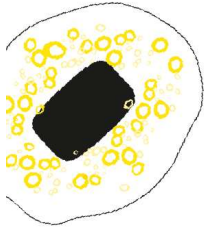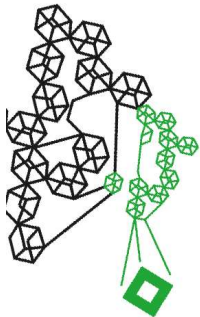**UNIVERSITY OF TWENTE.**

Master Thesis

The effect of social proof on customer purchases: an experiment with client testimonials and online reviews on website conversions

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Abstract

E-commerce businesses continue to grow as more consumers and businesses make their purchases online. The most critical challenge for online businesses is reducing the risk online visitors perceive compared to shopping offline. Online businesses can reduce risk by showing other customers' experiences through social proof. Social proof can take many forms, like celebrity endorsements and advice from friends and family. In an online context, electronic word-of-mouth is often used in the form of reviews. In this study, I focus on the effect of reviews through online reviews posted on a third-party website and the effect of customer testimonials. The effects of customer testimonials and online reviews on several website metrics were studied. First, consumer behavior was studied through bounce rate, and the path-to-purchase was studied through personalization, micro-conversions, and purchases. Customer testimonials are expected often perceived as expert opinions, thus creating higher perceived source expertise. In addition, online reviews are expected to have higher perceived trustworthiness since these are written on independent third-party review websites. The effect was studied using an online experiment, where website visitors were shown a variation of the website with either online reviews, customer testimonials, or the original website. Results show that social proof is crucial during the pre-purchase phase, where OR significantly improves the number of micro-conversions.

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1. Introduction

1.1 Background

Developing and maintaining trust has been one of the key challenges marketers have these days. This is also recognized by the Marketing Science Institute, which considers it a Tier 1 research priority (Marketing Science Insitute, 2020). In this study, the focus is to investigate the influence of social proof in the form of customer reviews on website visitor's behavior in their path-to-purchase. In this thesis, customer reviews are modelled to have either a function of authenticity or authority. Authentic reviews in the form of reviews posted on third-party-review websites (OR) such as trustpilot are used, as they are regarded as more trustworthy (Ho-Dac et al., 2013), since the business itself has no influence on the review. However, according to Park & Nicolau (2015), OR posted on third-party-review sites hold perceived lower expertise compared to customer testimonials (CT). CT have a higher perceived expertise due to the reviewers authority, but according to Seiler & Kuzca (2017), their perceived trustworthiness is lower than OR, as businesses have an influence of the presented reviews. Both types are measured through various metrics on the website. In this thesis, we will estimate the effect of CT and OR on through the actual behavior of visitors on a Dutch webshop in terms of conversions and bounce rates.

Especially online, building trust is essential, as customers perceive more risk. This is caused by a lack of face-to-face contact (Hidayat, Saifullah, & Ishak, 2016) and the absence of physical products to review (Dachyar & Banjarnahor, 2017). Moreover, trust is an essential element of building customer relationships (Mahliza, 2020). Because e-commerce is still proliferating (Emerce, 2021) and lack of trust is one of the reasons customers might not buy

online (Kim, Ferrin, & Rao, 2008), the importance of developing trust is essential. Although other factors, such as price, can influence purchases, these are out of the scope of this study.

In an online context, trust can come from a variety of sources, including online reviews (OR) and customer testimonials (CT). Reviews are generally user-generated content posted on a third-party review website like Trustpilot. Companies can then display these reviews on their website by using a widget provided by the review website. On the other hand, Testimonials can be defined as customer stories told by customers who have authority on the subject. One of the main differences between CT and OR, is the reviewer's motivation. OR on a third-party review website are submitted independently of the business. The reviewer is intrinsically motivated to submit the review, meaning that he writes the review for no other reason than for the activity itself. On the other hand, CT is extrinsically motivated: a business asks a customer whether he wants to share his experience with the company. The company can select which customers they want to share their experience with, altering the story's outcome. For example, a business can ask customers that will merely share positive experiences, ask experienced customers who have authority (i.e., are experts) on the subject, and not post stories that are not in line with their marketing objectives. OR are regarded as highly trustworthy sources (Park & Nicolau, 2015; Duverger, 2013), while CT is seen as a source with higher expertise (Seiler & Kuzca, 2017), but lower trustworthiness (Willemsen, Neijens & Bronner, 2012). These subjects will be elaborated upon in the theoretical framework.

Ultimately, the objective of every e-commerce website is to persuade customers to make a purchase. One of the most common ways of persuading customers to make a purchase is through persuasion principles. Most commonly known are the persuasion principles proposed by Cialdini (2001): reciprocity, commitment, authority, liking, scarcity, and social proof. A lot of these principles are already being implemented online. For example, scarcity is commonly used by websites like Booking.com, where they try to persuade customers to book

a hotel room by showing only three rooms available. Another example is commitment, where businesses offer a free trial if a visitor signs up with their contact information. Social proof is a persuasion principle that can influence a person's trust. (Amblee & Bui, 2011). In an online context, this principle can be implemented by showing electronic word of mouth (e-WOM) in the form of online reviews, and testimonials. In this study, we will examine whether social proof has an effect on measurable purchase-related behavior and whether CT and OR differ significantly.

1.2 Research objective

In this thesis, the main objective is to study the effect of CT and OR on online purchasing behavior. Online conversions can take many forms, for example, signing up for a newsletter, asking for a quotation or making a purchase, or micro-conversions leading to a purchase. As the main objective is to find whether social proof affects the decision to make a purchase, during this study, we will focus on the path-to-purchase. The path-to-purchase for webshops in building materials is more complex than general consumer products. In this specific path-to-purchase visitors firstly configure and personalize their products (personalization), after which the visitor gets an offer for their project (micro-conversion) and finally purchase the products (transactions). This will be elaborated upon during the experiment setting. The research question is:

'Do customer testimonials and online reviews have a positive effect on measurable purchase-related website behavior in Dutch construction business?'

To answer this research question, the existing theory was examined, and the hypotheses were tested in a real-life setting on visitors of the company website.

1.3 Academic Relevance

The research has both practical and academic relevance. As already discussed in the introduction, maintaining trust along the customer journey is a Tier 1 research priority, according to the MSI. This study can contribute to the academic work by adding to existing theories with proof from a real-life setting. For example, Huang et al. (2019) found eWOM to contribute to the pre-purchase phase of the path-to-purchase significantly. In this thesis, we will differentiate eWOM into two types: online reviews and customer testimonials. Thus we can identify whether both types contribute to the pre-purchase phase. Another example of the theoretical work this study can help prove is the work of Colicev, Kumar, and O'Connor (2018). In their study, the theory stated that expertise will dominate trustworthiness in purchases, but trustworthiness is more critical in previous phases of a consumer's path-to-purchase. The differentiation of OR and CT can contribute to this understanding by examining the results, as OR increases trustworthiness ((Park & Nicolau, 2015; Duverger, 2013) but testimonials increase perceived expertise (Seiler & Kuzca, 2017) the differences between are academically relevant in regard of the path-to-purchase.

Although many of these forms of e-WOM are already implemented in nowadays websites, the direct effect of CT and OR, especially the differences of both forms, is limitedly studied. To our knowledge, the effect has not been studied in Dutch construction.

1.4 Practical relevance

Using this study, businesses can determine whether adding social proof elements to their website will increase their customers' purchases. Moreover, the study can be used to assess whether CT is valued higher or lower than OR by the company's customers, therefore opening opportunities to implement these elements in the company's communication.

2. Theoretical Framework

This chapter, the theoretical foundation for the proposed hypotheses will be addressed. Then, the usage of social proof in an online context will be discussed, after which the differences between online reviews and customer testimonials will be highlighted.

2.1 Social Proof

One of the ways e-commerce businesses try to achieve perceived trust is through forms of social proof. The social proof principle is based on the idea that consumers follow the lead of peers when they are uncertain about the action they need to take (Cialdini, 2001). Consumers tend to believe that when they follow the successful behavior of peers, the chance of making a wrong decision decreases (Lee et al., 2008). By showing the positive experiences of previous customers, businesses try to get new customers to trust them. According to Cialdini (2001), people tend to look to peers to determine how to feel and act. Especially in uncertain cases, showing previous customers' experiences can lead to higher trust. (Cialdini & Goldstein, 2002). Consumers can use several sources as social proof: Experts and leaders, celebrities and influencers, family, and the crowd's wisdom. The social proof principle has been used in marketing practices for multiple decades, and many of the aforementioned sources can be recognized throughout the following examples. As early as the 19th-century forms of social proof were used in certain instances. Theatres hired people to applaud after the encore of a performance (Lupyan & Rifkin, 2003). This resulted in other spectators applauding as well. Another example is the usage of laughter effects in cinemas or movies (Hanich, 2014). In this study, spectators laughed along with the laughter effects in movies, even when they did not necessarily think the scene was funny.

One of the most effective ways of social proof is word-of-mouth (WOM). Previous customers sharing their experiences has been one of the most helpful information sources for potential

new customers for many years (Arndt, 1967). In an online context, social proof is used through electronic word-of-mouth (eWOM), where companies display the experiences of other customers through reviews (Amblee & Bui (2011). In this study, we focus on two reviews types: online reviews (OR), and customer testimonials (CT)

2.2 Online reviews

Online reviews (OR) are defined as user-generated content (UGC) where customers evaluate the product and experience with the company, in the form of a review posted on the company's website or a third-party website, such as Trustpilot, Google, or the Feedbackcompany. (Shaheen et al. 2020). Typically, it has two components: a quantitative element, such as a star-rating, and a textual element (Aghakhani et al., 2021), with which the reviewer can elaborate on the given rating.

OR is commonly used by websites and helps consumers make decisions about their purchases. In today's online environment, OR is seen as a driving force in online marketing (Cui et al., 2015), significantly improving purchase intention (Zhu, Wang, He, & Tian, 2020). The persuasive aspect of OR is often awarded to them because of their trustworthiness. The reviews on online review websites are generally viewed as reliable, as they are generated by independent users, rather than the business itself and, therefore, not driven by profit (Ho-Dac et al., 2013; Willemsen et al., 2012). Whether et al. (2007) found that information from independent sources, such as third-party review websites, is more reliable than information from the website of an online business.

Consumers are, however, also aware of the fact that reviews can be manipulated by the business, and therefore deem negative reviews to be more credible than solely positive reviews (Gavillan, Avello, & Martinez-Navarro, 2018). The fact that everyone can post a review has another aspect that depreciates the value of online reviews: consumers cannot

determine whether the person who wrote the review actually has enough experience to judge the quality of products, or knows enough about the market and business to make certain claims (Willemsen et al. 2012). Especially in an online business selling frames and windows, an argument could be made that the opinions of contractors, carpenters, and engineers are more important than those of a do-it-yourselfer (DIY) or private consumers.

2.3 Customer Testimonials

Customer testimonials (CT) are another form of eWOM (Ghebremariam, 2021) and can be seen as an alternative to OR. CT is defined as an endorsement of a customer representative to the company's target group (Wentzel et al., 2007). As CT is owned and posted by the business itself (Ghebremariam, 2021), the company controls the narrative of the testimonial and can post testimonials in line with its targets (Schivinski & Dabrowski, 2016). Although a testimonial is not a fake story, the company can select the customer and determine what customers to post on the website. Therefore a testimonial is controlled and in line with the company's ideas.

As OR, CT increases the level of trust website visitors have in the website compared to businesses that do not use CT (Spillinger & Parush, 2012). Contrary to OR, testimonials do not contain a quantitative element, and the review is given merely textual (Spillinger & Parush, 2012). In their study, Seiler & Kuzca (2017) found that presenting the CT with credentials (e.g. job description, name & photograph), enhances the perceived expertise awarded to the review. Moreover, as the reviewer's credentials can be verified, he can be regarded as an expert by website visitors (Seiler & Kuzca, 2017). Chen & Ho (2015) found expert opinions to be more credible than the opinion of laypersons. Although not every OR on a third-party website is written by a layperson, the credentials of the reviewer cannot be verified. The idea that CT can have a more positive effect on purchases than OR is based on

the theory of Colicev et al. (2018), showing that perceived expertise more important during purchasing phase of the path-to-purchase.

2.4 Differences between Customer testimonials and Online reviews

In this thesis, we propose that the main differences between CT and OR are the perceived trustworthiness and perceived expertise of the reviewer. Whether visitors accept eWOM as an information source is mainly dependent on whether the message is perceived to be true (Chong et al., 2018). Whether a message is perceived as true is largely dependent on the perceived credibility of the source of the message (Berlo, Lemert, & Mertz, 1969). Source credibility is influenced mainly by source expertise and source trustworthiness (Lowry, Wilson, & Haig, 2013); these components are decisive for the recipient of a message in determining whether the message is credible. The reason these are the main differences can be found in several previous studies. Hazelzet (2014) found that consumers perceive online reviews as more trustworthy than expert opinions. As CT can be regarded as expert opinions (Seiler & Kuzca, 2017), OR is expected to enhance perceived trustworthiness. However, due to their expertise, experts are found to be more credible than people who are not experts (Cheng & Ho, 2015). Other differences appear in the design of OR and CT. While OR generally has both a quantitative component (e.g., star-rating) and a textual component, CT does not have a quantitative component (Ghebremariam, 2021). Furthermore, CT is often displayed with credentials (Seiler & Kuzca, 2018)., while OR can be posted anonymously.

2.5 Social proof and Expertise

Source expertise can be defined as the extent to which an individual has the experience or knowledge to provide correct information about specific subjects (Homer & Kahle, 1990). It is considered one of the primary mechanisms in reducing uncertainty for consumers when they use sources of social proof, like reviews or testimonials (González-Rodriguez et al. 2016). The study by Gonzalez-Rodriguez et al. (2016) also shows that comments are usually

perceived as more useful when they are written by an expert source, consistent with Cheng & Ho (2015). This is a challenge in the current online landscape, as anyone can post online. Especially on third-party review websites, as reviews can be posted anonymously with a false name. Therefore, website visitors cannot check the credentials or judge the reviewer's expertise.

2.6 Social proof and Trustworthiness

Trust can be defined as the 'willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis, & Schoorman, 1995). Meaning that one party is willing to take a risk that another party will fulfill its promise. In an online environment, there is no face-to-face contact, and buyers are unable to touch or feel the product, increasing the risk website visitors experience (Hidayat et al., 2016; Dachyar et al., 2017). Therefore, trust is one of the most challenging aspects for e-commerce websites. Most consumers still fear negative experiences, and even experienced online shoppers want to be able to judge the trustworthiness of a website (Utz, Kerkhof, & Bos, 2012). Businesses use social proof to build up trustworthiness between the business and the customer (Schneider et al., 2018). Moreover, eWOM offers visitors an option to judge an online company's trustworthiness by reviewing previous customers' experiences (Fillieri, 2016). While text is the most essential component of a review, quantitative elements like ratings improve their perceived trustworthiness (Nazlan et al., 2018). Trustworthy reviews, moreover, have a significant positive effect on consumer's intention to purchase (Boer, 2021; Thomas et al., 2019) but are mainly important to decide whether customers consider buying products from a business (Colicev et al., 2018).

2.7 Social proof and Website Behavior

Whether or not a customer trusts a business influences his behavior on the website. It affects the time visitors spend on the website, the number of pages they visit, or the bounce rate of visitors (Singal & Kohli, 2016). The bounce rate refers to the number of sessions that only have one page view (Kamerer, 2020).

Homepage visits are often the first impression a visitor has with an online business; therefore, creating the perception of trust is essential to a website's success (Lowry, Wilson, & Haig, 2013). Assessing whether OR or CT significantly affects the visitors' behavior is a relevant subject in this research. The main differences between CT and OR are the different perceptions of trustworthiness or expertise, behavior that either perceived trustworthiness or expertise can influence is relevant to this study. Singal & Kohli (2016) found that bounce rate can indicate whether visitors believe the business to be trustworthy, meaning that trustworthy websites will have a lower bounce rate. The bounce rate is often used in studies predicting purchase intention (Kabir et al., 2019; Hoek, 2020). As discussed in the previous sections, OR is expected to enhance the trustworthiness of the website, and therefore hypothesis are:

H1: The presence of online reviews decreases the bounce rate, versus no presence of online reviews

H2: The presence of online reviews decreases the bounce rate, versus customer testimonials

H3: The presence of customer testimonials decreases the bounce rate, versus no presence of customer testimonials

2.7 Social proof and Purchases

After deciding not to leave the website, the customer can take several directions depending on their needs. A customer can for example, just be looking for more information about the products. In this study, however, the focus is on the effect on of CT and OR on the decision-making process toward purchases. Various scholars use this path-to-purchase concept, and has

many interpretations in literature (Towers & Towers, 2022). According to Towers & Towers (2018), the concepts of path-to-purchase, customer journey, and the customer decision-making process are used interchangeably. The common denominator within this concept consists of: before, during, and after purchase (Lemon & Verhoef, 2016; Batra & Keller, 2016). For this thesis, the phases of interest are the pre-purchase and purchase phase, as post-purchase is out of scope. In the pre-purchase stage, the customer searches, considers, and evaluates options in order to make a well-considered decision. In this stage, visitors' trustworthiness is most important (Colicev & O'Connor, 2018), as visitors are reluctant to buy products when they do not trust the seller (Kim et al., 2008). This is supported by Huang et al. (2019), who found that implementing online reviews on e-commerce websites, affected visitors in their pre-purchase phase: visitors added more products to their cart when being exposed to OR. Company-specific, the add-to-cart phase of the path-to-purchase is divided in two stages: personalization and micro-conversions. The company-specific stages will be discussed in the next section, but hypotheses can be made based on the theory:

H4: The presence of online reviews increases the number of personalizations, versus no presence of online reviews

H5: The presence of online reviews increases the number of personalizations, versus the customer testimonial

H6: The presence of customer testimonials increases the number of personalizations, versus no presence of customer testimonials

H7: The presence of online reviews increases the number of micro-conversions, versus no presence of online reviews

H8: The presence of online reviews increases the number of micro-conversions, versus the customer testimonial

H9: The presence of customer testimonials increases the number of micro-conversions, versus the original website

After the consideration stage, however, the effects of OR diminished (Huang et al., 2019). Colicev et al. (2018) found that in the pre-purchase stage, perceived trustworthiness was essential to visitors, partially explaining the results of Huang et al. (2019). Colicev et al. (2018) deemed perceived expertise more critical after the consideration stage. Therefore, we expect CT to perform better than OR on purchases:

H10: The presence of customer testimonials increases the number of purchases, versus no presence of customer testimonials

H11: The presence of customer testimonials increases the number of purchases, versus the presence of online reviews

H12: The presence of online increases the number of purchases, versus no presence of online reviews

3. Empirical context

In this chapter, the empirical context of the thesis will be discussed. The variables discussed in the theoretical framework will be applied to the context of this research and the research model will be discussed.

3.1 Company

This study was performed on behalf of a Dutch online platform where B2C and B2B customers can buy frames for windows, doors, and similar products. The company aims to fill the 'gap' between traditional factories, focusing on larger projects, and SMEs operating in the consumer market. Moreover, consumers can purchase their frames directly on the website. The company offers a website where consumers and SMEs can personalize their preferred frames. These frames are then produced by factories affiliated with the platform. It acts as the middleman: factories get to produce on a larger scale without dealing with customer support, service, and transportation to a comprehensive set of customers, while the customers get the attention they need. The research objective is to study the effects of OR and CT on websites and whether there is a significant difference in visitors' behavior and along the path-to-purchase. To clarify the concepts studied, the discussed independent variables (CT and OR) and the independent variables will be discussed in the company's context.

In this research, OR is regarded as user-generated content on a third-party review website. The company of offers customers the option to post either positive or negative reviews on the feedbackcompany.com website. Feedbackcompany offersa a function with which a company can display reviews given on the third-party website on their own website. This function was used to display OR on the homepage of the website. The design used can be found in Appendix A. The other variation in this thesis is CT. For this variation, an original customer testimonial was used, where an existing customer gave his opinion on the products and services of the company. The selected customer has authority on the subject through his job and expertise, which are presented in the testimonial. The customer also consented to the testimonial being displayed with his name and photo, and therefore his credentials can be verified. The design of the CT variation can be found in Appendix B.

Whether OR and CT have a positive effect, will be studied on website behavior and the path-to-purchase. The website behavior will be analyzed using the homepage's bounce rate, where the variations are displayed. In the conversion funnel for the company, a visitor must take three steps to be able to make a purchase: personalization, micro-conversions, and purchasing. In the personalization stage, a visitor composes a frame on the website. Every frame is customized, as every house is different; therefore, every consumer must complete this stage to make a purchase. During this stage, visitors can view prices and delivery time changes according to their personalization. The micro-conversions happen after the personalization process. After completing the steps in the personalization process, the visitor has the option to save the frame into a project: using this step the visitor can take time to consider buying the frame. After this micro-conversion, there is only one step to complete the transaction: the actual purchase.

Figure 1: Path-to-purchase

3.2 Research model

As discussed in the prior sections, this research aims to find the effect of OR and CT on

bounce rate, personalization, micro-conversions, and purchases. In order to adequately study

this effect, the original website is used as a control condition. While the research focuses on

the effects on bounce rate, personalization, micro-conversions, and purchases, several control

variables are included, as these could influence the outcomes of the variables of interest. The

day of the week is a highly influential variable in the company of interest. Data from the

company shows that Mondays are overperforming days while Sundays are underperforming

days; therefore, these are included as control variables. Another control variable is the website

sessions: the number of visits on the page with the variation or control condition. This control

variable is vital as the studied variables are count variables (this will be discussed in the

operationalization). As more sessions can lead to a higher amount of the studied variables,

this should be controlled for.
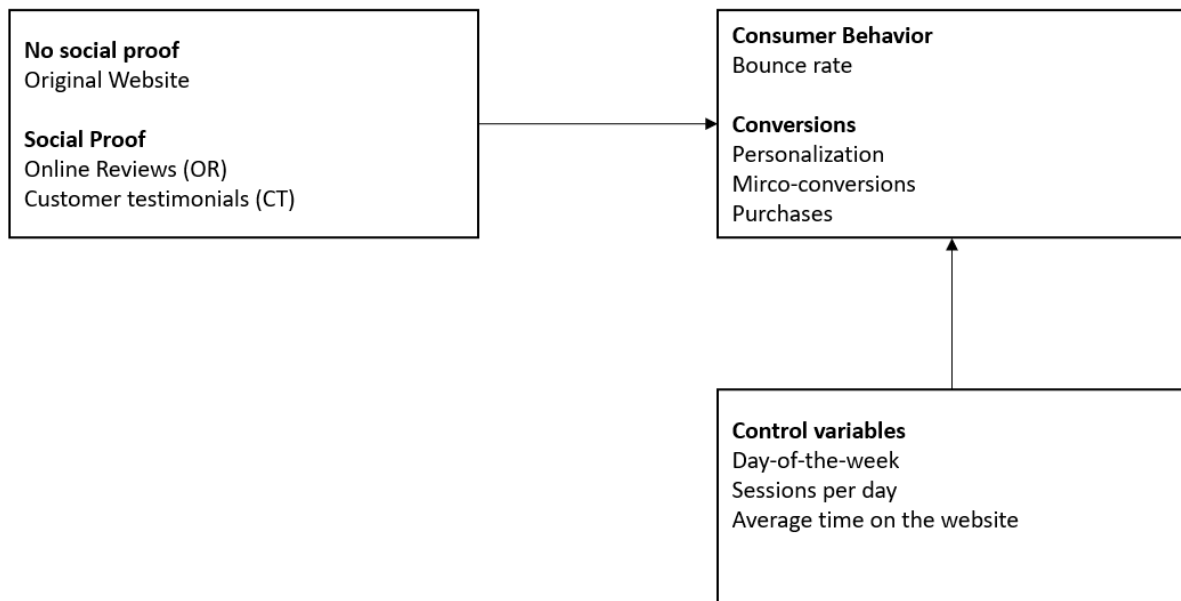
Figure 2: Research model

The last control variable is the average time spent on the website. As people who spent more time on the website are more likely to engage in one of the steps of the conversion funnel, this variable is likely to influence the outcome of the dependent variable.

Table 1

Independent & Control Variables

Variable	Operationalization	Variable type
Online reviews (OR)	Experiment variation in which the conversion was completed =1 if the days' amount was in the reviews variation, =0 if otherwise	Independent variable

Customer testimonials (CT)	Experiment variation in which the conversion was completed =1 if the days' amount was in the testimonials variation, =0 if otherwise	Independent variable
Sessions	Amount of sessions per day in variation group	Control variable
Average time spend	Average of seconds spend on the website that day	Control variable
Monday	Dummy variable determining whether the day was a Monday (=1) or not (=0. Monday is usually the best performing day of the week	Control variable
Sunday	Dummy variable determining whether the day was a Sunday (=1) or not (=0). Sunday is usually the worst performing day of the week	Control variable
Bounce rate	The number of visitors that only visited one page and saw the homepage during the experiment	Dependent variable

Personalization	The number of visitors that personalized a frame and saw the homepage during the experiment	Dependent variable
Micro-conversion	The number of times a project was saved by a visitor that saw the homepage during the experiment	Dependent variable
Purchases	The number of purchases that were made by visitors that saw the homepage during the experiment	Dependent variable

4. Methodology

In this section, the methodology of the thesis will be discussed. The experiment will be introduced, and the setting and design will be discussed, moreover, the statistical tests and analysis that will be performed will be discussed.

4.1 Experiment setting

In order to study the effect of OR and CT on behavior and conversions, an experiment was performed on the homepage of the website. On the homepage, the original website was manipulated on one aspect: the navigation function on the homepage was replaced with either OR, or CT. The design differences can be found in Appendix X.

The experiment lasted 29 days, and a total of 43.336 sessions in which 1107 purchases were made. The sessions were approximately equally distributed, as can be found Table 1.

Table 2

Distribution of sessions			
	Original	OR	CT
Sessions	14.362	14.485	14.489

4.2 Experiment design

The theoretical foundation and the hypotheses of the thesis have been made using the literature review. As the research objective is to gain empirical evidence for the proposed hypotheses, an experiment was set up on the website. Although one could argue that a qualitative approach could help better to understand the reasoning of customers behind different trust elements, this study aims to merely the effect several elements have, therefore, a quantitative approach is the most suitable.

The design of the quantitative approach will be an experiment set up on the website. In previous studies on trust elements along the customer purchase process, mainly surveys were used. However, an approach using a survey can cause respondents to be dishonest or give socially accepted answers (Schermer & Vernon, 2010). In research where surveys or interviews are used, the researcher relies on respondents telling the truth. In contrast, sometimes respondents will give a socially desirable answer or give an answer they think the researcher wants to hear (Randall, 1991). Setting up experimental manipulations on the website will cancel out the chance of prejudice.

Table 3

Variation designs

Type of social proof	Characteristics of social proof type	Design attributes
Online reviews (OR)	Higher perceived trustworthiness	Star-rating
		Textual quote
		Name & text from third-party website
Customer testimonials (CT)	Higher perceived expertise	Credentials
		Picture of reviewer
		Name & company name
		Textual quote & story-link

Table 3 shows the design of the experiment variation, including the design attributes. The design attributes were derived from real-life cases. For example, the OR variation is an often used widget from customers of the Feedbackcompany. The CT variation was designed by the company to be in line with the design of the website. The design attributes used, however, were acquired from literature. Seiler & Kucza (2017) showed that when using a testimonial that should enhance expertise, credentials in the form of a job description are relevant, as well as a picture and the company the reviewer works for; therefore, these are included in the CT design.

4.3 Measurements

The experiment resulted in two data sets: one with total observations and one with the day-to-day results of each experiment variation. Both data sets will be analyzed differently. The observed amount on each variable will be analyzed using Chi-square tests, while the day-to-day data will be analyzed through linear regression. Chi-square tests are used instead of ANOVA. When using ANOVA on the day-to-day data, the differences between days would influence the variance and therefore influence the results. As differences between the days are not the interest of this study, this test was not chosen. Instead of the variance between the days, the interest of this study are the differences between variations. As all observations are dichotomous(e.g. in a session the visitor did bounce, or did not) Chi-square is the most appropriate test.

Both analyses have value and limitations in this research. While the observations allow testing with the entire dataset (43.336 sessions) whether the groups significantly differ, the regression analysis of the day-to-day (29 days) data allows to control for other variables and explain the contribution of OR and CT to behavior and the conversion funnel.

4.3.1 Chi-square tests

As an initial analysis, chi-square tests were conducted on the observations. Before proceeding with the test, the assumptions of the Chi-square tests must be fulfilled. The assumptions of Chi-square include: the data should be counts of cases, the categories must be mutually exclusive, the groups must be independent, and at least 80 percent of the expected values must be higher than 5, while no cell can have an expected count lower than 1.

In the experiment data, the number of times an event happened could be viewed, as well as the total amount of sessions. The observations are mutually exclusive: either an event happened in a session, or it did not. The independence assumption is met as well, as an event

in OR does not affect the result of CT. Given that all expected values are higher than 5, all assumptions for the Chi-square test are met.

4.3.2. Linear regression

After conducting the Chi-square tests on the observations, regression analysis was conducted on the day-to-day data to understand the contribution of OR and CT. Before doing the analysis, the assumptions for multiple regression are tested. Assumptions are normality, linearity, homoscedasticity, and the absence of multicollinearity. Normality can be investigated using a normal P-P plot, which was made for all dependent variables. As can be seen in Appendices F through I, all the dots are more or less scattered around the probability line, we can assume normality. The homoscedasticity is tested using Levene's Test, of which the output can be found in the Appendix. As $P > .05$ for every variable, we do not reject the null hypothesis of equal variance and assume equal variance. Multicollinearity is tested using VIF values: the rule of thumb here is that no VIF value should exceed 10 (PennState). This assumption is met as well, which can be found in Appendix K. As both normality and homoscedasticity are met, the linearity assumption is met as well.

The dependent variables of the study is the behavior (Bounce) and the path-to-purchase: personalization, micro-conversions, and purchases.

4.4 Reliability & Validity

With an expected run of 4 weeks, the expected total sessions of the experiment were around 144.000. However, the actual experiment sessions were 43.336 sessions, as not all sessions were included because these did not visit the homepage. Not including these sessions helped to ensure validity in this experiment, as other sessions did not see either of the variations.

To ensure the study was valid, random assignment was used, meaning that every visitor had an equal chance of being put in either group. The randomization is done through

Google Optimize, a state-of-the-art testing tool that is used for conversion experiments on websites. The tool relies on cookies for the assignment. Using cookies, the tool assigns visitors that were on the website before to the same variation. Unless the visitor clears his cookies or uses a different browser, he will see only one variation. Using this random assignment method, the study is focused on the population of interest, namely visitors of the e-commerce website that were on the manipulated webpage.

Several of the previously discussed measures will help to ensure the validity of the research. Validity refers to whether the instrument used measures what it is supposed to measure (Anastasi & Urbina, 1997). In this section, several validity-enhancing measures will be discussed. As already discussed in the previous chapter, the groups will be assigned at random, and the original homepage will be the control condition.

The most important form of validity in this research is content validity. This refers to whether the expressed test measures the phenomenon that is intended to be measured. In this study, that means whether we actually test the effect of different usages of social proof. To ensure this, firstly, a theoretical framework was composed to create an understanding of the different ways social proof can be created. Another validity-enhancing measure is consistency in design: only one part of the homepage will be manipulated. The design assures that the difference in effect comes from that part only.

Moreover, design options like colors and font style will be consistent. To ensure the internal validity of the thesis, control variables were used in the regression analysis. By including control variables in the equation, the influence of confounding variables is limited, and the correlation between OR and CT and an uplift in either dependent variable can be explained.

5. Results

In this section, the results of the experiment will be discussed using descriptive statistics, chi-square tests, and regression analysis.

5.1 Descriptive statistics

In the table below, the descriptive statistics of the experiment can be found. In the first row of each variation, the total amount of times an action (e.g. made a transaction or bounced) during the experiment can be found. In the second and third rows, the mean and standard deviation per day is shown.

Looking at the experiment outcome, the OR has performed best, with a lower amount of bounce, and a higher amount on the personalization, micro-conversions, and transactions variables.

Table 3: Descriptive statistics

		Bounce	Personalization	Micro-conversions	Transactions
Original	Observations	5,860	1,617	417	337
	Mean	202.03	56.21	14.38	12
	SD	81.70	21.99	7.32	6
Online reviews (OR)	Observations	5,743	1,738	535	392
	Mean	198.07	60.03	18.45	14
	SD	78.09	23.54	8.01	7
Customer Testimonials (CT)	Observations	5,927	1,680	457	378
	Mean	204.38	57.69	15.72	13
	SD	81.53	21.55	6.94	7

Overall, the variations with social proof have better results than the control condition. Only on the variable 'Bounce', CT has a worse score than the original. The differences between CT and OR are the largest in bounce, personalization and micro-conversions. In the transactions,

however, the differences are minimal. Given the differences in the table, further analysis seems to be appropriate.

5.2 Chi-square tests

As an initial analysis, a Chi-square test was performed on the overall observations in order to analyze the differences between the variations. As both the behavior and conversions were measured as dichotomous variables (e.g. did bounce or did not bounce) it was possible to perform a chi-square test for the analysis.

Table 4: Chi-square test of observations

		Bounce (yes/no)		Personalization (yes/no)		Micro-conversion (yes/no)		Transactions (yes/no)	
		Yes	No	Yes	No	**Yes**	**No**	Yes	No
Original	Observed	5,860	8,502	1,617	12,745	**417**	**13,945**	337	14,025
	Expected	5,809.62	8,552.37	1,668.65	12,693.35	**466.96**	**13,895.04**	366.87	13,995.13
Online Reviews (OR)	Observed	5,743	8,742	1,738	12,747	**535**	**13,950**	392	14,093
	Expected	5,859.38	8,625.62	1,682.92	12,802.06	**470.96**	**14,014.04**	370.01	14,114.99
Customer Testimonials (CT)	Observed	5,927	8,562	1,680	12,809	**457**	**14,032**	378	14,111
	Expected	5,861	8,628	1,683.41	12,805.59	**471.09**	**14,017.91**	370.12	14,118.89
	X^2		5.863		3.855		**14.961 *****		4.009

Signif. Codes: 0 '***' .001 '**' .01 '*' .05 '.' .1 ' ' 1

In the table above, both the observed and expected amount for each variable can be found. As discussed in the literature review, the amount of bounce is a metric that can determine a visitor's trust in a website. In table 4, OR gives a substantially lower amount of observations than the expected amount, indicating that higher trustworthiness leads to a lower bounce rate. The chi-square test, however, does not give a significant effect with X^2 (df = 2, N= 43.336) 5,863, where p (.053) > alpha (.05). Given the P-value, we cannot reject the null hypothesis, and therefore cannot conclude that OR is significantly different from CT and the original.

The differences between the expected and observed values are smaller at the start of the conversion funnel. Therefore the logical result is that no significant differences can be found in the personalization. With p (.146) > alpha (.05), we do not reject the null hypothesis that all variations are equal. In the micro-conversions, OR does perform significantly better than CT and the original. With p (>.001) < alpha (.05) we reject the null hypothesis: all variations are not equal. Given the results from Table 4, we can conclude that OR on the homepage leads to a higher amount of micro-conversions, indicating that higher trustworthiness is important in this step of the conversion funnel. This result, however, does not appear in the transactions: X^2 (df = 2, N= 43.336) = 4,009 gives p (.135) > alpha (.05) and therefore we do not reject the null hypothesis.

5.3 Regression analysis

In order to understand the relationship between OR, CT, and the dependent variables, a regression analysis was performed. Moreover, examining the results while including control variables adds to the validity of the thesis.

In the observations could be seen that the variations with social proof (OR and CT) have better scores than the variation without social proof. The only significant difference could be

found in micro-conversion, where visitors in the OR variation on average, performed 3.97 micro-conversions more than the visitors in the control condition.

In the regression analysis of the bounce rate, no significant results could be found for OR or CT, meaning that either OR or CT does not significantly contribute to the bounce rate in a model with the control variables. Average session time and the number of sessions are most significant here, with p $(< .001) <$ alpha (.05). Given the regression equation, for every session on the website, the number of bounces increases by 0.437. Including average session time in the model influences the number of bounces as well. Per second the average session time increases, and the numbers of bounces decrease by 0.332. Both results are logical: when there are more sessions in a day, the number of bounces will increase as more visitors arrive on the homepage, and therefore more visitors will leave immediately.

Table 5: Regression table

	Bounce	Personalization	Micro-conversion	Transactions
Online Reviews (OR)	2.274 (6.073)	.238 (2.411)	2.934 (.996) *	.941 (1.155)
Customer Testimonials (CT)	2.529 (6.028)	.193 (2.393)	.951 (.989)	1.083(1.147)
Day of the week = Monday	14.291 (7.447).	-4.808 (2.957)	-2.290 (1.222).	-2.912 (1.417).

Day of the week = Sunday	15.106 (7.559).	- 8.027 (3.001).	-5.498 (1.240)***	-3.703 (1.438)*
Sessions	.437 (.016)***	.110(.006) ***	.030(.003)***	.025 (.003) ***
Average session time	-.332 (.031)***	.128 (.012)**	.041(.005)***	.035 (.006)***
Intercept	85.523 (14.374)***	-36.465 (5.706)***	-12.499 (2.358)***	-10.923(2.734) ***

Signif. codes: 0 '***' .001 '**' .01 '*' .05 '.' .1 ' ' 1

In personalization, OR and CT contribute to the number of personalized frames with 0.328 and 0.193, respectively. These results are insignificant in a model with the day-of-the-week, average session time, and sessions per day. In the research model, Sunday was expected to be an underperforming day. In the regression equation, this expectation is confirmed, as the amount of personalized frames decreases with 8.027 frames on Sundays. Average session time and number of sessions are significantly contributing to the amount of personalization. Respectively, per session, the amount of personalized frames increases by 0.110 frames, while every second of added average session time increases the number of frames by 0,128.

OR is found to significantly contribute to the number of micro-conversions: the number of micro-conversions increases with 2.934 conversions in the OR variation. A remarkable result was found for Mondays: in the research model, Mondays were included as they were expected to increase the number of conversions. On Mondays, however, the numbers of conversions decrease with 2.290 conversions. Although OR significantly contributes to micro-

conversions, this contribution does not appear in purchases. Neither OR or CT significantly contributes to the number of purchases per day in a model with day-of-the-week, average session time, and sessions per day. In line with the micro-conversion results, Mondays negatively affect the number of purchases on a day, meaning that the number of purchases is generally lower on Mondays than on other days. Overall, the number of purchases per day is influenced by the number of sessions and the average session time the most. One session increases the number of purchases with 0.025, while a second of average session time increases the number of purchases with 0.035.

6. **Discussion & conclusions**

The results will be discussed in this section, and possible future research directions will be presented. Moreover, recommendations will be given to the studied company.

6.1 Possible explanations of findings

The main research question was: *'Do customer testimonials and online reviews have a positive effect on website behavior and the conversion funnel in Dutch construction business?'*

In website behavior, the objective was to study if there were differences in the bounce rate of visitors. In bounce rate, the OR variation (39,65%) was substantially smaller than CT (40,91%) and the original (40,80%), but this result was not significant p (0.053) > alpha (0.05). As the p-value exceeds alpha, we do not reject the null hypothesis, but caution should be taken into account with differences this small to prevent a Type II error. Possibly, the experiment duration was too short to find significant differences when the differences were this small. In the regression analysis, OR and CT were not significant contributors in a model with average session time, and sessions per day. Average session time was significant, this is a logical outcome, as visitors with a higher average session time are less likely to bounce.

Sessions per day were also significant in the equation model, which can be explained by the fact that more sessions generally also lead to more bounce.

The path-to-purchase of the company contains three phases: personalization, micro-conversion, and purchases. In all phases, social proof variations (OR/CT) have performed better than the control condition in terms of higher conversion rates, but results were often insignificant.

In personalization, OR had the highest overall rate (12 %), compared to CT (11,60%) and the original (11,26%). The results were insignificant, however, with p (.14) > alpha (.05). Considering the differences are minor, likewise to the bounce rate, again, the duration of the experiment could explain the fact that no significant differences could be found. Although no significant differences could be found, the results are aligned with the hypothesis by looking at the results solely, where both social proof variations (OR/CT) exceed the original website and OR exceeds CT. Therefore, repeating the experiment could help to find possible significant minor differences.

In micro-conversions, a significant result was found for the OR, as it performed significantly better than CT and the original. Furthermore, in the micro-conversion, the number of visitors that saved their personalized frames into a project was observed. In this step, a visitor makes a first commitment to the company by saving a project with the company. This result indicates that higher perceived trustworthiness is vital to visitors in micro-conversions, and perceived trustworthiness is significantly important in committing to a company.

In purchases, however, no significant results could be found for either CT or OR. This is remarkable, as trustworthiness was important in the previous step of the conversion funnel. A possible explanation is that the manipulation of the homepage is no longer effective late in the conversion funnel. As most customers of the company take time to consider the frame, most

visitors did not view the homepage before deciding to purchase the frame. In the hypothesis, the expectation was that CT would perform better than OR in purchases through higher perceived expertise. Although CT did have a higher contribution in the regression equation, this result was not significant. This can possibly be explained by the influence of higher trustworthiness in the previous step: as the results are aggregated, purchases are influenced by the micro-conversions. This will be further discussed in the limitations. Another explanation can be the placement of the manipulation. As the homepage was manipulated, the influence of the manipulation could be limited at the final step of the path-to-purchase.

The main recommendation is to directly implement the OR variation on the homepage of the website. As it is the variation with a significant positive influence on micro-conversions, the variation therefore positively influences the company's performance. Over the whole study, OR has performed the best in terms of all conversions measured, although not every measured variable was significantly different. Secondly, we recommend the company examine what webpages are important in the pre-purchase phase of the path-to-purchase, and recommend the company to implement OR on these pages. As the OR is found to be significantly important in the pre-purchase phase OR may be able to have a positive impact on other pages. An example can be adding independent product reviews to various products.

6.2 Limitations and future research

As both future research on this subject, and future testing possibilities for the company mainly overlap, both are presented in this section.

6.2.1 Data limitations

An essential aspect of the practical and academic contributions of this experiment is the usage of actual data gathered on the website. This aspect, however, also offers a challenge. As the data in Google Analytics is only available per day, no useful standard deviations can be

computed for the entire observations (N = 43.336). For the observations themselves, this does not cause a large problem. As for the dichotomous variables, a standard deviation can be calculated based on the mean and N. However, we cannot calculate the statistical significance for other possibly useful variables. Therefore, variables such as average session time are only used in the regression analysis for the day-to-day data.

Moreover, the main limitation of the data is the fact that we cannot follow every visitor during his customer journey. The variables are investigated at the hand of all experiment sessions, as Google Optimize does not allow for segmentation based on target conversions during the experiment. This means that, for example, we cannot select all visitors that saved a project and see how many of them placed an order. Therefore, the path-to-purchase, as discussed in the theoretical framework, cannot be studied exactly. Shortly, in reality, N of purchases would be the amount of people that saved a project, as we cannot segment them. In this study, N is 43.336.

6.2.2 Research limitations

Every research has limitations, as well as this one. Firstly, the thesis is bound to time limitations, making it harder to investigate multiple possible angles. A possible addition to the study could be a survey to examine whether the variations had a higher trustworthiness or source expertise. Moreover, in the study, only the effect of one variation of customer testimonials and one variation with two online reviews were studied; therefore, we cannot generalize these results to all variations with customer testimonials of online reviews.

One of the limitations of this research is that the variations were only shown on the website's homepage. Due to this design, visitors were only exposed to the variation in an early stage of their purchasing process, which could also explain why CT did not score higher than OR. Therefore, a test after a customer saves a project could provide further insights. Therefore, the

recommendation is to test with OR and CT variations in the purchasing process's check-out phase.

Furthermore, in both variations, the customer feedback was positive. In the OR variation, scores were 9/10 and 10/10, and the quotes were handpicked. Negative reviews or quotes with less enthusiasm or arguments may not provide the same result. Lastly, the experiment was conducted in a specific business that sells frames online. A future research possibility is, therefore to reproduce the study in a different online business. Another could be to test social proof in another context: this study indicates where social proof improves website conversions in the purchasing process. This can also be studied in other research directions, for example, in email marketing or where a visitor has abandoned its cart.

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Appendix

Appendix A: Design online reviews (OR)

Figure 3: Design online reviews

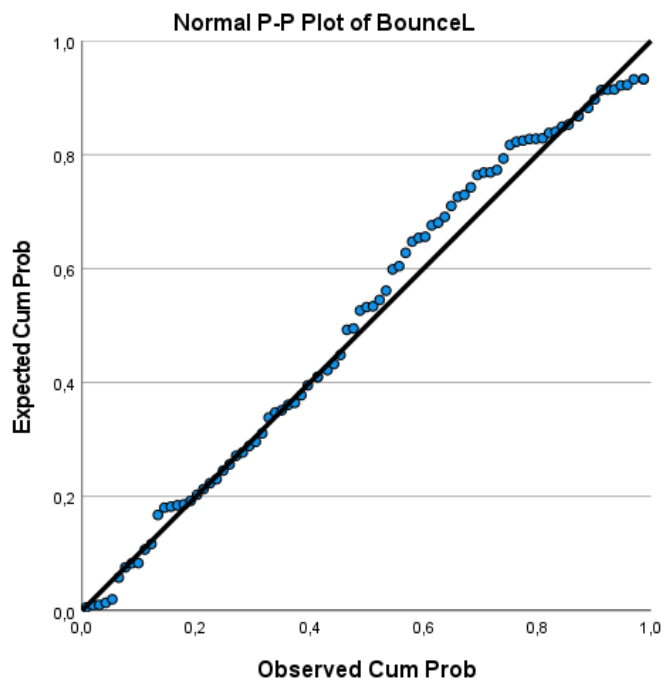**Appendix B: Design customer testimonial (CT)**

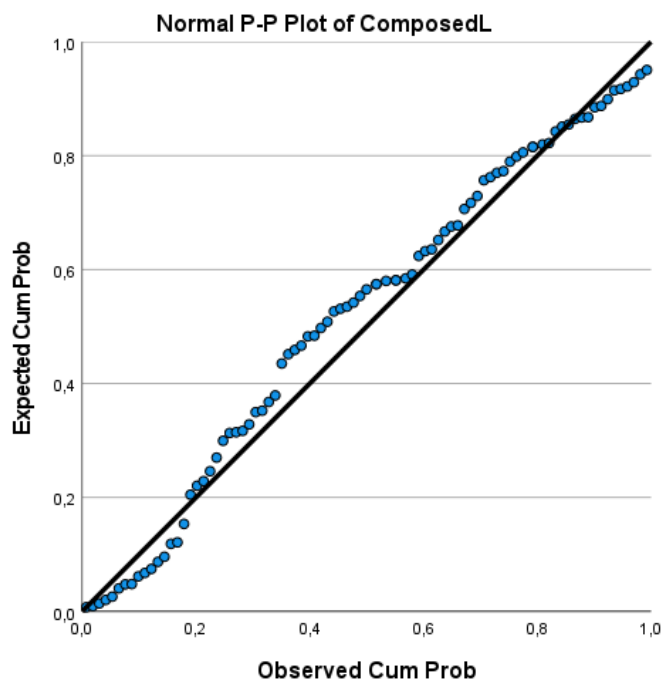*Figure 4: Design Testimonial*

Appendix C: Original Website

Appendix D: Online reviews- Homepage

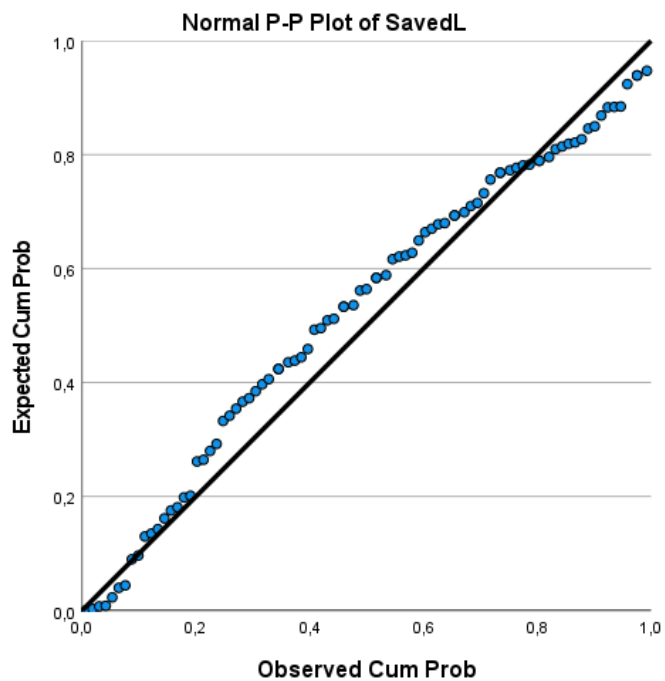**Appendix E: Customer Testimonials – Homepage**

Appendix F: P-P Plot Bounce
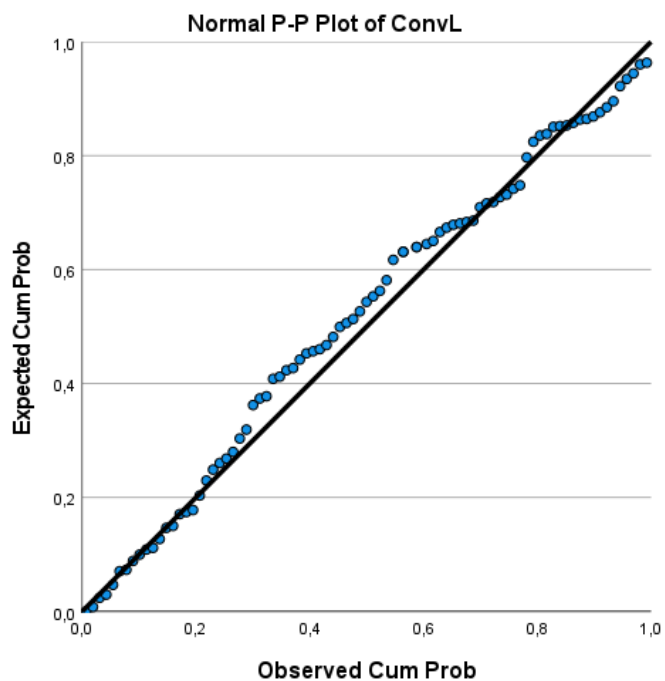

Normal P-P Plot of BounceL

Appendix G: P-P Plot Personalization 1

Normal P-P Plot of ComposedL

Appendix H: P-P Plot Micro-conversion

Normal P-P Plot of SavedL

Appendix I: P-P Plot Purchases

Normal P-P Plot of ConvL

Appendix I: Levene's test

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
AmountBounce	Based on Mean	,109	2	84	,897
	Based on Median	,068	2	84	,935
	Based on Median and with adjusted df	,068	2	83,889	,935
	Based on trimmed mean	,115	2	84	,892
Personalization	Based on Mean	,094	2	84	,910
	Based on Median	,099	2	84	,906
	Based on Median and with adjusted df	,099	2	83,391	,906
	Based on trimmed mean	,097	2	84	,908
Microconversion	Based on Mean	,131	2	84	,878
	Based on Median	,119	2	84	,888
	Based on Median and with adjusted df	,119	2	81,468	,888
	Based on trimmed mean	,138	2	84	,871
Transactions	Based on Mean	1,546	2	84	,219
	Based on Median	1,239	2	84	,295
	Based on Median and with adjusted df	1,239	2	76,007	,295
	Based on trimmed mean	1,528	2	84	,223

Appendix J: Scatterplot Residuals Bounce

Scatterplot
Dependent Variable: Bounce %
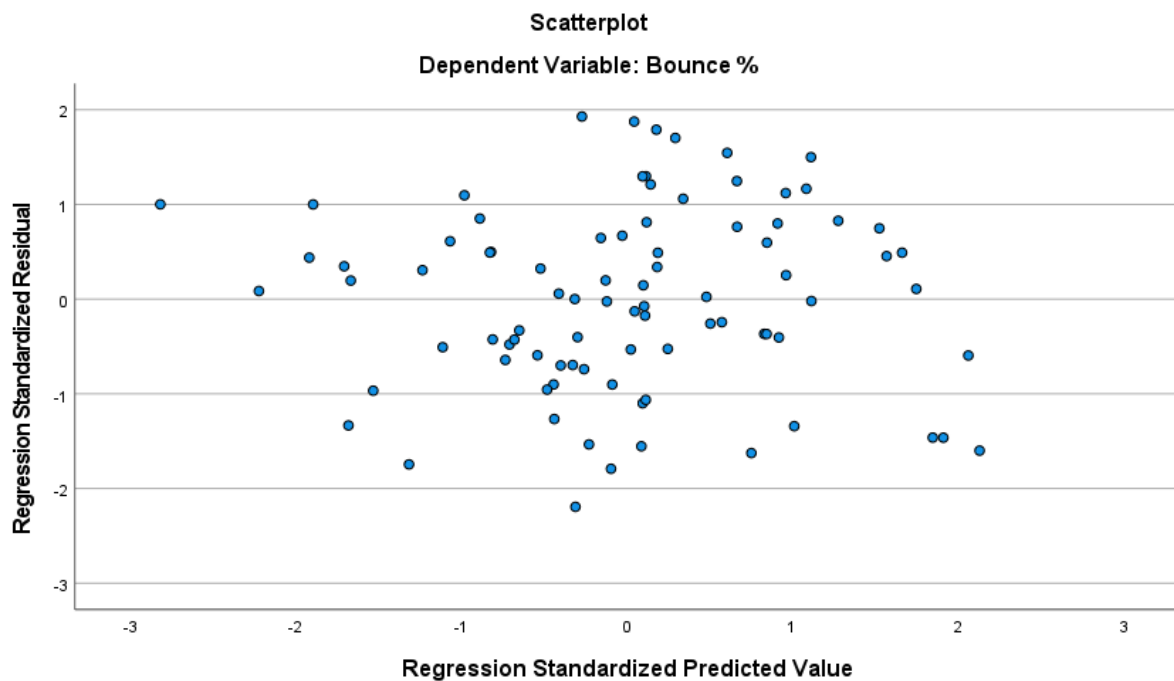
Appendix K: Scatterplot residuals Personalization

Appendix L: Scatterplot residuals Micro-conversion

Appendix M: Scatterplot residuals Purchases

Appendix N: VIF-values

Appendix O: Chi-square table Bounce rate

Bounce Rate	Did bounce	Did not bounce
Original	5860 (5809.62) [0.44]	8502 (8552.38) [0.30]
Online Reviews	5743 (5859.38) [2.31]	8742 (8625.62) [1.57]
Customer Testimonials	5927 (5861.00) [0.74]	8562 (8628.00) [0.50]

Appendix O: Chi-square table Personalization

Composed frames	Did compose a frame	Did not compose a frame
Original	1617 (1668.65) [1.60]	12745 (12693.35) [0.21]
Online Reviews	1738 (1682.94) [1.80]	12747 (12802.06) [0.24
Customer Testimonials	1680 (1683.41) [0.01]	12809 (12805.59) [0.00]

Appendix P: Chi-square table Micro-conversion

Saved projects	Did save a project	Did not save a project
Original	417 (466.96) [5.34]	13945 (13895.04) [0.18]
Online Reviews	535 (470.96) [8.71]	13950 (14014.04) [0.29]

Customer Testimonials	457 (471.09) [0.42]	14032 (14017.91) [0.01]

Appendix Q: Chi-square table Purchases

Purchases	Purchased	Did not purchase
Original	337 (366.87) [2.43]	14025 (13995.13) [0.06]
Online Reviews	392 (370.01) [1.31]	14093 (14114.99) [0.03]
Customer Testimonials	378 (370.12) [0.17]	14111 (14118.88) [0.00]