuality and relevance of product reviews as it presents only information that is related to specific product features without subjective details. For example, for a review that contains details of both "camera as a birthday gift" and "lens quality", only details of the lens will be included in the summary.

Cognitive fit theory (Vessey, 1991) postulates that when people are determined to make a purchase, they search for structured and concise information. Thus, diagnosticity, relevance and factuality are becoming the most important information characteristics to customers. As their final goal is to make a purchase, information sources that help them realize this goal will be considered as helpful and high in quality - particularly granular information, which can be used to better compare different alternatives and accelerate decision making process. Thus, the information aggregated into the summary will be perceived as higher in quality due to higher factuality, diagnosticity and relevance. As this information is taken from reviews, we expect it to also influence information quality of reviews and consequently increase their perceived helpfulness. Thus, we hypothesize, that:

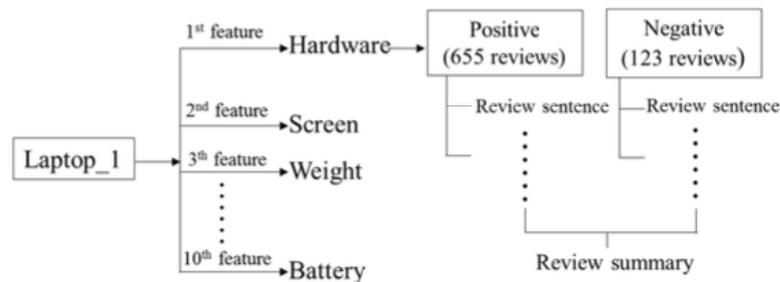
**Hypothesis 3: Feature-based review summary will positively affect the perceived review helpfulness by increasing the information quality of the later.**

The research is divided into two parts. In the methodology part we explain the process of a feature-based summary creation and later on we aim at testing its facilitating role in the decision-making process.

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## Methodology

The feature-based summarization of customer reviews implies extracting product features from customer reviews, assessing the valence of all reviews for each of the features and creating a summary. The process is conducted as follows: Firstly, we take the following three steps to generate the summary: 1). highlight features of a product that customers have commented on; 2). identify the positive or negative emotional orientation regarding each feature in the review sentences; 3). produce a feature-based review summary using mined information as described in Figure 1 (Hu & Liu, 2004). Secondly, we test the usefulness of the review summary through two 2 (information overload: limited vs. high)  $\times$  2 (review summary: yes vs. no) experimental studies to clarify whether summarized reviews could alleviate customers' information overload problem, make reviews more helpful and assist customers' product choices.



*Figure 1: an illustration of feature-based summary creation*

To the best of our knowledge, feature-based summarization of customer reviews has only been created in academic settings and has not been implemented in practice. We use the process described by Hu and Liu (2004) and partially simplify it to build our review summaries as our goal is to test the marketing implications of summarization but not to create the best performing extracting algorithm. The process of creating a summary for each product was divided into three parts (see Figure 2): plain text extraction and pre-processing (I), feature identification (II) and determining the valence of each feature mention (III). If we need to describe the process in more detail, we would present it as follows:

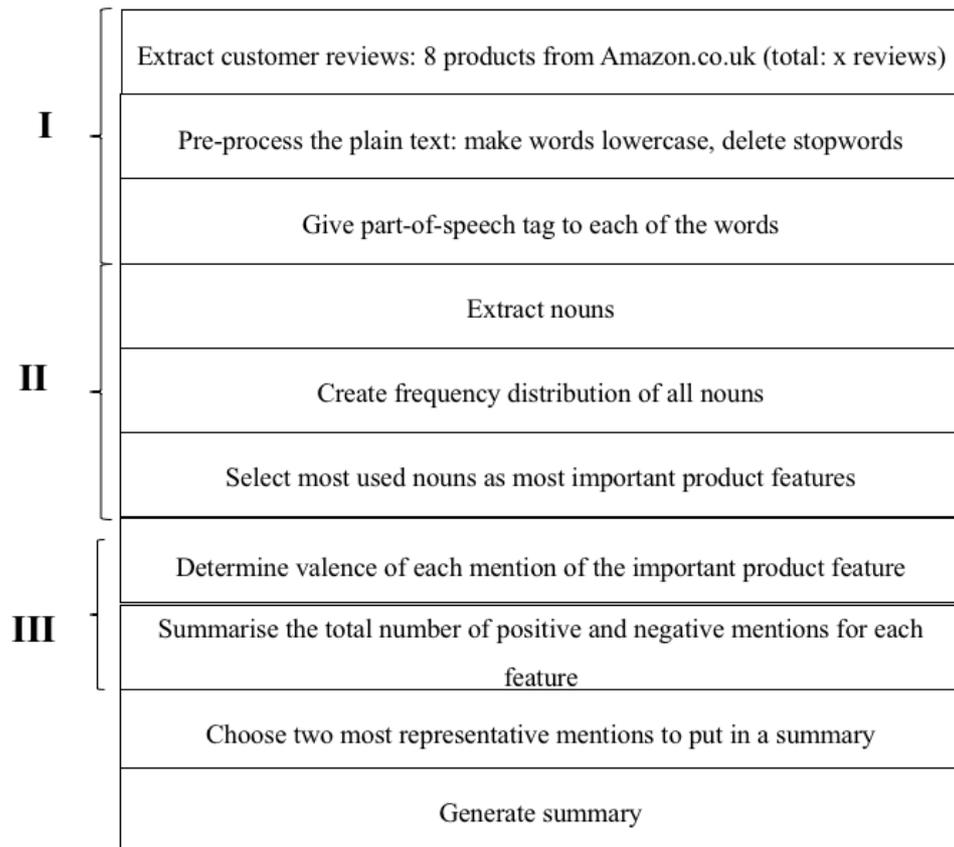


Figure 2: Creation of a feature-based summary, the technical part

The whole process was conducted by using Python programming language and existing libraries. For stage I we use scrapping algorithms (Beautiful Soup, Requests, NLTK (natural language toolkit)); for stage II, we use NLTK; for stage III, we use TextBlob. We decide to extract nouns because in our research we focus on researching explicit mentions of product features in reviews and when people talk explicitly about product features, they usually use nouns and adjective, like in this example:

*“Amazing **zoom** on this camera and takes really nice pics”*

By looking at previous works (Wang, Zhu, & Li, 2013) as well as analyzing reviews extracted on our own, we decide to proceed with extracting nouns as product features. We exclude brand names and product names from frequency lists and focus on product characteristics for three reasons: 1. a brand name is a prominent feature of a product and may overweigh other functional features. It is always treated as a variable independently from customer reviews (Kostyra, Reiner, Natter, & Klapper, 2016); 2. a brand name can lead to biased opinion as a participant may draw on his previous personal experience with the brand and form associations and

ignore the information we provide; 3. previous study shows that brand is a less important influencer than third-party reviews when customers make expensive purchases (Hoffmann, 2014). Lastly, we compare the list of most frequently used nouns with the product description so to be sure that customer reviews reflect what vendor is writing about the product.

TextBlob implementation on the latest stage resulted in the list of sentences for each of the product feature. Each sentence was given a polarity from -1 to 1 where “-1” means totally negative review, “1” – totally positive. As TextBlob is known as a relatively simple algorithm, we also adopt researcher codings of mentions to enhance result validity. Thus, we are able to, first, confirm the number of positive and negative mentions for each of the product features and, second, determine one positive and one negative mention for each feature that will represent sentiment the best.

In the end, we are supposed to receive the following summary that will be presented before the list of customer reviews:



Figure 3: The example of a feature-based summary

After creating summaries for each of eight products, chosen for our study, we are ready to conduct an experiment and test the hypotheses mentioned previously.

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## Study 1

The purpose of study 1 is to test the hypothesis regarding the positive effect of summarization on the satisfaction from the decision-making process. We intend to investigate whether a feature-based summary of customer reviews is able to minimize the negative effect of information overload on process satisfaction. We also want to see whether the summary as a helping tool will increase the perceived review helpfulness. To do that, we use a 2 (information overload: yes (8 product options) vs. no (4 product options)) by 2 (summary: yes vs no) between-subjects design and keep process satisfaction as the dependent variable. More specifically, we test how customers will react to a new type of visual assistance in the scenario of choosing a feature-rich product (digital cameras) in an online environment. In order to replicate an online shopping experience, we created a website for our study where we put all pieces of information that are available in a regular e-commerce store: product description, price tags, product pictures, and customer reviews.

### *Participants*

As the study implies a time-consuming process of reviewing large amounts of information and careful product selection, to ensure the response quality, we recruit people who are capable to understand the survey design and to perform this task from our personal networks. 50 participants (66% females, 34% males) age between 22-35 with university education background were recruited for this study. There was no significant difference in gender and age across conditions. The sample includes 10 nationalities (Russian, Chinese, American, Italian, Serbian, German, Vietnamese, Norwegian, Ukrainian), which gives us a chance to eliminate the potential cultural bias and to establish external validity.

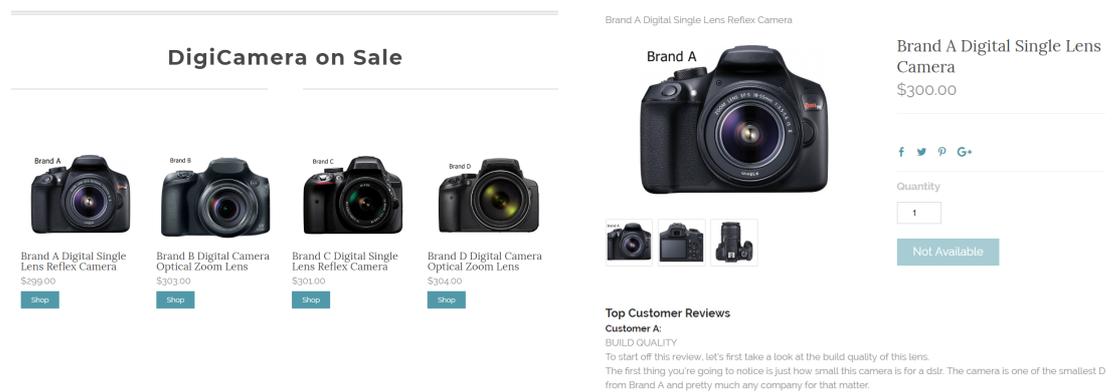
### *Procedure*

The study is divided into three parts: firstly, participants answer pre-test questions regarding their involvement in online shopping and product category. Then, they are given an online-purchasing scenario when they need to choose a particular digital camera among different alternatives. Finally, participants are asked to evaluate their online purchasing experience with questions of information overload, decision satisfaction and perceived helpfulness of review summary. All participants are randomly assigned to four treatment conditions. To involve participants and to

encourage them to make a thorough choice, we present the following scenario to them:

*Please imagine that you develop an interest in photography and decide to buy a really fancy camera (over 200 USD price). You are not a fan of any specific brand, so you choose among the alternatives presented in the e-commerce store. You are not limited by the budget - you can afford any camera on the website. Nevertheless, you are seeking for the product with the best price/quality ratio. Please click on the [link](#) to see the website and choose a brand that you would prefer. Use at least 6 mins to view the web pages (but there is no upper limit). Please remember the chosen brand and come back to the questionnaire to continue (You can write down the brand of choice on a piece of paper in case you forget). You will be able to proceed with the questionnaire after a thorough review of the website.*

In the text, participants see a hyperlink, what they can use to go to one of four websites, created for each condition: Limited list of customer reviews and no summary (N=12); Extended list and no summary (N=13); Limited list and yes-summary (N=13); and Extended list and yes-summary (N=12). Websites are created on the platform <https://weebly.com> (see an example in Figure 4). We incorporate most features of an e-commerce website to mimic a real-life online shopping environment (as shown below) to increase the ecological validity. In order to eliminate any potential confounds related to brand preferences and/or model visual attractiveness, we erase all the brand names from the pictures and from customer reviews as well as choose similar digital cameras in terms of visual characteristics.



*Figure 4: An example of the websites created for Study 1*

After reading the scenario, a participant goes to the home page of the website, where she can see four or eight (depending on the condition) digital cameras displayed with their prices listed. She can easily navigate back and forth to compare different

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options. In no-summary conditions, individual product pages show product description, top customer reviews and a button which participants can click on to read all other customer reviews (similar to the design of Amazon.com). In yes-summary conditions, participants see the same amount of content but also the summary (as shown in Figure 3) of customer reviews.

After making a choice, participants answer questions related to their feelings of information overload, process satisfaction and perceived helpfulness of each of the pieces of information. By asking these questions, we test whether people facing more difficult choice-set - 8 options instead of 4 options, no-summary conditions instead of yes-summary condition - feel more overwhelmed and confused (Chen et al., 2009; Sprotles & Kendall, 1986).

Purchase satisfaction is proved to be comprised of process satisfaction and product satisfaction (Czepiel & Rosenberg, 1977). As result satisfaction is not assessable in our research (people do not make a real purchase), we focus on process satisfaction. Process satisfaction affects a customer's overall satisfaction with the chosen object directly (Westbrook & Newman, 1978), which is highly relevant for the profitability and sustainability of an e-commerce business. Finally, we ask respondents specifically what they use mostly in their decision-making process (product description or customer reviews) and which they consider as more useful. This question helps us to assess whether customer reviews become more helpful to participants in yes-summary conditions. We decide not to ask about the summaries specifically as they are a part of customer reviews and many people may not distinguish them as a separate source of information.

### ***Manipulations***

We select digital cameras that are priced above average for our experiment so to facilitate more thorough decision-making process and feature comparison. According to a recent study, 54% of the respondents did research before they make expensive purchases (over \$1,000), out of which 74% visited multiple sites. On the contrary, only 27% of respondents did research before they make a small purchase (under \$10) (Hoffmann, 2014). Thus, people tend to think thoroughly when they buy something expensive.

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Functional technological products are time and knowledge-demanding in analysis in comparison with other categories. As we want to test whether feature-based summary will help customers to analyze information in large quantities, technological products seem to be the most appropriate category. In particular, digital cameras are chosen for the relative familiarity to an average respondent (people in their twenties, Master students). Also, as we follow the similar technical procedure as in a study done by Minqing Hu and Bing Liu (2004), we decide to take the same product category as they did. Second, we manipulate “information overload” by giving different numbers of options that respondents should choose from. Human capacity of information is restricted by the number of alternatives in a choice set or the number of features for each alternative (Simon, 1990). As we are not able to manipulate the number of features, we decide to manipulate the number of alternatives to create a feeling of being overwhelmed. Third, we remove all brand names in product pictures and customer reviews and change them to hypothetical brands A, B, C, D, E, F, G, H so to avoid potential confounds of special brand preferences. Fourth, we introduce the floor to the time spent on the website. More specifically, participants are not able to spend less than 6 minutes on the website. There is no opportunity to proceed further with the questionnaire before 6 minutes passed. This resembles a real purchasing experience when people spend a considerable amount of time choosing among products (up to 9.4 minutes on desktop, according to eMarketer (2) (2016)). Furthermore, such a timed question helps us to filter out respondents who are impatient and consequently, not be able to make a thorough decision. Finally, we put the feature-based summary in two conditions out of four to test whether it will facilitate the choice and make the decision-making process more appealing.

### *Measurements*

To measure the effect of manipulations we create a questionnaire in Qualtrics.com. We adapt scales from previous research and present the complete overview of questions in Appendix 1.

### *Process Satisfaction*

7-point Likert scale questions adapted from Fitzsimons’s (2000) research is used to measure process satisfaction, as a part of purchase satisfaction. We measure how people feel after the decision-making process and how they evaluate the process (interesting/frustrating).

To perform further analysis, we conduct a Principal Component Analysis to reduce dimensions. Based on Barlett's Test of Sphericity ( $\chi^2 = 59.493, p < .001$ ) as well as Kaiser-Meyer-Olkin Measure of Sampling adequacy (KMO = .653) we conclude that factor analysis is appropriate. All three questions (see Table 1) load high on one component, which gives us an opportunity to combine all three variables into one construct.

<i>Variables</i>	<i>Factor Loading</i>
I found the process of deciding which product to buy frustrating (reversed)	.75
I found the process of deciding which product to buy interesting	.902
I am satisfied with my experience of deciding which product brand to choose	.904

*Table 1: Process satisfaction construct*

By conducting Principal Component Analysis and extracting factor scores, we are able to create new variable "process satisfaction". The reliability of this variable is proved by high Cronbach's  $\alpha$  statistics = .808

#### *Information Overload*

7-point Likert scale for information overload is adapted from studies of Sprotles and Kendall (1986) and Chen et al. (2009). In order to measure whether people feel overloaded, we ask about the easiness of finding relevant information ("There was too much information about the product so that I was burdened in handling it") as well as the perceived difficulty of analyzing it ("I think the information is difficult to understand"). To perform a regression analysis, we conduct a principal component analysis first to extract factor scores and combine them into one variable for further analysis. Factor analysis is acceptable (KMO = .606, Bartlett's test of Sphericity:  $\chi^2 = 55.165, p < .001$ ) and after rotation we receive two factors: information overload (Q10\_2,4,8) and easiness to understand information (Q10\_5,7). Questions Q10\_1,3, and 6 are dropped due to issues of cross-loading. As easiness to understand the information provided in the online store is not a focus in our analysis, we drop this factor and proceed with factor 1 – information overload (see Table 2). Cronbach's  $\alpha$  of these variables is .908, which proves the reliability of this construct.

<i>Information overload</i>	<i>Factor Loading</i>
There was too much information about the cameras so that I was burdened in handling it	.865
Because of the plenty of information available, I felt difficult in acquiring all the relevant information that I need	.851
I feel it takes a lot of effort to process the information available	.798

*Table 2: Information Overload Construct*

### *Involvement*

As involvement has been proven to moderate the effect of overload on satisfaction previously (Mogilner, Rudnick, & Iyengar, 2008), we decide to control for it. In order to enhance internal validity of this study, our four groups of respondents in four conditions should be comparable in prior knowledge, interest towards product category and their online shopping habits. Questions are developed to understand respondents' product knowledge and interest to the category: 1). How would you describe your knowledge of digital camera's characteristics/features? (1-very limited, 7-very rich), 2). How would you describe your interest in digital camera in general? (1-very uninterested, 7-very interested). To assess their online shopping habits, we ask them six questions and measure on a scale from 1 to 7 of their experience with online shopping, frequency, thorough decision-making and most used information source (product description vs customer reviews).

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## Results of Study 1

In the results of study 1, first, we look at the Involvement section of the questionnaire to assess how comparable our four groups are in terms of their product category knowledge, interests towards digital cameras and online shopping habits. Then, we check whether there is statistical evidence that our manipulations perform as expected. Next, we perform a linear regression analysis to reveal to what extent the effect of information overload on process satisfaction is moderated by feature-based review summary. ANOVA test is conducted to determine whether those who see the summary perceive customer reviews as more helpful. Finally, we discuss the findings of study 1.

### *ANOVA test*

To ensure that individual differences and variability are not significant within each group, we perform an ANOVA analysis. Six tests are performed in order to compare the mean difference among all four conditions. As means of the groups are not significantly different on a 95% significance level (See Appendix 3), we may conclude that there is no statistically significant difference in terms of product knowledge, interest in the category and online shopping habits between the four groups that are being compared and there is limited possible confounds caused by differences in group characteristics.

### *Manipulation checks*

To understand whether the number of product options increases the feeling of information overload, we perform an independent samples T-test and compare means for variables that representing Information overload construct. We perform this check for groups without summary so to assess manipulations with product options without accounting for potential interactions between summary and information overload.

The difference in means proves to be significant for four variables that are related to the difficulty of handling information (see Table 3):

	<i>Mean</i>		<i>SD</i>		<i>t</i>	<i>p</i>
	8 options	4 options	8 options	4 options		
I feel it takes a lot of effort to process the information available	5.57	3.45	0.94	1.04	5.29	<.001
Because of the plenty of information available, I felt difficult in acquiring all the relevant information that I need	5.36	2.91	1.22	.94	5.67	<.001
I could effectively handle all of the information on the website	3.00	5.18	1.11	1.08	-4.96	<.001
There was too much information about the cameras so that I was burdened in handling it	5.71	2.73	1.541	.90	6.05	<.001

*Table 3: Manipulation Check of information overload*

As predicted, by facing 8 options of a feature-rich product like digital cameras, shoppers feel significantly more overwhelmed with information than those who face 4 options only. That is the reason why clues that help with information analysis should be available to customers.

The second manipulation check is conducted to assess whether people who see the summary are better in identifying important product features while reading information on a product page. Specifically, we ask respondents the same question (“To what degree would you agree with the following statement: when I make a choice, I know what features are more important to me”) before and after the treatment. Although the results before the treatment are not significantly different ( $t = .087$ ,  $p = .931$ ), the difference becomes salient after respondents face the decision-making task ( $t = -8.005$ ,  $p < .001$ , see Table 4). This check proves that the manipulation is conducted correctly, and we can proceed further with the analysis.

<i>When I make a choice, I know what features are more important to me</i>		Mean	SD	T	P ( $\alpha=.05$ )
Before treatment:	No-summary	4.88	1.616	.087	.931
	Yes-summary	4.84	1.65		
After treatment:	No-summary	3.12	.927	-8.01	<.001
	Yes-summary	5.28	.98		

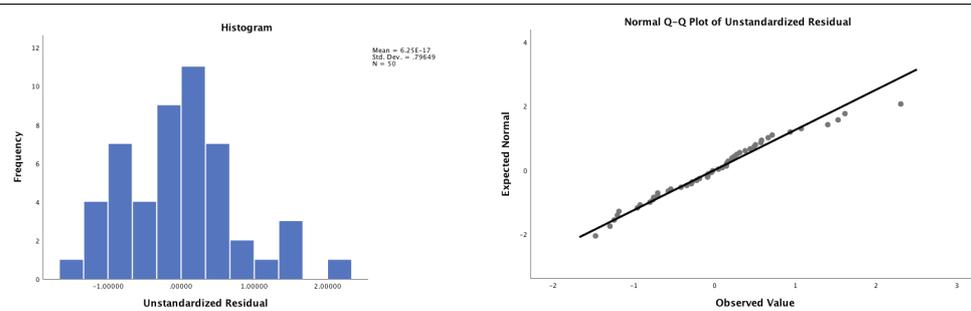
*Table 4: Manipulation check of summary (yes/no)*

### ***Hypotheses testing***

Hypothesis 1 predicts that there will be a main effect between information overload and process satisfaction. More precisely, we expect participants facing a limited product choice set to be more satisfied with the process of choosing a product in comparison with those who are given the extended choice set. Meanwhile, we introduce feature-based review summaries as another variable. Hypothesis 2 postulates that there should be an interaction effect where feature-based summary moderates the negative effect of information overload on process satisfaction. Finally, Hypothesis 3 expects a positive effect of feature-based summary on perceived review helpfulness. The extended result tables are presented in Appendix 3.

#### *Test of H1 – Dependent variable: Process satisfaction*

Before performing a regression analysis, we first test the assumptions of a linear regression so to be sure that our model is reliable: 1). Linearity, the model is linear in parameters and as we have only one independent variable we can ignore the analysis of multicollinearity. 2). Homoscedasticity, the insignificant results of the estimation of the model with squared residuals as a dependent variable ( $F=1.345$ ,  $p=.252$ ,  $\alpha=.05$ ) suggest that this assumption is met. As proven by graphs (see Graph 1) and Kolmogorov-Smirnov test (K-S test= .073,  $p=.20$ ,  $\alpha=.05$ ), residuals are normally distributed.



Graph 1: Distribution of residuals

A simple linear regression is conducted to test whether information overload negatively affects process satisfaction. Indeed, the model is significant at 95% significance level ( $F=14.224, p < .001$ ). R square of the model is small ( $R^2 = .229$ ) that means that there are other factors besides information overload that affects process satisfaction. Information overload coefficient is negative ( $b = -.478, t = -3.772, p < .001$ ) meaning that the higher the perceived information overload, the smaller the process satisfaction.

In order to reveal the potential difference between groups with and without summary, we proceed further with the analysis and perform a linear regression for each of the group. This test demonstrates that in case when participants see the summary, information overload becomes a more significant predictor of process satisfaction ( $R^2 = .467$ ). These findings prove that summary may have either direct or indirect effect on process satisfaction.

*Test of H2 – Moderating effect of feature-based summary*

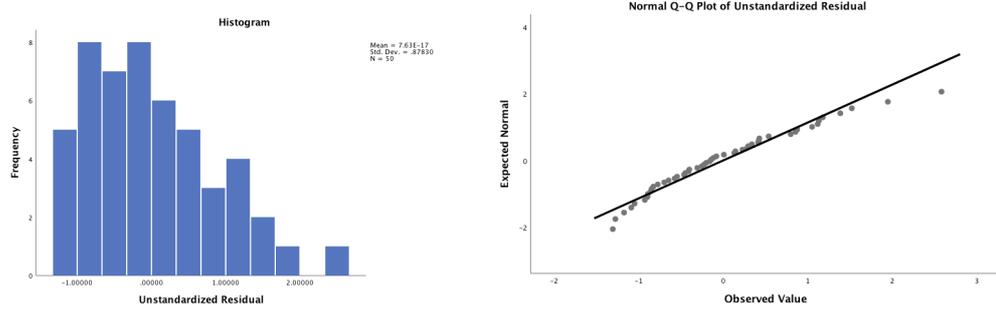
To perform the moderator analysis of a feature-based summary, we first compute the interaction variable by multiplying information overload and summary (dummy variable). Thus, the equation we would try to estimate will be as follows:

*Process satisfaction*

$$= b_1 * Information\ Overload + b_2 * Summary\ (D) + b_3\ Information\ Overload * Summary + \epsilon$$

Before the analysis, we check that all the assumptions of a linear regression are respected. Indeed, the model is linear in parameters, VIF coefficient is small, what indicates no-multicollinearity. The model is homoscedastic ( $F=2.023, p = .124, \alpha=.05$ ). Although the residuals are positively skewed, the assumption of normality

is not violated (Kolmogorov-Smirnov test: .098,  $p=.20$ , see Graph 2). Thus, we may conclude that our model is reliable.



Graph 2: The distribution of residuals

In order to prove the moderating effect of a summary, the coefficient of the interaction term ( $b_3$ ) should be significant at a 95% level. Although the model itself is proved to be significant ( $\alpha=.05$ ) by performing a linear regression ( $F=8.836$ ,  $p < .001$ ), the interaction term coefficient is not significant at a 95% level ( $b = .139$ ,  $t = .514$ ,  $p = .61$ ). Thus, we may conclude that summarization of customer reviews has limited function in mitigating the effect of information overload on process satisfaction. Nevertheless, the coefficient of summary is significant ( $b = -.73$ ,  $t = -3.128$ ,  $p = .003$ ). This result is not expected because, first, we do not expect a direct effect of summary on process satisfaction and second, we do not expect it to be negative. The regression shows that the existence of summary negatively affects process satisfaction. Although these results are unexpected, we may have an explanation for it. One of the reasons for that could be the novelty of the summary format. These findings will be discussed further in the discussion section.

#### *Test of H3 – Positive effect of a summary on perceived review helpfulness*

In order to explore the effect of a summary on perceived helpfulness of customer reviews, we perform an Independent Sample T-test. We ask respondents specifically whether they think that product description or/and customer reviews are very helpful when making the purchase decisions on this website. Although there is no significant difference in perceived helpfulness of product descriptions ( $t = .78$ ,  $p = .44$ ), people who see the summary perceive customer reviews as significantly more helpful than those who do not see the summary ( $t = -2.56$ ,  $p = .014$ , see Table 5).

<i>Variables</i>		<i>Mean</i>	<i>SD</i>	<i>T</i>	<i>P (α=.05)</i>
I think customer reviews are very helpful when making the purchase decisions on this website	No-summary	3.88	1.666	-2.56	.014
	Yes-summary	4.88	1.013		
I think product descriptions are very helpful when making the purchase decisions on this website	No-summary	5.08	1.222	.78	.44
	Yes-summary	4.8	1.323		

*Table 5: Results of Hypothesis 3 test*

Based on this assessment, we may conclude, that the existence of a summary has a positive effect on the perceived helpfulness of customer reviews.

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## Discussion of Study 1

The purpose of Study 1 is to examine the relationship among information overload, process satisfaction, perceived review helpfulness and feature-based summary. The proposition is that a feature-based summary of customer reviews will decrease the negative effect of information overload on process satisfaction. Moreover, we hypothesize that a feature-based summary aiming at helping customers to make a choice will make customer reviews more helpful.

Results show that information overload negatively affects process satisfaction (H1). The number of options, when increased, negatively affects information overload. These results support the notion that too much of a choice may create a feeling of frustration and consequently cause dissatisfaction of the decision-making process.

The main idea behind Study 1 is to test the effect of newly proposed user experience design – feature-based summary. Hypothesis 2 is rejected due to the fact that summary does not have a moderating effect on information overload. Summary does not make the process of choice easier by minimizing the feeling of information overload. What is revealed, is that summary has a significant negative main effect on process satisfaction. The existence of summary provokes the decrease in process satisfaction. Some reasons for that could be the sample that is small and the novelty of the format: a new format in user experience design demands some adoption time before it could become helpful for customers.

Moreover, the results of testing of hypothesis 3 reveal that a summary influences positively the perceived helpfulness of product reviews. These findings make us think about the potential mediating role of review helpfulness between the existence of a summary and process satisfaction.

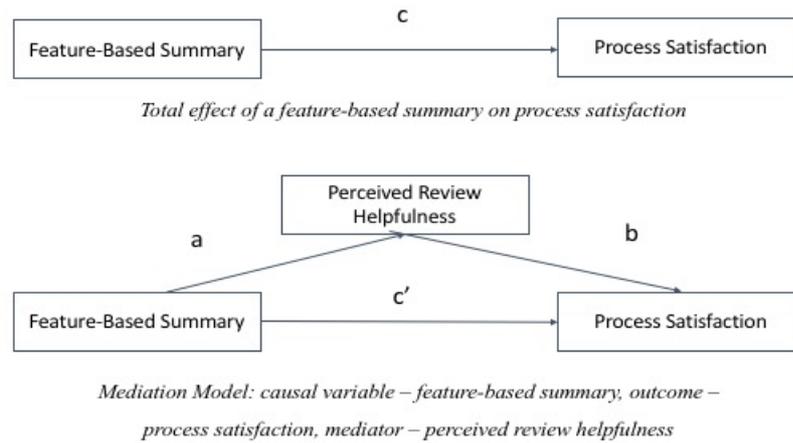
In order to test the summary effectiveness on a larger sample as well as to examine the relationships between the existence of a summary, product review helpfulness and process satisfaction, we decide to conduct Study 2.

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## Study 2

Study 2 conceptually replicates and extends Study 1. The main objective remains the same – 1) to test the effect of information overload on process satisfaction and the moderating effect of feature-based summarization, 2) to test the effect of a summary on review helpfulness. However, several adjustments were made. More precisely, we delete product descriptions on individual product webpage in order to create a more focused environment for the analysis of the proposed effects. Though in real life people tend to use both customer reviews and product description (Häubl & Trifts, 2000) to assist purchase decision making, in case of a survey, participants may try to minimize their time and efforts by skimming product descriptions and skipping the relatively lengthy customer reviews. To encourage participants to explore the available information more thoroughly and to highlight our primary research goal – examining the effect of feature-based summary on information overload and review helpfulness, we eliminate the product descriptions from our website. Meanwhile, we change all products' prices to \$300 (the price is obtained by averaging the prices of products taken for an experiment from Amazon.co.uk). We decide to unify the price as price difference may become a confound and influence participants' decision-making process but keep the price tags to preserve a real online shopping environment and to limit participants' self-assumptions of prices. We also expand our sample to 120 people to reduce the sample size bias.

In Study 2, we will test Hypotheses 1 and 2 but will modify Hypothesis 3. Study 1 shows a significant effect of summary on perceived review helpfulness and we want to explore further these relationships and their influence on process satisfaction. In our study, we expect that the existence of a summary will make participants more satisfied with the process of choosing a product. Furthermore, a summary is proved (in Study 1) to increase the perceived helpfulness of reviews. Taking these two aspects into account, as well as the unexpected results of Study 1 (direct negative effect of a summary on process satisfaction) we decide to create a mediating model. We hypothesize a mediating role of review helpfulness in the relationship between the existence of a summary and process satisfaction (illustrated in Figure 5): when a summary exists, participants are expected to perceive customer reviews as more helpful and consequently will be more satisfied with the process of choosing the product.



*Figure 5: Hypothesis 3 Conceptual Model*

### ***Procedure***

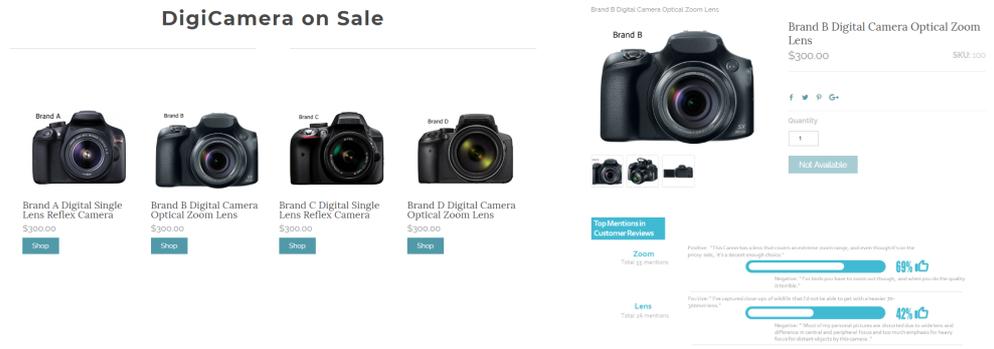
The procedure and manipulations of Study 2 are similar to those conducted in Study 1. We adopt an experimental setup to test the research hypotheses. Research participants' main task consists of browsing the e-commerce website that was created specifically for these purposes and choosing one camera based on a thorough evaluation of customer reviews.

We use a 2×2 between-subject experimental design. The manipulation factors are: Information overload (limited - with 4 cameras display, extended – with 8 cameras display), and Summary (yes, no).

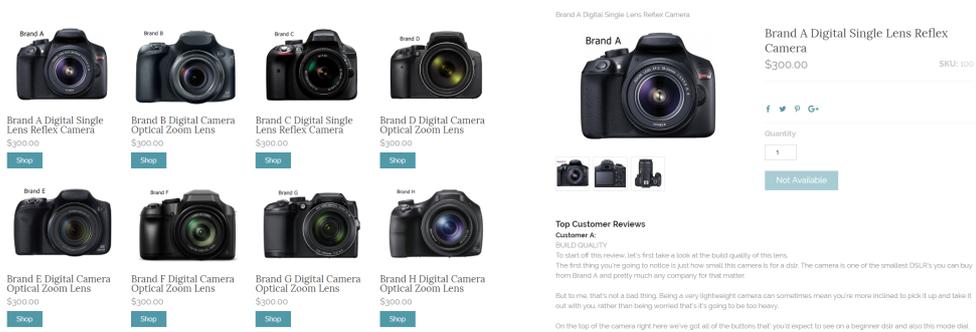
Firstly, we ask participants to rate their knowledge of digital cameras and their familiarity with online shopping. Then they were offered one of the four website links. There are four websites that are used for the 4 different conditions: C1: 4 options with summary, C2: 4 options without summary, C3: 8 options with summary, C4: 8 options without summary. We distribute questionnaires with website links<sup>1</sup> embedded to participants. Participants are randomly assigned to one of the four conditions using the randomization function of Qualtrics. Each participant, after clicking on one particular product, sees product pictures as well as customer reviews of the product. Those who are exposed to “with summary” conditions see feature-based summary from customer reviews (as illustrated in Figure 6). We use cameras that we chose for Study 1 with similar appearances and remove all the logos to avoid confounds of design and brand. Apart from the

<sup>1</sup> Website used in C1: <https://digicamexp.weebly.com/>, C2: <https://digicamonsale.weebly.com/>, C3: [https://camexp.weebly.com](https://camexp.weebly.com/), C4: <https://digicamonline.weebly.com/>

number of cameras displayed on the homepage and review summaries on the individual product page, all other elements remain the same across the four conditions.



C1: Limited information overload (4 cameras) with summary



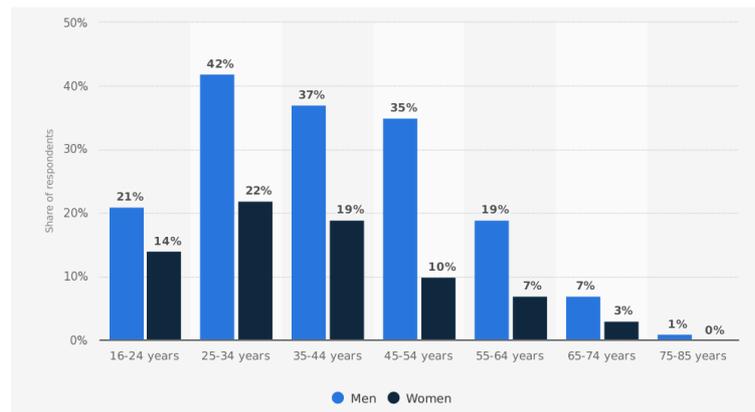
C4: Extended information overload (8 cameras) without summary

Figure 6: An illustration of websites created for the experiment

Participants can review each product in whatever order they prefer and each webpage is designed in a way that imitates a real online shopping environment. We set up a time control so that participants had to spend more than 6 minutes visiting the websites before they could proceed with the questionnaire. After viewing the website, participants were asked to provide the brand that they would choose to buy and explain the reasons for choosing the specific brand. We ask participants to explain why they choose the particular brand in order to ensure their thorough choice. Moreover, their answers give us an idea of whether they use summaries to make a choice or not. To better understand customers' perceptions of review summaries, we add questions about the helpfulness of summaries in assisting decision-making. Then, they are given questions regarding information overload, process satisfaction, helpfulness of reviews. The questionnaire ends with demographic questions and a "thank you" note.

## ***Participants***

120 participants were recruited from Amazon Mechanical Turk (<https://www.mturk.com>) with a \$1 incentive each. Most of them are males (81.7%). Although such a big male prevalence is not proved by studies of consumer electronics online purchases, we found that males are more frequent shoppers of electronics in online stores in Denmark, Sweden and the US (Statista, 2018). In Figure 7 the sample from Sweden shows that the number of males is almost twice bigger than the number of females, who buy consumer electronics online:



*Figure 7: Share of individuals who have bought the electronic equipment over the Internet in Sweden in 1<sup>st</sup> quarter of 2017 (sample: 2 876 respondents)*

Participants are almost equally distributed between two age groups: 25-34 (44.2%, 53 respondents) and 35-44 (50%, 60 respondents). Most of them are Americans (91.6%, 110 people), have Bachelor degrees as the highest level of education (80.8%, 97 people) and speak English on a native level. As the sample composition is not exactly representative of the overall population of e-commerce shoppers, we may consider that as a limitation of our study.

## ***Measurements***

To ensure reliability and content validity, we adapt scales from previously validated studies. Seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree) are adopted in the questionnaire. Process satisfaction construct, borrowed from Fitzsimons (2000), is the same as in Study 1. It is worth mentioning that we changed the wording for information overload variables and deleted questions that loaded low in Study 1. As a result, we have four questions, that were grouped as one factor by the Principal Component Analysis. Nevertheless, after conducting the reliability analysis, we follow the recommendations of Cronbach's  $\alpha$  statistics and

delete the first question (see Table 6). Final factor loadings are presented in Table 7.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Q8_4	14.86	6.785	.422	.707	-.200 <sup>a</sup>
Q8_3	14.69	5.996	.605	.764	-.456 <sup>a</sup>
Q8_2	14.77	5.787	.524	.579	-.418 <sup>a</sup>
Q8_1	16.56	14.333	-.438	.235	.894

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Table 6: Item-Total Statistics (Reliability Test)

	Component Matrix
Q8_2 There were so many brands to choose from that I felt confused	.878
Q8_3 The more I learned about the products, the harder it was to choose	.948
Q8_4 I feel it takes a lot of effort to process the information available	.905

Table 7: Final Factor Loadings (Information Overload variables)

For creating a process satisfaction construct we perform the same principal component analysis and as the components are the same, we receive the same level of reliability (Cronbach’s  $\alpha = .72$ ). Perceived review helpfulness is measured as the degree of agreement to the statements “I feel that customer reviews helped me to evaluate the products” and “It was easy for me to find important product characteristics from customer reviews”. The questions are adapted from the study of Li et al. (2013). Product knowledge is measured as the same question as in Study 1, “How would you describe your knowledge of digital camera's characteristics/features? (1-very limited, 7-very rich)”.

Perceived summary helpfulness is measured in two questions, “To what extent on a scale from 1 to 7 (1-completely false, 7 - completely true) you consider summary to be helpful in decision-making” and “To what extent on the scale from 1 to 7 (1-completely false, 7 - completely true) you consider summary to be easy to use”.

As perceived review helpfulness is measured in two questions, we perform a Principal Component Analysis to reduce dimensions. Bartlett’s Test of sphericity ( $p < .001$ ) and KMO (MSA=.5) suggest significant correlations between the two

variables in the population (see Table 8), therefore, we assume a Principal Component Analysis is appropriate. One factor is generated with 79% of the total variance in the variables explained.

Communalities			Component Matrix <sup>a</sup>	
	Initial	Extraction	Component 1	
Q12_1	1.000	.789	Q12_1	.888
Q12_2	1.000	.789	Q12_2	.888

Extraction Method: Principal Component Analysis.

Total Variance Explained							
Component	Total	Initial Eigenvalues			Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	1.577	78.861	78.861	1.577	78.861	78.861	
2	.423	21.139	100.000				

Extraction Method: Principal Component Analysis.

*Table 8: Perceived Review Helpfulness construct*

Cronbach’s  $\alpha$  (.728) proves that the variables can represent one construct.

Summary helpfulness questions are not used in the analysis directly but give us an understanding of the people’s attitude towards summaries. The questions and scales are displayed in Appendix 2.

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## Results of Study 2

ANOVA results suggest that all four groups that are assigned to 4 different conditions are not significantly different ( $p < .001$ ) regarding their prior knowledge of and interest in digital cameras, their online shopping behaviors and their gender, age and education background, which enable the comparison among the four groups. The extended results tables are available in Appendix 4.

### *Manipulation check*

#### *a) Comparison within the same summary condition*

To check the information overload manipulation, we investigate whether different groups have different feelings of information overload (see an extended report in Appendix 5). Independent sample t-tests are run among four conditions. We first compare the information overload level for groups without summary. The test for groups without summary (4 options and 8 options) suggests that for two out of four variables, representing information overload construct, the group with 8 options have significantly stronger feeling of information overload than the group with 4 options (Q9.3:  $t = -3.753$ ,  $p < .001$ ; Q9.4:  $t = -2.843$ ,  $p = .006$ ). This proves that our manipulation with the choice set is successful. Then, we perform the same test for groups with summary and it shows no significant difference.

#### *b) Comparison within the same number of options*

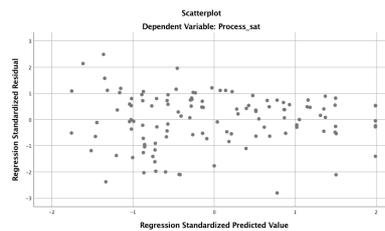
The test for groups with 8 options reveals, that the group without summary shows significantly stronger feelings of information overload than the group with summary across all the variables of information overload construct (Q9.1: mean difference = 1.33,  $t = -2.735$ ,  $p = .008$ ; Q9.2: mean difference = 0.91,  $t = -2.026$ ,  $p = .047$ ; Q9.3: mean difference = 0.98,  $t = -2.229$ ,  $p = .030$ ; Q9.4: mean difference = 1.30,  $t = -3.175$ ,  $p = .002$ ). The test for groups with 4 options also shows significantly stronger feelings of information overload for the group without summary for two out of four variables (Q9.1: mean difference = 1.20,  $t = -2.411$ ,  $p = 0.019$ ; Q9.4: mean difference = 1.43,  $t = -2.978$ ,  $p = 0.004$ ). Manipulation checks prove that the feeling of information overload correlates with the existence of a summary. Therefore, we conclude that both of our manipulations are successful.

***Hypotheses testing***

*Test of Hypotheses 1 and 2*

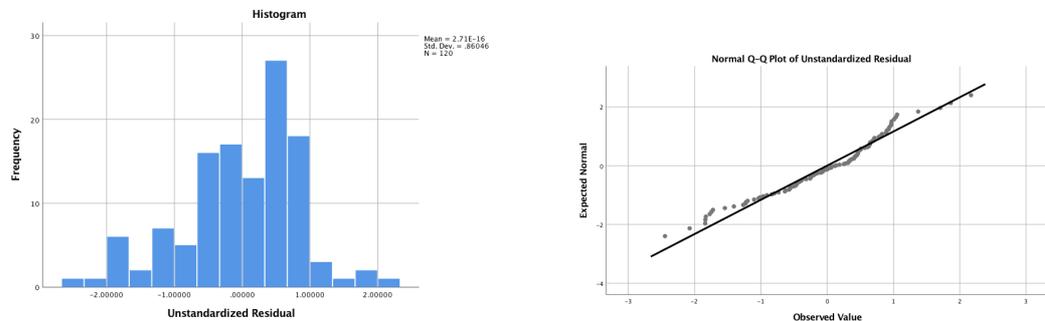
To examine H1 and H2, a hierarchical multiple regression analysis is conducted. First, we include Information overload (I), then Information overload and Summary (II). Lastly, we include the interaction term between them (Information overload×Summary, III).

We examine the assumptions of a linear regression before conducting the analysis. The Model is linear in parameters. Collinearity diagnostics show that variance inflation factor (VIF) of each variable is below 5 and tolerance value is above 0.5, which indicates a low possibility of multicollinearity (Myers, 1990). The homoscedasticity assumption is violated, and the model is heteroscedastic ( $F=3.286, p = .023, \alpha= .05$ ). Although there are no visible relations between residuals and predicted variables in the graph (see Graph 3). We may consider this as a limitation of our study.



*Graph 3: The relations between residuals and independent variables*

Skewness (-.515) and kurtosis (.218) values are close to zero as well as the graph 4 shows that the distribution of residuals is normal.



*Graph 4: The distribution of residuals*

We perform a linear regression and the model is significant at a 95% confidence level ( $F=38.231, p < .001$ ). Information overload has significant negative impact on process satisfaction ( $b = -.495, t = -6.183, p < .001$ ).

Information overload accounts for a significant amount of variance in process satisfaction ( $R^2 = .26, F(2, 117) = 20.49, p < .001$ ), which statistically prove H1. To avoid potentially problematic multicollinearity with the interaction term, the variables are centered and an interaction term between information overload and feature-based summary is created (Aiken & West, 1991). The interaction term is added to the regression model as an additional variable. Results suggest that the interaction between information overload and summary falls short of statistical significance,  $\Delta R^2 = .00, \Delta F(1, 116) = .032, p = .858$ . To minimize the negative effect of heteroscedasticity on result accuracy, we use SPSS Process<sup>2</sup> to run the moderation analysis again. As all the variables are standardized in the procedure, we may assume that error terms have constant variance. Though results are slightly different from the one from linear regression in values of constant and information overload (see Table 9), the insignificant moderation effect is found again. Therefore, H2 is rejected. Interestingly, though not significant, summary poses a direct positive effect on process satisfaction in this bigger sample instead of a negative one as shown in Study 1.

<u>Linear regression</u>	<i>b</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
<i>Constant</i>	-.134	.121	-1.11	.269
<i>Info overload</i>	-.437	.144	-3.042	.003
<i>Summary</i>	.255	.167	1.528	.129
<i>Info Overload</i> × <i>Summary</i>	-.032	.177	-.179	.858
<u>PROCESS Macros</u>	<i>b</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
<i>Constant</i>	-.005	.084	-.054	.957
<i>Info overload</i>	-.453	.088	-5.16	.000*
<i>Summary</i>	.255	.167	1.528	.123
<i>Info Overload</i> × <i>Summary</i>	-.032	.177	-.178	.858

Table 9: Linear model of predictors of Process Satisfaction

<sup>2</sup> The SPSS Process macro is developed by Hayes A.F. and described in Introduction to Mediation, Moderation, and Conditional Process Analysis (2017)

*Test of Hypothesis 3*

Hypothesis 3 is about the mediating role of perceived customer reviews helpfulness on the relationship between the existence of a summary and process satisfaction. Feature-based summary (categorical variable), in this case, is the exogenous variable, perceived review helpfulness (continuous variable) and process satisfaction (continuous variable) are the endogenous variables.

Before the test of hypothesis, we first consider testing the assumptions of linear regression. As we have three equations to test the hypothesis, we perform assumption tests for each of them. Here we present the test of assumptions for one model and the extended analysis is available in Appendix 4. We first look at the following model:

$$Process\ satisfaction = b_1Summary + b_2Perc\_rev\_help + const$$

The model is linear in parameters, as can be observed by looking at the equation. Secondly, to check the assumption of no or little multicollinearity, we need to examine the variance inflation factors (VIF, Table 10). In our case, VIF is small, therefore we do not have multicollinearity between the variables.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.061	.107		-.574	.567		
	Summary	.121	.154	.061	.782	.436	.888	1.125
	Perc_rev_help	.592	.077	.592	7.653	.000	.888	1.125

a. Dependent Variable: Process\_sat

*Table 10: Check for the absence of multicollinearity*

Then, we test the assumption of heteroscedasticity. We estimate the following equation:

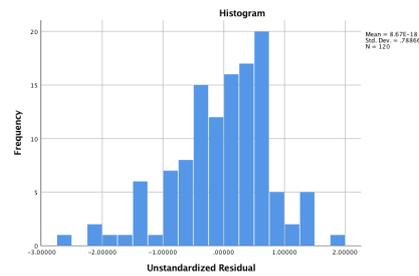
$$u^2 = \gamma_1Summary + \gamma_2Perc.rev.help + const$$

$$H_o: \gamma_1 = \gamma_2 = 0 \quad H_1: \text{at least one } \gamma_j \neq 0$$

(where  $u^2$  is the squared residuals)

To test the presence of heteroscedasticity we use the test of overall significance. Given the results of the test ( $F(2,117) = .898, p = .41$ ) we cannot reject the null hypothesis. Therefore, our data is homoscedastic. Lastly, the distribution of residuals follows normal distribution curve (see Graph 5). As skewness (-.653) and

kurtosis (.689) are not far from zero, we may conclude that the assumption of normality is also supported.



Graph 5: Normal distribution of residuals

To confirm the mediating variable and its significance in the model, we perform several steps of analysis. First, we examine the significance of the relationship between the outcome (*Process satisfaction*) and the causal variable (*Feature-based summary*). Then, we examine the significance of the relationship between the causal variable and the mediator (*Perceived review helpfulness*). Next, we examine the significance of the relationship between the mediator and the outcome in the presence of causal variable. SPSS Process Macros, which applies to simple mediation models, is adopted for the analysis (Preacher & Hayes, 2004).

The model is found significant ( $F(1, 118)=8.427, p =.004$ ). Results suggest that feature-based summary coefficient, not controlling for the mediator, is significant ( $b = .514, t(118) = 2.903, p <.001$ ). That means that the total effect of summary on process satisfaction (path c) proves to be significant. The regression of summary on perceived review helpfulness (path a), is also significant ( $F=14.808, p <.001$ ) as well as summary coefficient ( $b = .67, t(118) = 3.848, p <.001$ ). In the last step, while performing the regression of summary and perceived review helpfulness on process satisfaction, we can clearly see that although the model is significant ( $F=35.504, p <.001$ ) and the effect of perceived review helpfulness is also significant (path b:  $b =.592, t =7.653, p <.001$ ), the effect of summary is not (path c', direct effect:  $b =.121, t =.782, p =.436$ ). See Figure 8 for visualization:

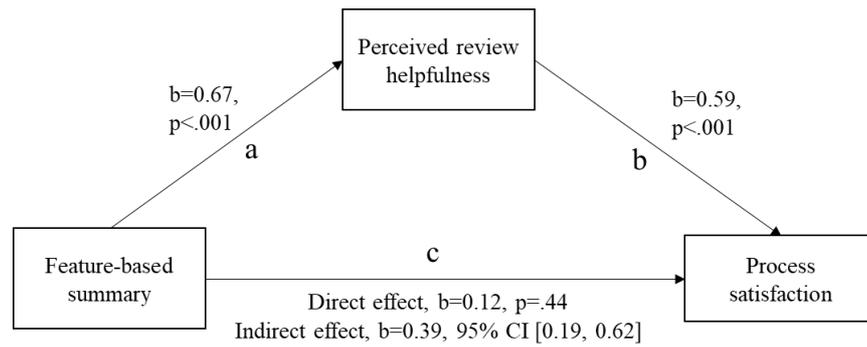


Figure 8: Estimations of the mediating model

A measure for the indirect effect of summary on process satisfaction suggests an effect size of 0.394, which is significant at 95% confidence interval as the bias corrected bootstrap confidence intervals (LLCI=.191, ULCI=.650) does not contain zero. We also conduct a Sobel test and find full mediation in the model ( $z = 3.4148$ ,  $p < .001$ ), which suggests that perceived review helpfulness fully mediates the relationship between feature-based summary and process satisfaction. As the mediation effect is highly significant, we conclude that H3 is supported.

As participants are also grouped based on information overload (limited, high), we further break down the analysis and compare results between Group 1 and 2, which are groups exposed to limited information overload condition (4 camera options) and Group 3 and 4, which are groups exposed to high information overload condition (8 camera options). For Group 1 and 2 (4 options), the model is found significant ( $R^2=.15$ ,  $F(1, 56)=10.733$ ,  $p < .001$ ). Results suggest that the regression of feature-based summary on process satisfaction, ignoring the mediator, is significant,  $b = 0.590$ ,  $t(56) = 2.388$ ,  $p = .021$ . The regression of summary on perceived review helpfulness, is also significant,  $b = 0.872$ ,  $t(56) = 3.2761$ ,  $p = .002$ . The mediation process reveals that perceived review helpfulness, controlling for the summary, is significant,  $b = .581$ ,  $t(55) = 5.016$ ,  $p < .001$ . While the summary, controlling for the mediator, is not a significant predictor of customer's process satisfaction,  $b = 0.084$ ,  $t(55) = 0.368$ ,  $p = .714$ . A measure for the indirect effect of summary on process satisfaction suggests an effect size of 0.506, which is significant at 95% confidence interval as the bias corrected bootstrap confidence intervals (LLCI=.202, ULCI=.929) does not contain zero. The Sobel test further proves the mediation role of perceived review helpfulness ( $z = 2.7055$ ,  $p = .007$ ). Results are presented in Figure 9.

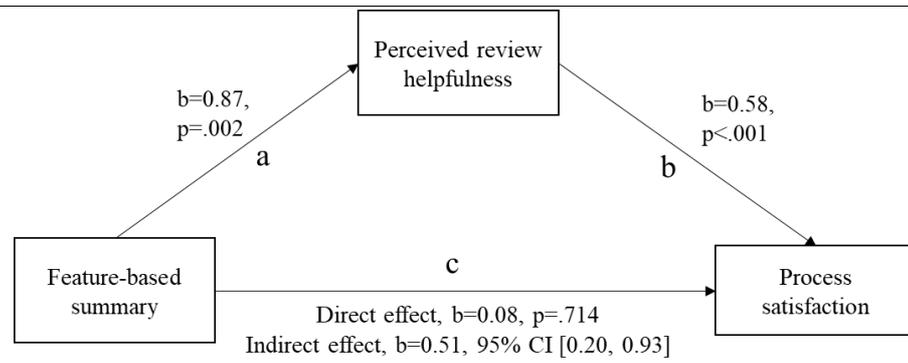


Figure 9: 4 options

For Group 3 and 4 (8 options), the model is not significant ( $R^2=0.061$ ,  $F(1, 60)=3.494$ ,  $p = .067$ ). Sobel test suggests no significant indirect effect ( $z = 1.651$ ,  $p = .10$ ). Both the regression of feature-based summary on process satisfaction, ignoring the mediator, and the regression of summary on perceived review helpfulness, are not significant. The mediation process reveals that perceived review helpfulness, controlling for the summary, is significant,  $b = .644$ ,  $t(59) = 3.989$ ,  $p < .001$ . While the summary, controlling for the mediator, is not a significant predictor of customer’s process satisfaction. Results are presented in Figure 10.

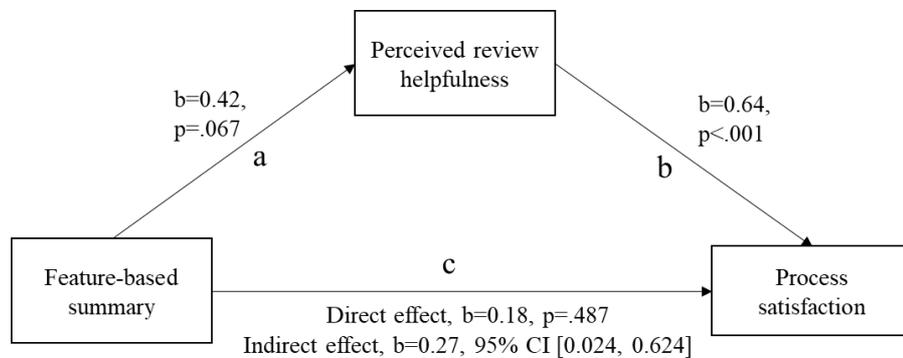


Figure 10: 8 options

**Additional analysis**

We ask respondents about their attitudes towards summary helpfulness. Summaries are easy to read and are expected to be helpful to customers. Indeed, respondents’ answers are significantly different from the neutral answer (neither agree nor disagree, test value=4, see the Table 11 below). Among all respondents who see summaries, only 2 people out of 61 (3.28%) say that they do not consider summaries to be useful. In terms of easiness to read, all people who have 4 options consider summaries to be easy to handle. Respondents faced 8 options choice set have varied opinions: 3 people do not think summary to be easy to use and 1 person is neutral

in his assessment. By asking these two questions, we receive the proof that this format can help customers to make purchase choices.

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Q43_1	26	5.88	1.071	.210
Q43_8	26	6.08	.628	.123
Q44_1	35	6.00	.939	.159
Q44_8	35	5.83	1.248	.211

**One-Sample Test**

Test Value = 4

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Q43_1	8.976	25	.000	1.885	1.45	2.32
Q43_8	16.875	25	.000	2.077	1.82	2.33
Q44_1	12.596	34	.000	2.000	1.68	2.32
Q44_8	8.667	34	.000	1.829	1.40	2.26

*Table 11: The one-sample t-test for summary helpfulness*

The open question regarding reasons why people choose the particular product reveals that people react positively to the summaries. When people evaluate among different camera features, we can clearly see that they use summaries to help them make decisions:

*“It has a high rating on battery life and picture”*,

*“It has decent reviews for video, zoom, and lens, but I was most excited about the excellent battery life compared to the competing brands”*,

*“The 100% battery statistic was the main selling point, with a nice spread on other features”*.

Their reasons of choices seems to be more thoughtful and logical than those who were presented to the non-summaries conditions:

*“It looked like it was probably of a higher quality than the others”*,

*“Best overall”*.

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## Discussion of Study 2

Study 2 is designed primarily to extend Study 1. Specifically, we enhance our research by testing hypotheses 1 and 2 on a larger sample and performing the analysis of the effect of summary on process satisfaction through a mediator of perceived review helpfulness.

Study 2 further confirms that there is no interaction effect between the summary and information overload. Nevertheless, results suggest that summary positively affects the process satisfaction through perceived review helpfulness. For those who see summaries, they perceive reviews as more helpful, which eventually leads to significantly higher process satisfaction. A close investigation of groups with different information overload reveals that the mediation effect is significant only under low information overload conditions. When information overload is high, the presence of review summary not necessarily brings higher perceived review helpfulness. This may be explained by the impaired cognitive efficiency in processing information caused by heavy information overload (Bawden & Robinson, 2009). Review summaries are essentially a tool to simplify information processing and to reduce mental effort when making purchase decisions – it still requires customers to spend time and energy, though less, to view and evaluate. Strong information overload disables customers' ability to process information in general, therefore, leads to relatively low effectiveness of review summaries. While under situations of limited information overload, the merits of review summaries are signified. Payne et al. (1991) point out that in a complex task environment, one may choose a selective way of processing information and distribute uneven attention for each of the attributes/alternatives. Review summaries, comparing to lengthy reviews, demands less cognitive effort and increases utility, which would be perceived as more useful and more convenient in assisting decision making.

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## General Discussion

### *Overall findings*

Two studies are designed to address the research question defined in Introduction: *Whether, and if so, why feature-based review summary would be an effective tool in assisting customer purchase decision making and subsequently increasing customers' decision satisfaction?* In Study 1, we find out that information overload has a significant negative effect on customers' purchase process satisfaction, which confirms previous findings in the literature that complex decision environment restrains an individual's ability to process and perceive information and leads to less satisfied and more confused experiences (Lee & Lee, 2004; Schick & Gordon, 1990).

Though our results fail to prove the moderating effect of review summary between information overload and process satisfaction, we find that summary significantly increases customers' perceived helpfulness of product reviews. Drawing on the literature of helping behavior, review summary serves as a helping deed which could be perceived as an endorsement of a group of reviewers' desires to help with problem-solving (Wasko & Faraj, 2005). From the perspective of bounded rationality, in a complex decision environment, individuals are prone to choose options that are helpful in reducing the amount of cognitive efforts even though they are not the most accurate ones (Shugan, 1980; Payne, Bettman, & Johnson, 1993). In Study 2 we further examine the role of perceived review helpfulness and find out that it significantly mediates the relation between feature-based summary and purchase process satisfaction under conditions of limited information overload. This finding can be explained by the theory of decision making, where humans' information-processing capacity influences their decision-making process and information overload causes mental burn-out (Park & Lee, 2007).

Contrary to results in Study 1, Study 2 reveals that summary positively affects process satisfaction. The drastic difference can be ascribed to the novelty of a review summary and the sample size bias. As in Study 2 we recruit a larger sample and create a purer research setting with only reviews and summaries being presented on the websites, we believe the positive relation is more valid and convincing. New formats may cause uncertainty for people as they expect that they need to perform new tasks by using them (Sujan, 1985). Therefore, ambiguity in

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results may be also accounted for the new interface agent adoption, that may cause several doubts among respondents.

Nevertheless, according to TAM model (technology acceptance model, Davis, 1989) that we adopted while asking about the helpfulness of a summary, the summary has the great potential to be adopted as it is both helpful (“usefulness” in TAM terminology) and easy to read (“ease-of-use”).

### ***Theoretical implications***

Our research is the interdisciplinary study that explores the role of feature-based review summary in assisting customers’ purchase decision making under conditions of information overload. Although there have been several attempts to create a summary out of customer reviews before (Cho & Kim, 2017; Wang, Zhu, & Li, 2013), to the best of our knowledge there has not been any tests of the efficiency of a summary as a decision facilitating tool in an e-commerce setting.

By proving the mediator of perceived review helpfulness and the positive relation between review summary and process satisfaction, we support the theory of mental information filtering mechanism and enrich literature on decision behavior with a new format of a decision aid. We also contribute to the studies of electronic word-of-mouth (eWOM) by introducing a new way of how its perceived usefulness can be enhanced.

### ***Managerial implications***

The managerial implications of our study are based on two conditions: the research of information overload for high involvement category and the testing of a new interface agent adoption. Our findings suggest that feature-based review summary increases customers’ perceived review helpfulness and contributes to purchase process satisfaction. Feature-based review summary will be a promising and helpful tool in assisting customer decision making in online shopping environment, especially when customers experiencing limited information overload. In our study, we simulate the limited information overload condition with 4 brands showing high similarity. This resembles a real-life shopping experience of product selection – customers first filter uninterested options, narrow down the selection to a few alternatives and then closely examine among these options to identify the most appealing one. The trade-off and evaluation among a few selected choices that takes most of the time. This stage is the most difficult one and lack of assistance may

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cause the shopping cart abandonment. In this case, review summary would be very effective as it not only helps customers to gain a comprehensive understanding of product features, but also highlights the prominent features that previous customers care most so to make the comparison easier, which subsequently improves their decision-making process and enhances their satisfaction. From the perspective of e-commerce journey, only 14.5% customers proceed to sessions with Add-to-Cart and only 3.3% complete their transactions (SmartInsights, 2018). The presence of review summary would ease the comparison and selection process and relieve customers' cognitive burden, which enhances their satisfaction of decision-making process and subsequently will facilitate their readiness to make a purchase.

Another merit of our study is that we use high-involvement feature-rich products (digital cameras) that may bring higher margins instead of low involvement, low margin products. Our research proves that information overload can also take place for products which involve high cognitive efforts by default. To relieve customers' pain in identifying the most relevant option, e-commerce retailers of electronic products/appliances should adopt environmental clues to make customers' choice process easier. Therefore, we suggest e-commerce websites to adopt feature-based summary for popular search products showing a certain level of similarity, this could be smartphones, digital cameras, laptops, microwave ovens etc.

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## Limitations and Suggestions for Further Research

### *Limitations*

The results in the present study are limited by product category, settings of the experiment, sample, and heteroscedasticity of a few linear models.

Our study is centered on feature-rich durable products (digital camera) and it has limited application when people are searching for products that are less demanding in terms of cognitive abilities (e.g. cheap products or product with few features) as they are not bothered to read through reviews or summaries and they may not perceive review summary as helpful.

Another limitation is that the experiment is conducted remotely. We believe that if the summary efficiency is tested in laboratory settings with necessary equipment (e.g. eye-tracking devices, timers) and remuneration that encourages thorough choice (e.g. a lottery when one of the participants receives his chosen camera as a gift), participants would have been more involved and the research results might have been further improved.

Furthermore, our sample in the second study is not representative in terms of gender distribution. Although there is evidence that males are more active in shopping digital products online than females across several regions (Harris Poll, Statistics Sweden, Statistics Denmark, n.d.), such a big difference in genders in our sample may not reflect the real situation in an online shopping environment.

Lastly, we find that 2 out of 7 linear regressions that we performed are heteroscedastic. However, by standardizing all the variables, we believe that the negative effect of heteroscedasticity is minimized.

### *Further research*

In study 1 we found the trend that product knowledge may influence the way people perceive a feature-based summary. Customers who possess high levels of product knowledge know better of their preferences, are more focused when searching for information, and evaluate more effectively with their own criteria (Cowley & Mitchell, 2003). What we find interesting is that participants, who have a rich knowledge of the product category, spend more time viewing summaries ( $M=4.57$ ,  $SD=1.45$ ) than those whose knowledge is small ( $M=4.09$ ,  $SD=1.57$ ). The same situation occurs with helpfulness assessment: those whose knowledge is rich perceive summary as more helpful ( $M=4.78$ ,  $SD=1.42$ ) than those whose

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knowledge is small ( $M=3.9$ ,  $SD=1.13$ ). Although the trend was not significant in our study, it is an area worth investigating for further research. Another area that worth exploring is the effect of a summary on result satisfaction. More precisely, how the certainty in the chosen product and the post-purchase regret may be influenced by the existence of a feature-based summary. Last but not least, the adoption of summaries for experiential goods (books, films, etc) may be an interesting research area. Although there are several challenges such as the difficulty to obtain product features from reviews as these features are mostly feelings and emotions, it may be promising to investigate whether people would trust the summary extracted from reviews or would prefer to read the whole review to see the total amount of feelings and emotions associated with the product.

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## Appendix

### *Appendix 1: Questionnaire for Study 1*

Dear Participants,

This study concerns the topic of online shopping. This questionnaire is part of a master thesis project. The information provided by you in this questionnaire will be used for research purposes only. It will not be used in a manner which would allow identification of your individual responses. Data will be deleted once the research is finished. Participation in this research study is completely voluntary. You have the right to withdraw at any time. By clicking on the 'next' button, you agree to participate in this survey. Thank you!

Q2 How would you describe your knowledge of digital camera's characteristics/features?

- Very limited (1)
- Limited (2)
- Somewhat limited (3)
- Neutral (4)
- Somewhat rich (5)
- Rich (6)
- Very rich (7)

Q3 How would you describe your interest in digital camera in general?

- Very uninterested (1)
- Uninterested (2)
- Somewhat uninterested (3)
- Neutral (4)

- Somewhat interested (5)
- Interested (6)
- Very interested (7)

Q4 To what degree would you agree with the following statements of online shopping?

Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (8)	Strongly agree (9)
--------------------------	-----------------	--------------------------	-----------------------------------	-----------------------	--------------	-----------------------

I am experienced in online shopping (1)

<input type="radio"/>							
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I buy things/service online often (> 4 times/month) (2)

<input type="radio"/>							
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I think thoroughly before I buy something expensive online (3)

<input type="radio"/>							
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I usually do a lot of research before I buy something expensive online (4)

<input type="radio"/>							
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I spend most of my time on viewing product descriptions when I shop online (5)

I spend most of my time on viewing customer reviews when I shop online (6)

Q6 To what degree would you agree with the following statement? When I shop online....

Strongly disagree (2)	Disagree (5)	Somewhat disagree (6)	Neither agree nor disagree (7)	Somewhat agree (8)	Agree (9)	Strongly agree (10)
--------------------------	-----------------	--------------------------	-----------------------------------	--------------------	-----------	------------------------

I know what features are more important to me

Q7 Please imagine that you develop the interest in photography and decide to buy a really fancy camera (over 200 USD price). You are not a fan of any specific brand, so you choose among the alternatives presented in the e-commerce store. You are not limited by the budget - you can afford any camera on the webpage. Nevertheless, you are seeking for the product with the best price/quality ratio. Please click on a link to view the website and choose a brand that you would prefer. Use at least 6 mins to view the web pages (but there is no upper limit). Please remember the chosen brand and come back to the questionnaire to continue. You can write down the brand of choice on a piece of paper in case you forget).

You will be able to proceed with the questionnaire after a thorough review of the website.

Q8 Which brand would you most likely to buy?

Q9 To what degree would you agree with the following statements?

			Neither			
Strongly	Disagree	Somewhat	agree	Somewhat	Agree	Strongly
disagree	(2)	disagree	nor	agree (5)	(6)	agree (7)
(1)		(3)	disagree			
			(4)			

I found the process of deciding which product to buy frustrating (1)

I found the process of deciding which product to buy interesting (2)

I am satisfied with my experience of deciding which product brand to choose (3)

Q10 Based on your experience with the website, to what degree would you agree with the following statements?

Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
disagree	(2)	disagree	agree	agree (5)	(6)	agree (7)
(1)		(3)	nor			

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disagree  
(4)

I carefully read  
the information  
available on the  
website (1)

There was too  
much  
information  
about the  
cameras so that I  
was burdened in  
handling it (2)

I could  
effectively  
handle all of the  
information on  
the website (3)

Because of the  
plenty  
information  
available, I felt  
difficult in  
acquiring all the  
relevant  
information that  
I need (4)

I was certain  
that the product  
information on  
the website  
fitted to my  
need (5)

I had no idea  
about where to  
find the  
information I

needed on this website (6)

I think the information is easy to understand (7)

I feel it takes a lot of effort to process the information available (8)

Q11 To what degree would you agree with the following statement? When I shop online...

Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
--------------------------	-----------------	--------------------------	-----------------------------------	-----------------------	--------------	-----------------------

I know what features are more important to me

Q12 Consider your online shopping simulation within this study, to what degree would you agree with the following statements?

Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (8)	Strongly agree (9)
--------------------------	-----------------	--------------------------	-----------------------------------	-----------------------	--------------	-----------------------

I spent most of my time on viewing product descriptions when I made

purchase  
decisions on this  
website (1)

I spent most of  
my time on  
viewing

customer  
reviews when I  
made purchase  
decisions on this  
website (2)

I think product  
descriptions are  
very helpful  
when making the  
purchase  
decisions on this  
website (3)

I think customer  
reviews are very  
helpful when  
making the  
purchase  
decisions on this  
website (4)

Q13 What's your gender?

Male

Female

Q14 What's your age?

Under 25

- 25 - 34
- 35 - 54
- 55 - 64
- 65 and above

Q15 What is the highest degree or level of school you have completed?

- High school or less
- Some college
- Graduated from college
- Some graduate school
- Completed graduate school

Q16 This is the end of the survey, thank you very much for your patience and support! If you are interested in knowing more about this research, you are welcome to contact [thesisgroupbi@gmail.com](mailto:thesisgroupbi@gmail.com).

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***Appendix 2: Questionnaire for Study 2***

Dear Participants,

This study concerns the topic of online shopping. This questionnaire is part of a master thesis project. The information provided by you in this questionnaire will be used for research purposes only. It will not be used in a manner which would allow identification of your individual responses. Data will be deleted once the research is finished. Participation in this research study is completely voluntary. You have the right to withdraw at any time. By clicking on the 'next' button, you agree to participate in this survey. Thank you!

Q1 How would you describe your knowledge of digital camera's characteristics/features?

- Very limited
- Limited
- Somewhat limited
- Neutral
- Somewhat rich
- Rich
- Very rich

Q2 How would you describe your interest in digital camera in general?

- Very uninterested
- Uninterested
- Somewhat uninterested
- Neutral

Somewhat interested

Interested

Very interested

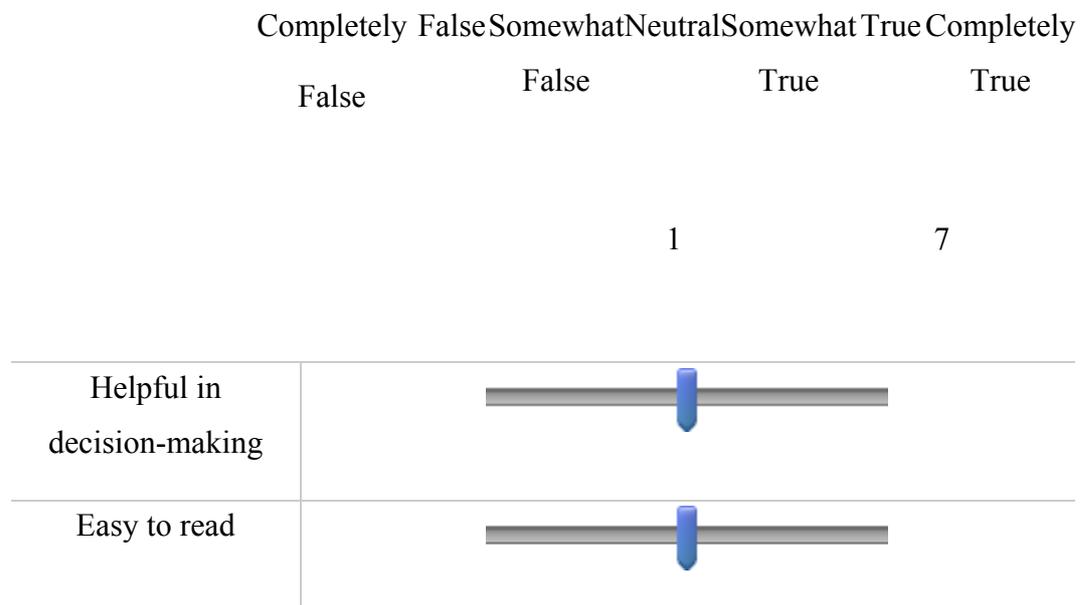
Q3 To what degree would you agree with the following statements of online shopping?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I am experienced in online shopping	<input type="radio"/>						
I buy things/service online often (> 4 times/month)	<input type="radio"/>						
I think thoroughly before I buy something expensive online	<input type="radio"/>						
I spend a lot of time on viewing customer reviews when I buy something expensive online	<input type="radio"/>						

Please imagine that you develop the interest in photography and decide to buy a really fancy camera (over 200 USD price). You are not a fan of any specific brand, so you choose among the alternatives presented in the e-commerce store. You are not limited by the budget - you can afford any camera on the web page. Nevertheless, you are seeking for the product with the <strong>best price/quality ratio. You are expected to view all cameras on the website before you make a thorough decision. There is no time limit for this. Please remember the chosen brand and come back to the questionnaire to continue. (You can write down the brand of choice on a piece of paper in case you forget. Click [HERE](#) to go to the website. (four links to the websites are assigned to each of the conditions)

(this question is only displayed to the treatments, when summaries are presented)

Q4 Please assess your overall experience with customer review summary. To what extent on the scale from 1 to 7 (1-completely false, 7 - completely true) you consider summary to be: A review summary looks like that:



Q6.1 Which brand would you most likely to buy?

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Q6.2 Can you please briefly explain why you chose the brand?

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Q7 To what degree would you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I found the process of deciding which product to buy frustrating	<input type="radio"/>						
I found the process of deciding which product to buy interesting	<input type="radio"/>						
I am satisfied with my experience of deciding which product to buy	<input type="radio"/>						

Q8 Based on your experience with the website, to what degree would you agree with the following statements?

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
There was too much information in customer reviews that I felt confused (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were so many brands to choose from that I felt confused (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The more I learned about the products, the harder it was to choose (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel it takes a lot of effort to process the information available(4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9 Consider your online shopping simulation within this study, to what degree would you agree with the following statements?

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	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
I feel that customer reviews helped me to make a decision	<input type="radio"/>						
It was easy for me to find important product characteristics from customer reviews	<input type="radio"/>						

Q10 What's your gender?

- Male
- Female

Q11 What's your age?

- Under 25
- 25 - 34
- 35 - 54
- 55 - 64
- 65 and above

Q12 What is the highest degree or level of school you have completed?

- High school or less
- Some college
- Graduated from college
- Some graduate school
- Completed graduate school

**Appendix 3: Results of Study 1**

Group comparability: same level of Involvement

Conditions: Low and high information overload groups with and without summary

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
How would you describe your knowledge	Between Groups	3.128	3	1.043	0.503	0.682
	Within Groups	95.372	46	2.073		
	Total	98.500	49			
How would you describe your interest in	Between Groups	1.705	3	0.568	0.296	0.828
	Within Groups	88.295	46	1.919		
	Total	90.000	49			
I am experienced in online shopping	Between Groups	2.325	3	0.775	0.399	0.755
	Within Groups	89.455	46	1.945		
	Total	91.780	49			
I buy things/service online often (> 4 times/mont	Between Groups	13.369	3	4.456	1.188	0.325
	Within Groups	172.551	46	3.751		
	Total	185.920	49			
I think thoroughly before I buy something	Between Groups	4.397	3	1.466	0.702	0.556
	Within Groups	96.103	46	2.089		
	Total	100.500	49			
I usually do a lot of research before I buy	Between Groups	8.240	3	2.747	1.037	0.385
	Within Groups	121.840	46	2.649		
	Total	130.080	49			

Manipulation checks:

Conditions: 4 options and 8 options with summary

	OVERLOAD_ MANIPULATION	Mean	SD	t	p
How would you describe your knowledge of digital camera's characteristics/features?	8 options	3.17	1.337	-1.884	.074
	4 options	3.23	1.363		

How would you describe your interest in digital camera in general?	8 options	4.42	1.443	-.805	.429
	4 options	4.69	1.437		
I am experienced in online shopping	8 options	4.42	1.975	-.903	.376
	4 options	4.15	1.676		
I buy things/service online often (>4 times/month)	8 options	5.67	.778	-1.528	.143
	4 options	4.85	1.676		
I think thoroughly before I buy something expensive online	8 options	6.33	.985	-.291	.773
	4 options	5.77	1.641		
I usually do a lot of research before I buy something expensive online	8 options	5.75	1.485	1.324	.199
	4 options	5.38	2.219		
I spend most of my time on viewing product descriptions when I shop online	8 options	5.42	1.24	-.443	.662
	4 options	5.54	1.33		
I spend most of my time on viewing customer reviews when I shop online	8 options	4.25	2.006	-.121	.904
	4 options	5.00	1.78		

Conditions: 4 and 8 options without summary

	OVERLOAD_ MANIPULATION	Mean	SD	t	p
How would you describe your knowledge of digital camera's characteristics/features?	8 options	2.83	1.337	-.119	.907
	4 options	3.92	1.553		
How would you describe your interest in digital camera in general?	8 options	4.42	1.379	.478	.637
	4 options	4.85	1.281		
	8 options	3.25	1.913	.357	.724

I am experienced in online shopping	4 options	4.0	2.236		
I buy things/service online often (>4 times/month)	8 options	5.08	1.621	1.547	.13
	4 options	5.92	1.038		
I think thoroughly before I buy something expensive online	8 options	5.67	1.557	1.051	.306
	4 options	5.85	1.519		
I usually do a lot of research before I buy something expensive online	8 options	6.25	.622	.48	.631
	4 options	5.54	1.761		
I spend most of my time on viewing product descriptions when I shop online	8 options	5.17	1.267	-.237	.815
	4 options	5.38	1.193		
I spend most of my time on viewing customer reviews when I shop online	8 options	5.0	1.809	-.986	.335
	4 options	4.92	1.32		

### Hypothesis Testing (1)

DV: Process Satisfaction

IV: Information Overload

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.478 <sup>a</sup>	.229	.213	.88739770

a. Predictors: (Constant), Info\_overload

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.201	1	11.201	14.224	.000 <sup>b</sup>
	Residual	37.799	48	.787		
	Total	49.000	49			

a. Dependent Variable: Process\_sat

b. Predictors: (Constant), Info\_overload

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.276E-16	.125		.000	1.000
	Info_overload	-.478	.127	-.478	-3.772	.000

a. Dependent Variable: Process\_sat

DV: Process Satisfaction

IV: Information Overload

Data split on two groups based on summary

**ANOVA<sup>a</sup>**

Summary	Model		Sum of Squares	df	Mean Square	F	Sig.
no_summary	1	Regression	4.596	1	4.596	4.816	.039 <sup>b</sup>
		Residual	21.948	23	.954		
		Total	26.544	24			
yes_summary	1	Regression	7.996	1	7.996	20.125	.000 <sup>b</sup>
		Residual	9.138	23	.397		
		Total	17.134	24			

a. Dependent Variable: Process\_sat

b. Predictors: (Constant), Info\_overload

**Coefficients<sup>a</sup>**

Summary	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
no_summary	1	(Constant)	.370	.196		1.884	.072
		Info_overload	-.608	.277	-.416	-2.195	.039
yes_summary	1	(Constant)	-.360	.126		-2.850	.009
		Info_overload	-.469	.105	-.683	-4.486	.000

a. Dependent Variable: Process\_sat

**Testing of the Hypothesis 2**

DV: Process Satisfaction

IV: Summary, Information Overload

Interaction: Summary\*Information\_Overload

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.605 <sup>a</sup>	.366	.324	.82205568

a. Predictors: (Constant), interaction, Summary, Info\_overload

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.914	3	5.971	8.836	.000 <sup>b</sup>
	Residual	31.086	46	.676		
	Total	49.000	49			

a. Dependent Variable: Process\_sat

b. Predictors: (Constant), interaction, Summary, Info\_overload

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.370	.165		2.238	.030
	Info_overload	-.608	.233	-.608	-2.608	.012
	Summary	-.730	.233	-.369	-3.128	.003
	interaction	.139	.270	.120	.514	.610

**Appendix 4: Results of Study 2**

Manipulation Check

4 options with summary and 8 options with summary: no significant difference in information overload

**Group Statistics**

	Group	N	Mean	Std. Deviation	Std. Error Mean
Q9_2	4 options w summary	26	3.08	1.853	.363
	8 options w summary	35	2.97	1.978	.334
Q9_3	4 options w summary	26	2.46	1.581	.310
	8 options w summary	35	2.94	1.893	.320
Q9_4	4 options w summary	26	3.38	1.878	.368
	8 options w summary	35	3.46	1.930	.326
Q9_8	4 options w summary	26	3.73	1.909	.374
	8 options w summary	35	4.37	1.880	.318

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q9_2	Equal variances assumed	.209	.649	.212	59	.833	.105	.499	-.892	1.103
	Equal variances not assumed			.214	55.819	.832	.105	.494	-.884	1.095
Q9_3	Equal variances assumed	2.980	.090	-1.052	59	.297	-.481	.458	-1.397	.434
	Equal variances not assumed			-1.080	58.134	.284	-.481	.446	-1.373	.411
Q9_4	Equal variances assumed	.155	.696	-.147	59	.884	-.073	.494	-1.061	.916
	Equal variances not assumed			-.147	54.817	.883	-.073	.492	-1.059	.914
Q9_8	Equal variances assumed	.358	.552	-1.308	59	.196	-.641	.490	-1.621	.340
	Equal variances not assumed			-1.305	53.557	.198	-.641	.491	-1.625	.344

4 options without summary and 8 options without summary: in the condition of 8 options people feel significantly more overloaded

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q9_2 4 options wo summary	32	4.28	1.938	.343
8 options wo summary	27	4.30	1.772	.341
Q9_3 4 options wo summary	32	2.38	1.338	.237
8 options wo summary	27	3.85	1.634	.314
Q9_4 4 options wo summary	32	3.31	1.635	.289
8 options wo summary	27	4.44	1.423	.274
Q9_8 4 options wo summary	32	5.16	1.687	.298
8 options wo summary	27	5.67	1.109	.214

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q9_2	Equal variances assumed	.620	.434	-.031	57	.975	-.015	.487	-.991	.960
	Equal variances not assumed			-.031	56.608	.975	-.015	.483	-.983	.953
Q9_3	Equal variances assumed	2.179	.145	-3.818	57	.000	-1.477	.387	-2.251	-.702
	Equal variances not assumed			-3.753	50.254	.000	-1.477	.393	-2.267	-.687
Q9_4	Equal variances assumed	.554	.460	-2.809	57	.007	-1.132	.403	-1.939	-.325
	Equal variances not assumed			-2.843	56.934	.006	-1.132	.398	-1.929	-.335
Q9_8	Equal variances assumed	4.020	.050	-1.345	57	.184	-.510	.380	-1.270	.250
	Equal variances not assumed			-1.392	54.007	.170	-.510	.367	-1.246	.225

8 options with and without summary: in the condition with summary respondents feel significantly more overloaded.

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q9_2 8 options w summary	35	2.97	1.978	.334
8 options wo summary	27	4.30	1.772	.341
Q9_3 8 options w summary	35	2.94	1.893	.320
8 options wo summary	27	3.85	1.634	.314
Q9_4 8 options w summary	35	3.46	1.930	.326
8 options wo summary	27	4.44	1.423	.274
Q9_8 8 options w summary	35	4.37	1.880	.318
8 options wo summary	27	5.67	1.109	.214

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q9_2	Equal variances assumed	.415	.522	-2.735	60	.008	-1.325	.484	-2.294	-.356
	Equal variances not assumed			-2.774	58.599	.007	-1.325	.478	-2.281	-.369
Q9_3	Equal variances assumed	1.653	.204	-1.988	60	.051	-.909	.457	-1.824	.006
	Equal variances not assumed			-2.026	59.194	.047	-.909	.449	-1.807	-.011
Q9_4	Equal variances assumed	3.921	.052	-2.229	60	.030	-.987	.443	-1.873	-.101
	Equal variances not assumed			-2.318	59.903	.024	-.987	.426	-1.839	-.135
Q9_8	Equal variances assumed	11.473	.001	-3.175	60	.002	-1.295	.408	-2.111	-.479
	Equal variances not assumed			-3.383	56.554	.001	-1.295	.383	-2.062	-.528

4 options with and without summary: group with summary demonstrates significantly low information overload

**Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Q9_2	4 options w summary	26	3.08	1.853
	4 options wo summary	32	4.28	1.938
Q9_3	4 options w summary	26	2.46	1.581
	4 options wo summary	32	2.38	1.338
Q9_4	4 options w summary	26	3.38	1.878
	4 options wo summary	32	3.31	1.635
Q9_8	4 options w summary	26	3.73	1.909
	4 options wo summary	32	5.16	1.687

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q9_2	Equal variances assumed	.336	.565	-2.400	56	.020	-1.204	.502	-2.210	-.199
	Equal variances not assumed			-2.411	54.483	.019	-1.204	.499	-2.206	-.203
Q9_3	Equal variances assumed	.773	.383	.226	56	.822	.087	.383	-.681	.854
	Equal variances not assumed			.222	49.149	.825	.087	.390	-.697	.870
Q9_4	Equal variances assumed	.539	.466	.156	56	.876	.072	.461	-.852	.996
	Equal variances not assumed			.154	49.989	.878	.072	.468	-.868	1.012
Q9_8	Equal variances assumed	2.929	.093	-3.017	56	.004	-1.425	.472	-2.372	-.479
	Equal variances not assumed			-2.978	50.418	.004	-1.425	.479	-2.387	-.464

Group comparability: same level of Involvement

Conditions: Low and high information overload groups with and without summary

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
How would you describe your knowledge	Between Groups	2.800	3	0.933	0.366	0.778
	Within Groups	295.791	116	2.550		
	Total	298.592	119			
How would you describe your interest in	Between Groups	9.889	3	3.296	1.123	0.343
	Within Groups	340.436	116	2.935		
	Total	350.325	119			
I am experienced in online shopping	Between Groups	2.497	3	0.832	1.360	0.259
	Within Groups	70.377	115	0.612		
	Total	72.874	118			
I buy things/service online often (> 4 times/mont	Between Groups	15.355	3	5.118	1.952	0.125
	Within Groups	304.237	116	2.623		
	Total	319.592	119			
I think thoroughly before I buy something	Between Groups	3.398	3	1.133	1.593	0.195
	Within Groups	81.745	115	0.711		
	Total	85.143	118			
I usually do a lot of research before I buy	Between Groups	3.532	3	1.177	0.959	0.414
	Within Groups	142.335	116	1.227		
	Total	145.867	119			

Moderation Analysis using linear regression

Model Summary <sup>c</sup>										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change	Durbin-Watson
						F Change	df1	df2		
1	.509 <sup>a</sup>	.259	.247	.86789827	.259	20.491	2	117	.000	
2	.510 <sup>b</sup>	.260	.240	.87151106	.000	.032	1	116	.858	2.118

- a. Predictors: (Constant), Summary, Infoovld
- b. Predictors: (Constant), Summary, Infoovld, infoosum
- c. Dependent Variable: Prosat

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.870	2	15.435	20.491	.000 <sup>b</sup>
	Residual	88.130	117	.753		
	Total	119.000	119			
2	Regression	30.894	3	10.298	13.559	.000 <sup>c</sup>
	Residual	88.106	116	.760		
	Total	119.000	119			

- a. Dependent Variable: Prosat
- b. Predictors: (Constant), Summary, Infoovld
- c. Predictors: (Constant), Summary, Infoovld, infosum

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.128	.116		-1.109	.270
	Infoovld	-.458	.083	-.458	-5.518	.000
	Summary	.252	.165	.127	1.524	.130
2	(Constant)	-.134	.121		-1.110	.269
	Infoovld	-.437	.144	-.437	-3.042	.003
	Summary	.255	.167	.128	1.528	.129
	infosum	-.032	.177	-.025	-.179	.858

- a. Dependent Variable: Prosat

**Moderation Analysis using PROCESS**

Model = 1

Y = Prosat

X = Infoovld

M = Summary

Sample size

120

\*\*\*\*\*

Outcome: Prosat

---

Model Summary

R	R-sq	MSE	F	df1	df2	p
.5095	.2596	.7595	14.0707	3.0000	116.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.0045	.0918	-.0492	.9609	-.1863	.1773
Summary	.2553	.1840	1.3873	.1680	-.1092	.6197
Infoovld	-.4534	.1087	-4.1733	.0001	-.6686	-.2382
int_1	-.0316	.2188	-.1443	.8855	-.4649	.4018

Product terms key:

int\_1 Infoovld X Summary

R-square increase due to interaction(s):

	R2-chng	F	df1	df2	p
int_1	.0002	.0208	1.0000	116.0000	.8855

\*\*\*\*\*

Conditional effect of X on Y at values of the moderator(s):

Summary	Effect	se	t	p	LLCI	ULCI	
	-.5083	-.4374	.1843	-2.3729	.0193	-.8025	-.0723
	.4917	-.4690	.1179	-3.9775	.0001	-.7025	-.2354

Mediation Analysis: Test of the Assumptions for Linear regression

model 1: Process\_sat = Summary + const

VIF: no multicollinearity

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.261	.126		-2.070	.041		
	Summary	.514	.177	.258	2.903	.004	1.000	1.000

a. Dependent Variable: Process\_sat

Durbin-Watson test: no autocorrelation

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.258 <sup>a</sup>	.067	.059	.97018203	2.196

a. Predictors: (Constant), Summary  
b. Dependent Variable: Process\_sat

Heteroscedasticity: no heteroscedasticity

For model:

$$u^2 = \gamma_1 Summary + const$$

$$H_0: \gamma_1 = 0 \quad H_1: \text{at least one } \gamma_j \neq 0$$

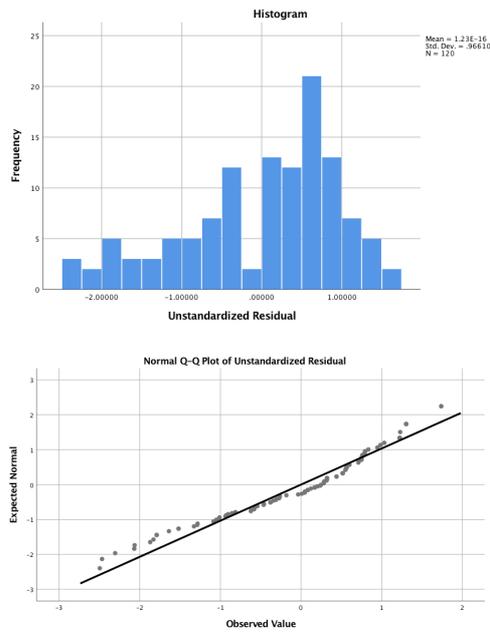
The model is not significant (F=.773, p=.381). Thus, we reject H1 and conclude that the model is homoscedastic.

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.207	1	1.207	.773	.381 <sup>b</sup>
	Residual	184.136	118	1.560		
	Total	185.343	119			

a. Dependent Variable: U\_2\_model1  
b. Predictors: (Constant), Summary

Normality: Judging by the graphs as well as the values of skeweness (-.69) and kurtosis (-.154) we may conclude that the residuals are normally distributed.



Model 3: Perc\_rev\_help = Summary + const

VIF – no multicollinearity

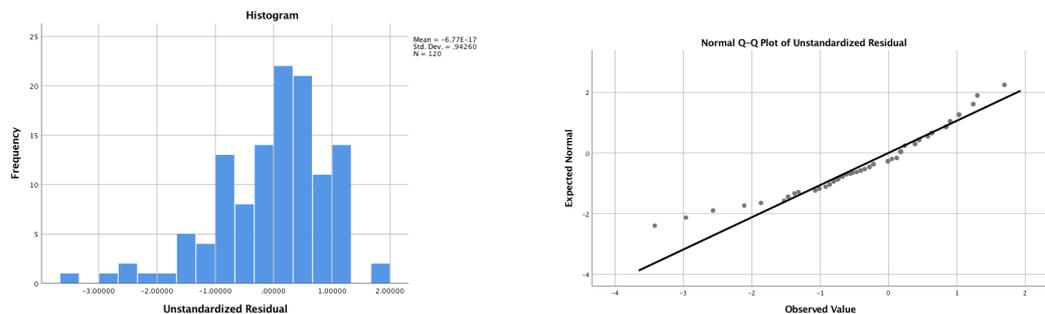
**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.338	.123		-2.744	.007	
	Summary	.665	.173	.334	3.848	.000	1.000

a. Dependent Variable: Perc\_rev\_help

Heteroscedasticity: this model is heteroscedastic

The model is normal. Although skeweness and kurtosis are distant from zero, the distribution of residuals follows the normal one.



### Mediation Analysis

Model = 4

Y = Process satisfaction

X = Summary

M = review helpfulness

Sample size

120

\*\*\*\*\*

Outcome: rvrhel (path a)

#### Model Summary

R	R-sq	MSE	F	df1	df2	p
.3339	.1115	.8960	14.8083	1.0000	118.0000	.0002

#### Model

	coeff	se	t	p	LLCI	ULCI
constant	-.3381	.1232	-2.7436	.0070	-.5822	-.0941
Summary	.6651	.1728	3.8482	.0002	.3229	1.0074

\*\*\*\*\*

Outcome: Process satisfaction (path b, c')

#### Model Summary

R	R-sq	MSE	F	df1	df2	p
.6148	.3780	.6326	35.5543	2.0000	117.0000	.0000

---

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.0613	.1068	-.5737	.5673	-.2728	.1502
rvrhelph	.5920	.0774	7.6531	.0000	.4388	.7452
Summary	.1205	.1541	.7822	.4357	-.1846	.4257

\*\*\*\*\*TOTAL EFFECT MODEL\*\*\*\*\*

Outcome: Process satisfaction (path c)

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2582	.0667	.9413	8.4272	1.0000	118.0000	.0044

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.2614	.1263	-2.0697	.0407	-.5115	-.0113
Summary	.5143	.1772	2.9030	.0044	.1635	.8651

\*\*\*\*\* TOTAL, DIRECT, AND INDIRECT EFFECTS \*\*\*\*\*

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5143	.1772	2.9030	.0044	.1635	.8651

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.1205	.1541	.7822	.4357	-.1846	.4257

Indirect effect of X on Y

---

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.3937	.1161	.1906	.6501

Partially standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.3937	.1099	.1923	.6256

Completely standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.1977	.0550	.0970	.3145

Ratio of indirect to total effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.7656	.8750	.3613	2.0057

Ratio of indirect to direct effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	3.2669	161.0854	.3289	1461.8849

R-squared mediation effect size (R-sq\_med)

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.0634	.0379	.0020	.1508

Normal theory tests for indirect effect

Effect	se	Z	p
.3937	.1153	3.4148	.0006

Model estimation for 4 options sample

---

Y = Prosat

X = Summary

M = rvrhelphelp

Sample size

58

\*\*\*\*\*

Outcome: review helpfulness (path a)

Model Summary

R	R-sq	MSE	F	df1	df2	p
.3900	.1521	1.0853	10.7329	1.0000	56.0000	.0018

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.5387	.2217	-2.4296	.0183	-.9828	-.0945
Summary	.8718	.2661	3.2761	.0018	.3387	1.4049

\*\*\*\*\*

Outcome: Proress satisfaction (path b, c')

Model Summary

R	R-sq	MSE	F	df1	df2	p
.6761	.4571	.5505	17.7208	2.0000	55.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	.0418	.1444	.2896	.7732	-.2475	.3311
rvrhelphelp	.5807	.1158	5.0162	.0000	.3487	.8127

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Summary	.0840	.2280	.3682	.7141	-.3731	.5410
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\*\*\*\*\* TOTAL EFFECT MODEL \*\*\*\*\*

Outcome: Prosess satisfaction (path c)

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2993	.0896	.9067	5.6997	1.0000	56.0000	.0204

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.2710	.1934	-1.4010	.1667	-.6585	.1165
Summary	.5902	.2472	2.3874	.0204	.0950	1.0855

\*\*\*\*\* TOTAL, DIRECT, AND INDIRECT EFFECTS \*\*\*\*\*

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.5902	.2472	2.3874	.0204	.0950	1.0855

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.0840	.2280	.3682	.7141	-.3731	.5410

Indirect effect of X on Y

Effect	Boot SE	BootLLCI	BootULCI
rvrhelph	.5063	.1841	.2023 .9291

---

Partially standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.5118	.1636	.2120	.8589

Completely standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.2568	.0817	.1081	.4352

Ratio of indirect to total effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.8577	8.8973	.3433	2.7165

Ratio of indirect to direct effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	6.0297	942.9270	1.6537	5862.0481

R-squared mediation effect size (R-sq\_med)

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.0881	.0605	-.0073	.2332

Normal theory tests for indirect effect

Effect	se	Z	p
.5063	.1871	2.7055	.0068

4 options

Model estimation for sample of 8 options

Y = Prosat

X = Summary

M = rvrhelphelp

Sample size

62

\*\*\*\*\*

Outcome: rvrhelphelp

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2465	.0608	.7023	3.4936	1.0000	60.0000	.0665

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.1004	.1884	-.5330	.5960	-.4773	.2764
Summary	.4229	.2263	1.8691	.0665	-.0297	.8755

\*\*\*\*\*

Outcome: Prosat

Model Summary

R	R-sq	MSE	F	df1	df2	p
.5711	.3261	.7221	15.0066	2.0000	59.0000	.0000

Model

	coeff	se	t	p	LLCI	ULCI
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constant	-.1854	.1772	-1.0460	.2998	-.5400	.1692
rvrhelph	.6441	.1615	3.9888	.0002	.3210	.9672
Summary	.1812	.2592	.6990	.4873	-.3375	.6999

\*\*\*\*\* TOTAL EFFECT MODEL \*\*\*\*\*

Outcome: Prostat

Model Summary

R	R-sq	MSE	F	df1	df2	p
.2227	.0496	1.0014	3.0651	1.0000	60.0000	.0851

Model

	coeff	se	t	p	LLCI	ULCI
constant	-.2501	.1910	-1.3092	.1954	-.6321	.1320
Summary	.4536	.2591	1.7508	.0851	-.0647	.9718

\*\*\*\*\* TOTAL, DIRECT, AND INDIRECT EFFECTS \*\*\*\*\*

Total effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.4536	.2591	1.7508	.0851	-.0647	.9718

Direct effect of X on Y

Effect	SE	t	p	LLCI	ULCI
.1812	.2592	.6990	.4873	-.3375	.6999

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Indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.2724	.1498	.0239	.6237

Partially standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.2676	.1485	.0135	.5990

Completely standardized indirect effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.1337	.0734	.0082	.2984

Ratio of indirect to total effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.6005	7.6000	-.1081	4.6330

Ratio of indirect to direct effect of X on Y

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	1.5033	1012.5650	.0630	781.2819

R-squared mediation effect size (R-sq\_med)

	Effect	Boot SE	BootLLCI	BootULCI
rvrhel	.0422	.0424	-.0069	.1674

Normal theory tests for indirect effect

Effect	se	Z	p
.2724	.1650	1.6505	.0988

