

## ***“Making your own choices?”***

*An investigation of the influence of horizontal price presentation order, star-ratings & product type on average revenue in online web-shop environments.*



Master Thesis  
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## **Abstract**

**AIM.** The primary aim of this study was to investigate the extent to which horizontal price presentation order (PPO) influences product choices and therefore average revenue (in €) in online web-shop environments. In addition to this, it was studied to what extent the potential effect of horizontal price presentation order on average revenue (in €) would be influenced by both star-ratings as quality indicators and product types. Direct effects of both star-ratings and product type on average revenue (in €) have been studied as well, as (pricing) literature suggests both factors to influence average revenue (in €) regardless of the PPO employed. Furthermore, the potentially mediating role of price-, and quality-perceptions on the effects of horizontal price presentation order, star-ratings and product type on average revenue has been studied, as well as the direct effect of horizontal PPO, star-ratings and product type on both price- and quality-perceptions.

**METHOD.** The present study was conducted by employing a 2 (horizontally descending PPO vs. horizontally ascending PPO) x 3 (descending star-ratings vs. ascending star-ratings vs. no star-ratings) x 2 (high-knowledge product vs. low-knowledge product) between-respondents, scenario-based experimental research design. Data collection was performed by the use of an online-survey in which participants got to see one of the twelve different web-shop environments. During the survey, participant's product choice (average revenue in €), perception of both price- and quality, as well as level of product knowledge was measured. A total of 303 participants, mainly from the University of Twente participated in the conducted study.

**RESULTS.** The results of this study show a significant interaction effect of horizontal PPO and star-ratings on average revenue (in €). In addition, both horizontal PPO and star-ratings have a significant main effect on quality-perception. Product type (high-knowledge product vs. low-knowledge product) had a significant impact on average revenue (in €), as well as price-perceptions. Nevertheless, horizontal PPO on its own had no significant impact on average revenue (in €).

**CONCLUSION.** Participants were willing to spend significantly more money when the combination of horizontal PPO and star-ratings created a positive price-quality relationship (descending PPO x descending star-ratings; ascending PPO x ascending star-ratings). The quality of products is also seen more positively when star-ratings are present and when horizontally descending PPO is used. Low-knowledge products are perceived to be more expensive and average revenue (in €) is lower when low-knowledge products are displayed. Nevertheless, horizontal PPO alone does not seem to significantly influence average revenue (in €) in online web-shop environments.

*Key words: Horizontal price presentation order, star-ratings, product type, product knowledge, price-perception, quality-perception.*

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I hope that reading this thesis achieves to be both interesting and informative by showing the impact of the topic at hand in a detailed, yet understandable manner.

## ***Table of contents***

<b>1. Introduction</b>	6
<b>2. Theoretical framework</b>	9
2.1 Horizontal price presentation order	9
2.1.1 Price presentation order: The PPO-effect	9
2.1.2 Mechanisms of the PPO-effect	9
2.2 Main effects of horizontal PPO	10
2.2.1 Horizontal PPO and price- & quality-perceptions	10
2.2.2 Horizontal PPO and average revenue	11
2.3 Interaction effects of horizontal PPO, star-ratings & product type	13
2.3.1 Horizontal PPO and star-ratings	13
2.3.2 Horizontal PPO and product type	15
2.4 Main effects of star-ratings	16
2.4.1 Star-ratings and price- & quality-perceptions	16
2.4.2 Star-ratings and average revenue	17
2.5 Main effects of product type	17
2.5.1 Product type and price- & quality-perceptions	18
2.5.2 Product type and average revenue	18
2.6 Conceptual model	19
<b>3. Method</b>	20
3.1 Preliminary study	20
3.2 Research design	21
3.3 Sample	22
3.4 Stimulus material	23
3.5 Measures	24
3.6 Procedure	26
<b>4. Results</b>	27
4.1 Manipulation checks	27
4.2 Main results	27
4.2.1 Price-perception	28
4.2.1.1 Main effects	28
4.2.1.2 Interaction effects	29
4.2.2 Quality-perception	30
4.2.2.1 Main effects	30
4.2.2.2 Interaction effects	32

4.2.3 Average revenue .....	32
4.2.3.1 Main effects .....	32
4.2.3.2 Interaction effects .....	34
4.3 Mediation analysis .....	35
4.4 Hypotheses .....	36
<b>5. Discussion .....</b>	<b>38</b>
5.1 Main effects .....	38
5.1.1 Price presentation order (PPO) .....	38
5.1.2 Star-ratings .....	40
5.1.3 Product type .....	40
5.2 Interaction effects .....	41
<b>6. Implications .....</b>	<b>42</b>
6.1 Theoretical implications .....	42
6.2 Practical implications .....	42
<b>7. Limitations &amp; suggestions for further research .....</b>	<b>44</b>
<b>8. Conclusion.....</b>	<b>46</b>
<b>References .....</b>	<b>47</b>
<b>Appendix A: Preliminary study &amp; stimulus material .....</b>	<b>49</b>
<b>Appendix B: Demographics main study.....</b>	<b>55</b>
<b>Appendix C: Main study &amp; stimulus material .....</b>	<b>56</b>

## 1. Introduction

The rapid development of the internet thus far has significantly influenced the structure and context of retail-options consumers are presented with nowadays, shifting the focus towards an online-, instead of an offline-environment for many services and product categories. Nowadays, online retail-shops have become quite common and their usage seems to be growing as well<sup>1</sup>.

Just as a salesperson does in an offline environment, online retail-shops often aim to influence consumer's responses and choices by applying different techniques and strategies when it comes to presenting various offers and prices. A great example of this is the use of price presentation order as studied by Suk, Lee and Lichtenstein (2012). The concept behind price presentation order (PPO) is to manipulate the order in which products and their prices are being presented to consumers. This can mainly be done in two different ways.

Firstly, consumers can be confronted with a sequence of options that goes up in price with every additional option presented. What this means is that a sequence of products starts with the cheapest options at the beginning and finishes with the most expensive option. Suk et al. (2012) refer to this as an ascending sequence. Secondly, this process can be mirrored, meaning that a sequence of options to choose from goes down in price with every additional option. In this case, the product at the beginning is the most expensive one and the product at the bottom the least expensive one, making this an example of a descending price sequence. Results of Suk et al. (2012) have indicated that those differences in PPO can significantly influence the average revenue achieved in such sequences of options or products by influencing consumer choices. The practical translation of this is that consumers seemingly tend to prefer respectively higher- or lower-priced products dependent on the PPO they get to see, which in turn influences average revenue (Suk et al., 2012).

This being said, as of today the principle of PPO has almost exclusively been studied in offline-settings and with vertical sequences of products and corresponding prices. Here, a vertical sequence refers to options and corresponding prices being ordered from top to bottom (see Table 1).

Table 1. *Example of the principle of price presentation order implied in a vertical sequence of products.*

Product (#)	Price (ascending order)	Price (descending order)
1	€7	€10
2	€8	€9
3	€9	€8
4	€10	€7

<sup>1</sup> <https://www.cbs.nl/nl-nl/nieuws/2016/24/meer-nederlanders-shoppen-online>

Therefore, this study first aims to fill this literature gap by generally broaden the scope of knowledge regarding the principle of PPO, by investigating the extent to which the potential effects of PPO still hold when tested in a different context and under divergent circumstances.

In order to examine this under different but yet modern conditions, the principle of PPO will be tested in online-settings and with horizontal, rather than vertical sequences of options and corresponding prices presented to consumers. This approach is based on the commonly employed structure of online retail-shops often using not only vertical, but also horizontal sequences in order to display their products to customers. A stereotypical example of such an online retail-environment is shown in Figure 1.



Figure 1. Example of an online retail-shop

This study aims to simulate web-shop environments similar to the one as shown in Figure 1 in order to test the principle of PPO under realistic online-circumstances. While a respectively ascending or descending price order will be employed, horizontal sequencing (as shown in Figure 1), rather than vertical sequencing will be used. This means that the left-hand side will either display the cheapest option followed by more expensive products (ascending order), or that the left-hand side will display the most expensive product followed by less expensive ones (descending order).

In addition, this study will also inspect the potentially interacting effects of both product type (product knowledge) and star-ratings on PPO, as can be assumed based on pricing literature (e.g. Rao & Monroe, 1989; Suk et al., 2012). With regards to product type, this study will distinguish between high-knowledge product types and low-knowledge ones, as the level of product knowledge impacts what kind of information potential customers have stored in memory and how they react to new information presented to them (Rao & Monroe, 1989; Suk et al., 2012). This should in turn influence the potential impact of PPO on average revenue in web-shop environments, as it impacts the extent to which PPO is used as a source of information by potential customers (Suk et al., 2012). Star-ratings on the other hand (as also employed in the example illustrated by Figure 1) are expected to

impact the effect of PPO on consumer choices and thus average revenue by acting as simple indicators of quality (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). Such forms of attribute information can help customers to make more educated decisions regarding product evaluations (Herr, Kardes, & Kim, 1991).

This study will discuss isolated effects of both product knowledge and star-ratings on average revenue. Nevertheless, as the focus of this study lies on the investigation of the effectiveness of the PPO principle, the priority besides investigating a main effect of PPO on average revenue in online web-shop environments is to examine to what extent this effect is being influenced by both product type and star-ratings. The following research questions are formulated:

- **RQ1:** *To what extent does horizontal price presentation order (PPO) influence the average revenue in online web-shop environments?*
  
- **RQ2:** *To what extent do product type and star-ratings influence the effect of horizontal price presentation order (PPO) on average revenue in online web-shop environments?*

While this investigation will bring more light into the still relatively vague pool of knowledge regarding PPO, it will also be of practical significance for the online-retail world by indicating the degree of flexibility of PPO. Efficiently designing online web-shop environments for consumers to spend their money in could be facilitated by relevant additional information as to how and under which conditions PPO can have an actual influence on consumer responses. This study's aim is to provide such information and therefore clarify how PPO can effectively be used as a marketing-tool.

With special regards to horizontal, rather than vertical sequencing of options and prices on a list, the study in question could (dis-)confirm the argumentation of influential authors and bloggers of the psychological-pricing scene such as Lincoln Murphy or Benjamin Brandall, whom argue that the principle of PPO should work no different in horizontal settings and sequences<sup>2</sup>. Again, this question is of practical relevance as well, as showing if and how PPO works in horizontal settings would give online marketers new insides and, more importantly, new options to work with.

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<sup>2</sup><https://www.process.st/saas-pricing-pages/>

## **2. Theoretical framework**

### **2.1 Horizontal price presentation order**

#### **2.1.1 Price presentation order: The PPO-effect**

Price presentation order (PPO) is defined as the order in which prices are being presented (Suk et al., 2012). In general, prices in sequences can either follow an ascending order (from lowest-to-highest price), or a descending one (from highest-to-lowest price).

The idea that this concept matters can be traced back to a study conducted by Suk et al. (2012). The researchers manipulated the PPO of different beers, giving customers either an ascending product list or a descending one to choose from. Prices on both lists were presented simultaneously employing vertical sequencing, meaning that prices (either in ascending or descending order) were presented from top-to-bottom. Their results clearly indicated that the average revenue was maximized by an extra \$0.24 per beer when customers were presented with a descending price list, as they then tended to choose expensive beers more often in comparison with the ascending price list (the PPO-effect).

In the following sections the underlying mechanisms belonging to the PPO-effect will shortly be introduced. It will be explained as to why these mechanisms should still work when employing horizontal sequences as done by the present study.

#### **2.1.2 Mechanisms of the PPO-effect**

There are two fundamental concepts functioning as a basis for the PPO-effect to occur. Firstly, Suk et al. (2012) argue that information search patterns (ISPs) play an important role in the way the PPO-effect seems to be working and why it should be transferable to horizontal sequences as well.

The concept behind ISPs describes the principle that the sequence in which information or options are being presented to consumers (vertically or horizontally) influences the approach people employ in order to scan the information available to them (Suk et al., 2012). Results of their study confirmed existing eye-tracking research (e.g. Pieters & Warlop, 1999), indicating that consumers tend to be paying initial attention to options presented at the top of the list in vertical sequences. On the other hand, left-hand side information received consumer's initial attention in horizontal sequences as further supported by the left-to-right bias as discussed by Spalek and Hammad (2005). It can thus be summarized that the results of Suk et al. (2012) clearly indicate that sequencing (vertical vs. horizontal) does influence consumers ISPs (from top-to-down vs. from left-to-right).

This concept matters, as it influences the second foundation of the PPO-effect often referred to as 'reference point' (Raghubir, 2006) or 'anchoring effect' (Furnham & Boo, 2011), henceforth referred to as reference pricing (reference price). This conception can be described as being one of the most robust cognitive heuristics in socio-economics and human decision making processes (Furnham & Boo, 2011). Heuristics such as this can be defined as "*intuitive, rapid, and automatic systems*" (Shiloh,

Salto & Sharabi, 2002, p.417), which “*reduce the complex tasks of assessing probabilities and predicting values to simpler judgement operations.*” (Tversky & Kahneman, 1974, p.1124).

In short, reference pricing summarizes the idea that the first option (or price) consumers get confronted with creates an anchor value (price) which will then be used to judge subsequent offers (e.g. Biswas & Blair, 1991; Biswas, Wilson, & Licata, 1993; Niedrich, Sharma, & Wedell, 2001). Because of this, the perception of subsequent offers or prices can differ dependent on the reference price that originates in consumers’ minds (e.g. Janiszewski & Lichtenstein, 1999).

The argumentation thus far has indicated that ISPs influence which option (or price) out of a sequence of options receive consumers initial attention. The principle of reference pricing then makes it so that this option is used as an anchor value by consumers in order to judge subsequent offers and options. This should be the case in horizontal sequences of options just as it is in vertical ones. This is the case, as the sequence of a list of prices and corresponding options does not interfere with the theoretical relationship between ISPs and the principle of reference pricing as discussed here. As the function of both ISPs and reference pricing does not change in horizontal settings, horizontal PPO should generally be capable of influencing consumer reactions. More detailed expectations regarding the effects of horizontal PPO will now be discussed.

## **2.2 Main effects of horizontal PPO**

### **2.2.1 Horizontal PPO and price- & quality-perceptions**

It has been indicated that due to the principle of reference pricing, horizontal PPO will create a so called ‘anchor value’ or ‘anchor price’ that people will use in order to evaluate subsequent offers and corresponding prices (Suk et al., 2012). Dependent on the PPO employed, a respectively high or low reference price will originate in the mind of customer (Suk et al., 2012). This in turn should influence consumer’s price-perceptions of subsequent offers (e.g. Janiszewski & Lichtenstein, 1999; Kalyanaram & Winer, 1995; Monroe, 1990; Thaler, 1985; Winer, 1988).

What is of special interest here is the argumentation of for example Chang and Wildt (1994) or Rao and Monroe (1989), indicating that price- and quality-perceptions are often positively related to each other. As a consequence, the positive relationship between price- and quality-perceptions is often described in terms of the commonly employed premise that a higher price equals a higher quality as well. This originates from the mindset that the product(s) price(s) are used by consumers as a simple indicator for quality (e.g. Leavitt, 1954; Rao & Monroe, 1989; Steenkamp, 1990). Because of the relationship between price- and quality-perceptions, a respectively high or low reference price can be expected to create a respectively high or low reference quality as well (Suk et al., 2012). Based on the argumentation presented, reference values for both price and quality can thus be expected to influence both price- and quality-perceptions of subsequent offers.

Based on the presented argumentation regarding ISPs, when employing horizontal PPO, the left-hand option (product) will set the reference price for judging subsequent offers and prices. When the horizontal PPO is descending, the reference price will be relatively high, which should make subsequent offers appear to be relatively cheap. On the other hand, when a horizontal ascending PPO is employed, the reference price will be relatively low, which should make subsequent offers appear to be relatively expensive (e.g. Janiszewski & Lichtenstein, 1999; Kalyanaram & Winer, 1995; Monroe, 1990; Thaler, 1985; Winer, 1988). Because of the positive relationship between price- and quality-perceptions (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989), the same principle should apply for quality-perceptions as well.

As a consequence of this, a center-option with equal price and attributes in both descending and ascending PPOs should nevertheless be perceived differently with regards to both price- and quality-perceptions in respectively descending and ascending PPOs, as the different reference values will impact people's perceptions. Therefore, a significant main effect of PPO on both price-, as well as quality-perceptions is expected. The following hypotheses are formulated:

- **H1a:** *Price-perceptions of an equal center-option are significantly lower in horizontally descending PPOs when compared to ascending PPOs.*
  
- **H1b:** *Quality-perceptions of an equal center-option are significantly lower in horizontally descending PPOs when compared to ascending PPOs.*

### **2.2.2 Horizontal PPO and average revenue**

It has been argued that due to the principle of reference pricing, horizontal PPO should be capable of influencing both price- and quality-perceptions of consumers. In order to understand how this should ultimately impact the average revenue (in €) achieved in different web-shop environments, the principle of loss aversion will shortly be introduced.

In general, loss aversion describes the psychological tendency to prefer avoiding losses rather than acquiring gains of a fairly equivalent magnitude (Tversky & Kahneman, 1991). Translated to the context of choosing from a variety of products in a web-shop environment, this means that whenever an options is being chosen, benefits from the options that have been turned down are lost<sup>3</sup>. Depending on the PPO employed (descending vs. ascending), different potential losses can be perceived when a list of options (prices) is scanned by consumers<sup>4</sup>.

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<sup>3</sup> <https://www.nickkolenda.com/psychological-pricing-strategies/>

<sup>4</sup> <https://www.nickkolenda.com/psychological-pricing-strategies/>

In horizontally descending PPOs, a relatively high reference price or value originates in the mind of consumers (Suk et al., 2012). Prices of subsequent options descend, which should make them appear to be relatively cheaper based on the reference price they are being compared to (e.g. Janiszewski & Lichtenstein, 1999; Kalyanaram & Winer, 1995; Monroe, 1990; Thaler, 1985; Winer, 1988). This can be perceived as a so called gain in price, as one would have to pay less for every additional option following after the reference value (Suk et al., 2012). This being said, as a consequence of the commonly perceived positive correlation between price and quality (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989; Steenkamp, 1990; Lichtenstein, Ridgway, & Netemeyer, 1993), a gain in price (having to pay less) is accompanied by a loss in quality (Suk et al., 2012).

Because consumers tend to focus on the avoidance of losses rather than obtaining gains of fairly similar magnitude (Tversky & Kahneman, 1991), in horizontally descending PPOs, consumers should try to avoid a loss in quality with every additional option presented to them and should thus favor to choose higher-priced option towards the left of the horizontal sequence (Suk et al., 2012). Based on the argumentation presented, the opposite effect should occur in horizontally ascending PPOs. Here, consumers would have to pay more with every additional option following after the reference one (loss in price) while simultaneously experiencing a gain in quality with every additional option to choose from. Again, as consumers should try to avoid losses, lower-priced options towards the left should be favored in horizontally ascending PPOs.

As the average prices of options chosen directly influences the average revenue (in €) achieved in respectively horizontally descending or ascending PPOs, a significant main effect of horizontal PPO on average revenue (in €) is expected. Furthermore, the argumentation presented mentions how both price- and quality-perceptions dictate perceptions in terms of gains and losses, which in turn influence consumer's choices (Tversky & Kahneman, 1991), and thus average revenue. This is further supported by Chang and Wildt (1994), whom argue that both price- and quality-perceptions are a significant factor for influencing purchase (buying) intentions. Because of this, both price- and quality-perceptions should influence the effect of horizontal PPO on average revenue (in €) As a consequence, the following hypotheses are formulated:

- **H2a:** *Average revenue (in €) is significantly higher in horizontally descending PPOs when compared to horizontally ascending PPOs.*
  
- **H2b:** *The effect of horizontal PPO on average revenue (in €) is mediated by both price- and quality-perceptions.*

## **2.3 Interaction effects of horizontal PPO, star-ratings & product type**

### **2.3.1 Horizontal PPO and star-ratings**

In online web-shop environments, star-rating systems are often employed, giving potential customers a quick and relatively easy overview or indication of a product's overall quality (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). Considering the argumentation as presented by Herr, Kardes and Kim (1991), such rating systems can be seen as product attribute information, supporting customers to perform a more educated product evaluation.

As described earlier, the general positive relationship of price and quality is often interpreted in terms of higher-priced products being assumed to be of better quality as well (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989). For the purposes of the present study, respectively descending or ascending PPO will not only be used without any additional product attribute information (star-ratings), but will also be combined with star-ratings that serve as quality indicators by either confirming or disconfirming the common perception of price and quality being positively related.

In practice, this will be achieved by combining a respectively horizontally descending or ascending PPO (from highest-to-lowest price vs. from lowest-to-highest price) with a respectively descending or ascending order of star-ratings (from highest-to-lowest star-rating vs. from lowest-to-highest star-rating). By doing so, the information presented will either be congruent with the commonly perceived positive relationship between price and quality (descending PPO x descending star-ratings; ascending PPO x ascending star-ratings) or incongruent with it (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings). Adding no star-ratings at all is interpreted as congruent information in regards to the relationship between price and quality information, as customers generally simply assume higher-priced products to be of better quality if no information is given to them that suggests otherwise (Suk et al., 2012).

When PPO is being combined with star-ratings that create a congruent relationship between price and quality (descending PPO x descending or no star-ratings; ascending PPO x ascending or no star-ratings), the effects regarding price- and quality perceptions should be fairly similar to the expected main effects of PPO on its own, as no information is given to consumers that contradicts the often assumed positive relationship between price and quality (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989).

Nevertheless, when PPO employed and star-ratings create an incongruent price-quality relationship, a slightly different influence on price- and quality-perceptions is expected. When a horizontally descending PPO is being combined with ascending star-ratings, options to choose from are getting cheaper with every additional option. While this might normally be associated with a loss in quality with every additional option due to the relationship between price and quality (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989), the addition of ascending star-ratings indicates that the quality of

products is actually improving with every additional option, as the addition of star-ratings gives people more information to go on when determining the quality of a certain product (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). This, in short, should create the perception of a 'win-win' situation with regards to both price and quality, as options on such a horizontal sequence would become cheaper in price and better in quality with every additional option to choose from. On the other hand, a horizontally ascending PPO combined with descending star-ratings should create the perceptions of products becoming more expensive in price and worse in quality. This in turn should impact people's reference values and thus create different perceptions of an equal center option. Because of this, a significant interaction effect of horizontal PPO and star-ratings on price-, as well as quality-perceptions is expected. The following hypotheses are formulated:

- **H3a:** *Price-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and descending, or no star-ratings when compared to conditions with horizontally ascending PPOs and ascending, or no star-ratings.*
- **H3b:** *Price-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and ascending star-ratings when compared to conditions with horizontally ascending PPOs and descending star-ratings.*
- **H3c:** *Quality-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and descending, or no star-ratings when compared to conditions with horizontally ascending PPOs and ascending, or no star-ratings.*
- **H3d:** *Quality-perceptions of an equal center-option are significantly higher in conditions with horizontally descending PPOs and ascending star-ratings when compared to conditions with horizontally ascending PPOs and descending star-ratings.*

In addition, a significant interaction effect of horizontal PPO and star-ratings on average revenue (in €) is expected, due to the function of star-ratings as quality indicators (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). In incongruent price-quality conditions (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings), paying a higher price for a product that is indicated to be of actual lower quality by the presence of star-ratings would not seem to be a logical choice. The presence of star-ratings should therefore influence the effect of horizontal PPO on average revenue (in €). As a consequence, the following hypothesis is formulated:

- **H4:** *Average revenue (in €) is significantly higher in congruent price-quality conditions (descending PPO x descending or no star-ratings, ascending PPO x ascending or no star-ratings) when compared to incongruent price-quality conditions (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings).*

### **2.3.2 Horizontal PPO and product type**

In general, a lot of different product types can be advertised in online web-shop environments. The present study will therefore make a distinction between two different product types that are assumed to represent respectively high-, and low-knowledge products. This distinction is made as Suk et al. (2012) argue that the amount of product knowledge can influence the potential impact of the PPO-effect.

Here, smartphones will represent the high-knowledge product category as their rapid growth in adoption by nearly all social classes (e.g. Falaki et al., 2010; Poushter, 2016) suggests relatively high levels of knowledge about smartphones. On the other hand, universal remote-controls, allowing users to control all of their home-entertainment devices by using just a single remote-control are much less commonly used and should therefore represent a proper example of a low-knowledge product.

Product knowledge refers to how much one knows about a certain product or a product category. Literature on this field suggests that consumers who possess a relatively high level of knowledge regarding a certain product or general product category tend to have stored quite a lot of concrete information about that particular product or product category in memory (e.g. Brucks, 1985; Lin & Chen, 2006; Mitchell & Dacin, 1996).

Following the argumentation as presented by Suk et al. (2012), the amount of product knowledge can influence the potential impact of the PPO-effect. This is the case, as consumers who know quite a lot about a product category tend to also make use of that information when confronted with options to choose from belonging to that particular product category. In order to make a choice and evaluate options presented to them, consumers simply rely on their product knowledge, rather than employing PPO as a source of information (Suk et al., 2012). On the other hand, if consumers have no or only little product knowledge to work with, they use additional information such as the PPO or the commonly positively perceived relationship between price and quality more often in order to make decisions (Suk et al., 2012), thus strengthening the potential influence of the PPO-effect.

As a consequence of this argumentation, a significant interaction effect of horizontal PPO and product knowledge on price-, quality-perceptions and average revenue (in €) is expected. The main effects of horizontal PPO on price-, quality-perceptions and average revenue (in €) as described should still hold in general, but should differ in strength dependent on the product type (high-knowledge product vs. low-knowledge product) displayed. The following hypotheses are formulated:

- **H5a:** *High-knowledge products significantly decrease the effect of horizontal PPO on price-perceptions when compared to low-knowledge products.*
- **H5b:** *High-knowledge products significantly decrease the effect of horizontal PPO on quality-perceptions when compared to low-knowledge products.*
- **H5c:** *High-knowledge products significantly decrease the effect of horizontal PPO on average revenue (in €) when compared to low-knowledge products.*

## **2.4 Main effects of star-ratings**

It has been discussed how the interaction between horizontal PPO and star-ratings should be capable of influencing both price- and quality-perceptions, as well as average revenue (in €). Nevertheless, the present study expects star-ratings to have an impact on both price- and quality-perceptions, as well as average revenue (in €), regardless of the horizontal PPO employed. In the following part, those expectations will be discussed.

### **2.4.1. Star-ratings and price- & quality-perceptions**

It has been discussed how star-ratings are often used as indicator of a products overall quality (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). Following the argumentation of Fishbein and Ajzen (1975) or Steenkamp (1990), such systems can be interpreted as descriptive information regarding product-relevant attributes, influencing quality-perception through informational belief formation. Because of the commonly perceived positive relationship between price and quality (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989), star-ratings should be able of influencing not only quality-, but also price-perceptions, regardless of the horizontal PPO employed.

Analog to the argumentation regarding horizontal PPO (Suk et al, 2012), subsequent products should be perceived differently depending on the order in which star-ratings are presented (descending, from highest-to-lowest rating; ascending, from lowest-to-highest rating), as this should create a respectively high or low anchor value (anchor quality) in the mind of consumers (Suk et al., 2012). Because of this, similar to the expected effect of horizontal PPO on both price- and quality-perceptions, the same center option in respectively horizontally descending and ascending orders of star-ratings should be perceived differently. The following hypotheses are formulated:

- **H6a:** *Price-perceptions of an equal center-option are significantly lower when star-ratings are ordered in a horizontally descending manner when compared to a horizontally ascending one.*

- **H6b:** *Quality-perceptions of an equal center-option are significantly lower when star-ratings are ordered in a horizontally descending manner when compared to a horizontally ascending one.*

#### **2.4.2. Star-ratings and average revenue**

It has been discussed how both price- and quality-perceptions should be capable of influencing perceptions in terms of gains and losses, as introduced by Tversky and Kahneman (1991). This in turn should influence consumer's product choices and thus average revenue (Suk et al., 2012). As the present study expects similar main effects of both horizontal PPO and star-ratings on price- and quality-perceptions, the argumentation regarding the main effects of horizontal PPO on average revenue (in €) should be applicable for the isolated effects of star-ratings as well.

Similar to horizontal PPO, star-ratings on their own should influence the perceived reference values and thus impact how subsequent offers are perceived in terms of gains and losses. When star-ratings are presented in a descending order (from highest-to-lowest star-rating), subsequent offers should be perceived as a loss in quality, which consumers will try to avoid (Tversky & Kahneman, 1991). On the other hand, when star-ratings are presented in an ascending order (from lowest-to-highest star-rating), subsequent offers should be perceived as a gain in quality, but a loss in price due to the relationship between price and quality (e.g. Chang & Wildt, 1994; Rao & Monroe, 1989). Because of this, a significant main effect of star-ratings on average revenue (in €) is expected. The following hypotheses are formulated:

- **H7a:** *Average revenue (in €) is significantly higher when star-ratings are presented in a horizontally descending manner when compared to horizontally ascending one.*
- **H7b:** *The effect of star-ratings on average revenue (in €) is mediated by both price- and quality-perceptions.*

#### **2.5 Main effects of product type**

Similar to the argumentation regarding star-ratings, the present study expects product type (high-knowledge product vs. low-knowledge product) to influence both price- and quality-perceptions, as well as average revenue (in €) regardless of both horizontal PPO and star-ratings employed. The argumentation as to why this should be the case will be presented in the upcoming sections.

### **2.5.1 Product type and price- & quality-perceptions**

The present study will distinguish between high-knowledge products (smartphones, based on e.g. Falaki et al., 2010; Poushter, 2016) and low-knowledge product types (universal remote-controls). Following the argumentation of Falaki et al. (2010) or Poushter (2016), smartphones are widely expected as common everyday technology, suggesting that consumers should be fairly familiar with this product type.

Based on research such as Biswas (1992) or Hardesty, Carlson and Bearden (2002), it can be suggested that levels of product familiarity and thus knowledge can impact consumer's price perceptions. When consumers are more skeptical about a certain product or product category (because of a lack of knowledge), prices of those products or the product category in question could be perceived as relatively more expensive (e.g. Biswas, 1992; Hardesty, Carlson, & Bearden, 2002). Nevertheless, when knowledge about a certain product or product category is relatively low, a relatively expensive product should not automatically be assumed to be of better quality as well. This is due to the fact that not a lot of concrete information about a certain product or product category is accessible in memory when product knowledge is low (e.g. Brucks, 1985; Lin & Chen, 2006; Mitchell & Dacin, 1996), making it harder for consumers to form clear quality-related opinions (e.g. Marks & Olson, 1981; Steenkamp, 1990). As a consequence, consumers should be more skeptical regarding quality-perceptions when product knowledge is low.

Because of the argumentation presented, a main effect of product type (high- vs. low-knowledge product) on both price- and quality-perceptions is expected. The following hypotheses in terms of the same center option in respectively horizontally descending or ascending sequences are formulated:

- **H8a:** *Price-perceptions for the same center option are significantly higher in low-knowledge product conditions when compared to high-knowledge product ones.*
  
- **H8b:** *Quality-perceptions for the same center option are significantly lower in low-knowledge product conditions when compared to high-knowledge product ones.*

### **2.5.2 Product type and average revenue**

It has been argued how both price-, and quality-perceptions influence perceptions in terms of gains and losses (e.g. Suk et al., 2012; Tversky & Kahneman, 1991) and influence product choice and thus average revenue (e.g. Chang & Wildt, 1994; Suk et al., 2012). As the argumentation thus far has indicated that product type (high- vs. low-knowledge product type) should influence both price-, as well as quality-perceptions, a significant main effect of product type on average revenue (in €) is

expected, regardless of the horizontal PPO or star-ratings employed.

As prices should be perceived as relatively high, while quality-perceptions should be relatively low for low-knowledge product types, the present study expects that consumers will be more cautious with spending money on low-knowledge products when compared to high-knowledge ones with which they might feel more comfortable and familiar. Because of the argumentation as presented here, the following hypotheses are formulated:

- **H9a:** Average revenue (in €) is significantly lower in low-knowledge product conditions when compared to high-knowledge product ones.
  
- **H9b:** The effect of product type on average revenue (in €) is mediated by both price- and quality-perceptions.

### 2.6 Conceptual model

The conceptual model as presented in Figure 2 highlights the proposed relationships between the relevant variables of the present study. The model is based on the argumentation as presented in this chapter.

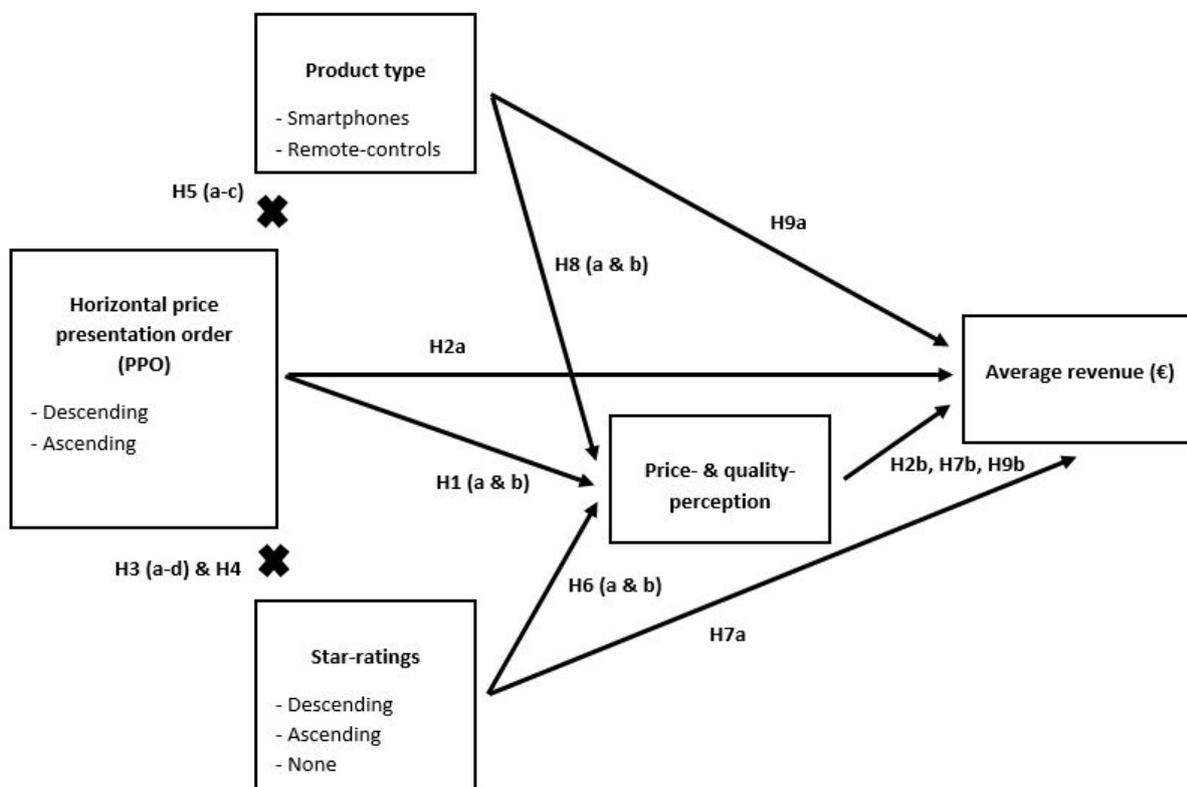


Figure 2. Conceptual model of variables

### 3. Method

#### 3.1 Preliminary study

In order to enhance validity of the final study, a preliminary test (see Appendix A) was conducted. A total of N=28 participants, all of which were students at the University of Twente, participated in the preliminary study. 17 participants were female, while 71.4% of the participants were of Dutch nationality. The mean age of participants was 21.8 years.

Results indicated that the product types representing either a high-, or low-knowledge product category were chosen successfully, as participants generally knew very little and significantly less about universal remote-controls when compared to smartphones. In order to measure product knowledge for both product types, a shortened version of the scale as designed by Flynn and Goldsmith (1999) has been used which proved to be highly reliable ( $\alpha = .91$ ).

In addition to this, the manipulation regarding the perceived relationship between price- and quality- perceptions, can be described as successful as well, as a significant difference regarding participant's perceptions of the relationship between price and quality has been measured in congruent price-quality conditions (more expensive products have better star-ratings) when compared to incongruent price-quality conditions (more expensive products do not have better star-ratings). Here, participants were asked to what extent they agreed that higher-priced options were indeed of better quality and if they believed that price and quality were related to another. It was mentioned that both questions were directly related to the web-shop environment they got to see. The scale as used by Suk et al. (2012) has been employed for measurement which turned out to be reliable ( $\alpha = .74$ ). Table 2 gives an overview of the results of both manipulation checks.

Table 2. Results independent samples tests product knowledge; PPO x star-ratings

Manipulation	M	SD	Sig. (2-tailed)	t	df
<b>Product knowledge</b>			0.00*	4.93	26.00
Smartphones	4.82	1.05			
Remote-controls	2.86	1.02			
<b>PPO x star-ratings (price-quality relationship)</b>			0.03*	2.58	9.47
Congruent	5.46	0.92			
Incongruent	3.69	1.79			

**Note:** *p* significant at  $\leq 0.05$

In addition, in order to prevent influencing participants based on the general level of perceived realism and attractiveness of the employed stimulus material in the actual study, participants have been asked to indicate to what extent they agree with the statements that the stimulus material used

(smartphones vs. universal remote-controls) is respectively realistic and appealing. This has been measured by the use of a seven-point Likert scale (from 1, 'strongly disagree' to 7, 'strongly agree'). As indicated by the results, participants experienced all conditions represented by the different stimulus materials as almost equally realistic and appealing (attractive), indicating no significant differences in regards to perceptions of realism ( $p = 0.22$ ) or attractiveness ( $p = 0.79$ ) Biased results as a consequence of this are therefore unlikely to appear in the actual study.

**3.2 Research design**

In order to answer the formulated hypotheses an experimental online-study has been employed. This allows controlled manipulation of relevant variables in order to determine their relationship to one another (Kardes, Cronley & Cline, 2011), thus supporting researchers to gather knowledge regarding people's (re-)actions and reasoning behind it (Hinkelmann, 2011).

The concept of the conducted study is summarized in a 2x3x2 between subjects research design as shown in Figure 3.

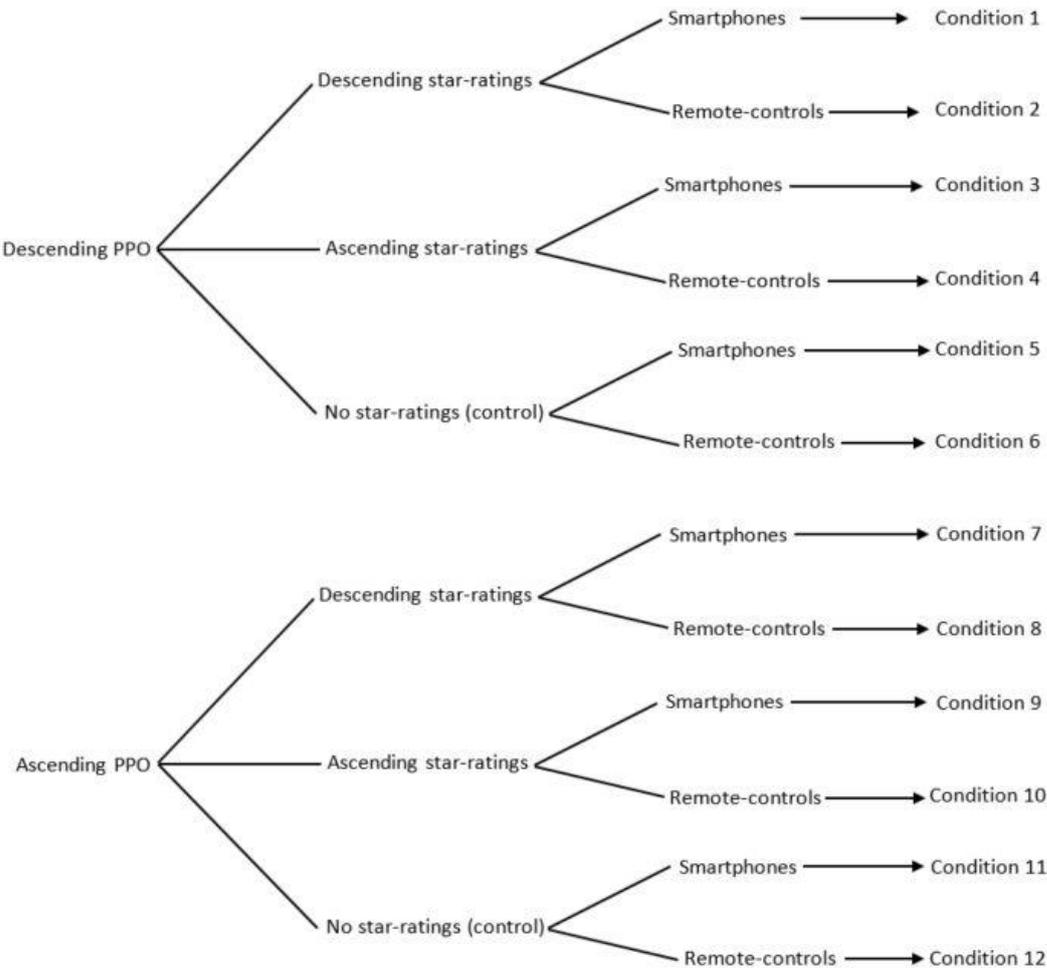


Figure 3. Research design

### 3.3 Sample

A total of 316 participants participated in the conducted study. The results of 13 participants were excluded from the study as they either completed the survey too quickly to truly be trustworthy or were not old enough in order to participate (under 18). As a consequence, the results of 303 participants were used for further analysis.

Participants were of German (52.1%), Dutch (29.4%) or of a different nationality (18.5%). A total of 189 were female and 114 were male. Participants were aged from 18 to 66 years with a mean age of 25.61 years (SD= 6.47). Participants were generally highly educated, as 80.5% of all participants were currently enrolled in a bachelor's program or had already obtained a bachelor's degree or an even higher degree (master's degree). All demographic information can be found in Appendix B.

A minimum sample size of 25 participants per condition has been chosen in order to ensure informational value while still maintaining a manageable amount of data-collection effort (Martínez-Mesa et al., 2014). Keeping in mind validity and generalizability, participants have randomly been assigned to one of the conditions of the conducted study (Hacking, 1988). Table 3 gives an overview of the distribution of participants among the different conditions.

Table 3. *Distribution of participants among conditions*

Condition	Gender (% male)	Age (male & female) M (SD)	General price-quality perception M (SD)	N
1	48.00 %	25.48 (6.79)	4.30 (1.18)	25
2	40.00 %	26.64 (6.82)	4.60 (1.15)	25
3	18.50 %	26.52 (10.87)	4.02 (1.16)	27
4	44.00 %	25.68 (3.92)	4.16 (1.24)	25
5	32.00 %	24.28 (2.23)	4.40 (1.16)	25
6	36.00 %	28.24 (10.55)	4.18 (1.39)	25
7	48.00 %	24.24 (2.60)	4.40 (1.17)	25
8	36.00 %	24.36 (3.40)	4.34 (1.27)	25
9	36.00 %	24.52 (3.37)	5.02 (0.96)	25
10	46.20 %	26.42 (6.97)	4.33 (1.29)	26
11	36.00 %	26.72 (8.00)	4.62 (1.19)	25
12	32.00 %	24.08 (3.15)	4.34 (1.16)	25

**Note:** One-way ANOVA's for respectively age ( $p = 0.39$ ) and general price-quality perception ( $p = 0.29$ ) revealed no statistically significant differences between the means of conditions. Also, a crosstabs analysis with regards to gender revealed no significant differences ( $p = 0.66$ ) between conditions.

### **3.4 Stimulus material**

The twelve different web-shop environments representing the different conditions of the study can be seen in Appendix C. As explained earlier, participants have been introduced to respectively the smartphone or universal remote-control conditions by a short introduction indicating which of the products they will actually get to see. In order to prevent any kind of bias, participants did not receive the information that this study investigates two different kind of products.

A fictitious brand (Koncom) with fictitious product names has been chosen for the different conditions of the conducted study. This has been done in order to avoid bias due to possible brand preferences of participants (Chaxel, Russo & Kerimi, 2013).

Smartphones and universal remote-controls have been chosen as advertised products in the web-shop environments in order to create two groups of product type that differ in regards to product knowledge, as this study suggested that this should have an impact on the effect on PPO. The assumption that smartphones and universal remote-controls indeed significantly differ in regards to product-knowledge has been confirmed by the conducted preliminary study.

In conditions in which a horizontally descending PPO was employed, a high-priced product was displayed on the left-hand side of the horizontal sequence. Subsequent product prices of the same sequence were then descending towards the right-hand side. In horizontally ascending PPO-conditions, this structure was mirrored meaning that the cheapest product of the sequence was displayed on the left-hand side with subsequent products ascending in price towards the right-hand side.

This has been combined with no star-ratings as quality indicators at all, or star-ratings in respectively descending or ascending order, creating conditions that were either congruent or incongruent with the common price-quality relationship assumption (highest-priced product is of best quality). This means that, in congruent price-quality conditions, the orders of both prices and star-ratings were the same (descending PPO x descending star-ratings; ascending PPO x ascending star-ratings). On the other hand, in incongruent price-quality conditions, the orders of both prices and star-ratings did not match (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings).

Figures 4 and 5 give an example of the stimulus material as used in two conditions of the conducted study in order to indicate how the used stimulus material looked. All conditions of the conducted study can be seen in Appendix C.

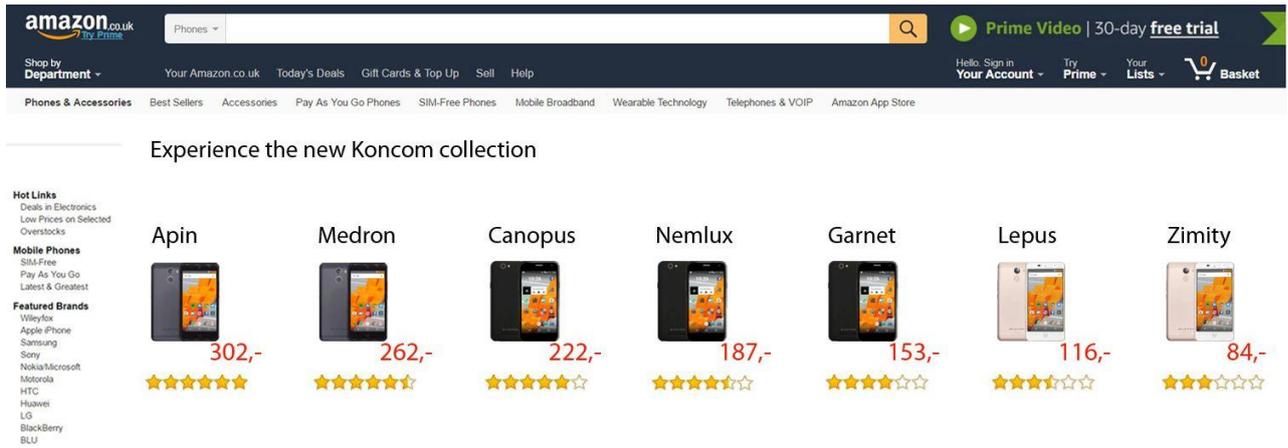


Figure 4. Stimulus material as used in C1. Smartphones, PPO & star-ratings are both descending (example of congruent price-quality condition).

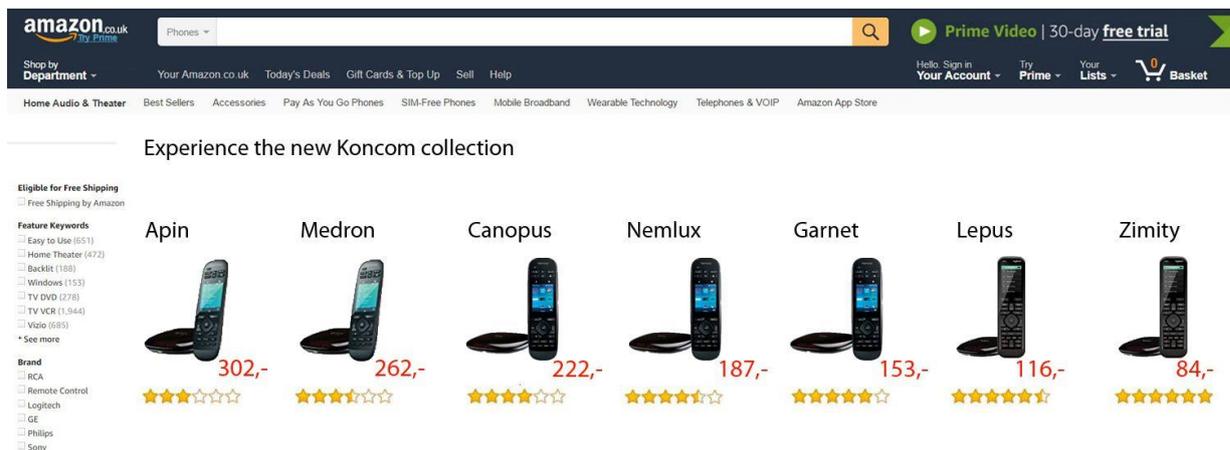


Figure 5. Stimulus material as used in C4. Universal remote-controls, PPO is descending while star-ratings are ascending (example of incongruent price-quality condition).

### 3.5 Measures

Participants of the conducted study were requested to fill in an online-questionnaire in order to measure the items of the theoretical constructs included. A seven-point Likert scale (from 1 'strongly agree' to 7 'strongly disagree') was used. This facilitates data analysis, as well as participation for survey takers (DeVellis, 2016). A complete list of all statements as used in the employed study can be found in Appendix C. Where possible, prior literature on (psychological) pricing strategies has been used for the construction of the employed constructs.

The items that were used for the measurement of product knowledge have been based on the work of Flynn and Goldsmith (1999). An example of a statement used to measure product-knowledge is: “*I have heard of most of the new ... that are around*”. It needs to be noted here that ‘...’ has been replaced with either ‘smartphones’ or ‘remote-controls’ in the actual study.

For measuring participants’ perceptions of the relationship between price and quality, a scale based on Suk et al. (2012) has been used. An example of a statement from this is “*Higher-priced products have better quality*”. This scale has been used twice. Ones with a direct reference to the stimulus material (web-shops) participants were confronted with in order to check for differences between groups, and ones without any direct reference to the stimulus material, aiming to measure to what extent participants generally agree with the popular assumption that higher-priced products are of better quality.

In order to check the internal validity of the employed constructs, Cronbach’s alpha has been determined. Table 4 gives an overview of the results. Based on the results, the constructs regarding the measurement of product knowledge and the perceived relationship between price and quality were seen as valid for further analysis, as they scored an Cronbach’s alpha of above 0.70.

Table 4. Cronbach’s alpha of measured constructs

Construct	Cronbach’s alpha
Product knowledge	0.93
Price-quality relationship (web-shops)	0.87
Price-quality relationship (general)	0.78

**Note:**  $\alpha \geq 0.70$  is considered valid.

In order to measure the dependent variable average revenue (in €), participants have simply been asked to choose for one of the product options presented to them in the web-shop environment. Similar to Suk et al. (2012), the average price of the options chosen by participants has then been used in order to determine the respective average revenue (in €) achieved in the different conditions.

In order to measure both price- and quality perceptions of the center-option in the different conditions, two seven-point Likert scales for respectively price- and quality-perceptions, ranging from 1 (‘very low’), to 7 (‘very high’) were used. By filling in these scales, participants indicated how they perceived both price, as well as quality of the center option in the web-shop environment displayed to them. Both product choice (average revenue in €) and quality-, as well as price-perceptions have not been included in the analysis of Cronbach’s alpha, as they were measured by the use of single-item scales.

### **3.6 Procedure**

The conducted study consisted of five different parts. After participants filled out a consent form, informing them about terms and conditions of the research, participants' demographics were collected. Participants were therefore asked about their age, gender, nationality and level of education. After this, participants were randomly placed in one of the 12 conditions of the study. They received an introduction, explaining to them that the first part of upcoming questions would be related to a web-shop environment they were about to see and were asked to carefully look at it, as they had to answer questions about products advertised in it. Which web-shop environment was presented depended on the condition participants were placed in. The given introduction regarding the web-shop environments was the same in all conditions with the exception of referring to one of either smartphones or universal remote-controls as advertised products.

Subsequently, participants answered questions regarding their product choice, their quality- and price-perceptions of the different products and their perception regarding the relationship between quality and price of the products advertised in the web-shop. Afterwards, the study continued with a set of questions about participants' product knowledge (of either smartphones or universal remote-controls) and their general perception of the relationship between price and quality. It was stated to participants that these set of questions were no longer related to any specific web-shop environment. Finally, participants were thanked for their participation.

For all questions used, the respective measures as described earlier in this chapter were employed. The complete questionnaire as used in the conducted study can be seen in Appendix C.

## 4. Results

### 4.1 Manipulation checks

Before any further analysis were conducted, manipulation checks similar to the preliminary study were performed. This was done in order to check the manipulations of both product knowledge by respectively high-knowledge products (smartphones) and low-knowledge ones (universal remote-controls), as well as the perceptions of the relationship between price and quality in respectively congruent (descending PPO x descending star-ratings; ascending PPO x ascending star-ratings) and incongruent (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings) price-quality conditions. Results were similar to the preliminary study indicating that both manipulations were successful (see Table 5).

Table 5. Results independent samples tests product knowledge; PPO x star-ratings

Manipulation	M	SD	Sig. (2-tailed)	t	df
<b>Product knowledge</b>			0.00*	10.99	301
Smartphones	4.64	1.38			
Remote-controls	2.95	1.30			
<b>PPO x star-ratings (price-quality relationship)</b>			0.00*	17.53	201
Congruent	5.46	1.14			
Incongruent	2.48	1.28			

**Note:** *p* significant at  $\leq 0.05$

### 4.2 Main results

Analyses of variance (ANOVA's) were performed in order to examine how the dependent variables price- and quality-perception, as well as average revenue (in €) are affected by PPO (descending vs. ascending), product type (high-knowledge product vs. low-knowledge product) and star-ratings (descending vs. ascending). Here, results are structured by presenting the outcomes of every ANOVA for respectively price-, quality-perceptions and average revenue (in €) separately. Main effects are presented first, while interaction effects are presented afterwards. An overview of the hypotheses as formulated by the present study will be given at the end of this chapter, including either a rejection or acceptance of the hypothesis in question.

## 4.2.1 Price-perception

### 4.2.1.1 Main effects

The performed ANOVA indicates no significant main effect of either PPO ( $F(1, 291) = 0.55, p = .46$ ) nor star-ratings ( $F(2, 291) = 0.89, p = .41$ ) on price-perception of the same center option. This being said, a significant main effect of product type on price-perception of the same center option has been found ( $F(1, 291) = 17.70, p = .00$ ). Price-perception of the same center option was significantly lower in high-knowledge product conditions ( $M = 4.00, SD = 0.99$ ) when compared to low-knowledge product conditions ( $M = 4.46, SD = 0.92$ ). This effect is illustrated by Figure 6. Tables 6 and 7 give an overview of the means and standard deviations, as well as the results of the conducted ANOVA in regards to the significance of the main effects of the independent variables on price-perception.

Table 6. Means & standard deviations – price-perception

Price-perception		N	M	SD
PPO	Descending	152	4.27	1.01
	Ascending	151	4.19	0.96
Star-ratings	Descending	100	4.23	1.10
	Ascending	103	4.32	1.01
	None	100	4.14	0.83
Product type	High-knowledge	152	4.00	0.99
	(smartphones)			
	Low-knowledge	151	4.46	0.92
	(Remote-controls)			

Table 7. Results ANOVA main effects – price-perception

Independent variable	df	F	$\eta^2$	Sig.
PPO	1, 291	0.55	0.00	0.46
Star-ratings	2, 291	0.89	0.01	0.41
Product type	1, 291	17.70	0.06	0.00*

**Note:** \*Significant effect:  $p \leq 0.05$

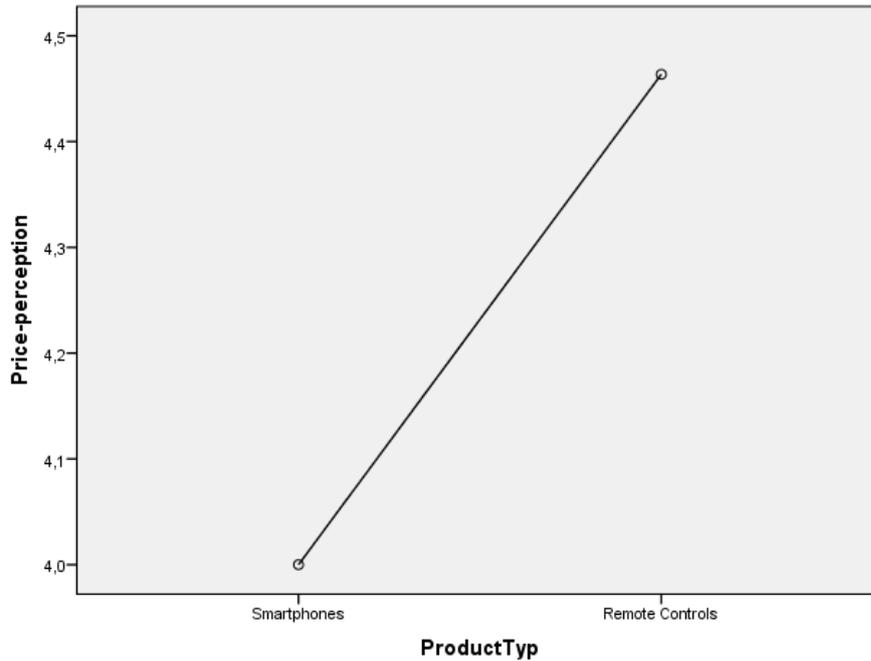


Figure 6. Main effect of product type on price-perception.

#### 4.2.1.2 Interaction effects

The conducted ANOVA revealed no significant interaction effects for PPO and star-ratings ( $F(2, 291) = 0.01, p = .99$ ), PPO and product type ( $F(1, 291) = 1.05, p = .31$ ), or star-ratings and product type ( $F(2, 291) = 0.13, p = .88$ ) on price-perception of the same center option. In addition, no three-way interaction of PPO, star-ratings and product type on price-perception has been found ( $F(2, 291) = 1.61, p = .20$ ). Table 8 gives an overview of the results of the ANOVA regarding interaction effects of the independent variables on price-perception of the same center option.

Table 8. Results ANOVA interaction effects – price-perception

Independent variable	df	F	$\eta^2$	Sig.
PPO x Star-ratings	2, 291	0.01	0.00	0.99
PPO x Product type	1, 291	1.05	0.00	0.31
Star-ratings x Product type	2, 291	0.13	0.00	0.88
PPO x Star-ratings x Product type	2, 291	1.61	0.01	0.20

**Note:** \*Significant effect:  $p \leq 0.05$

## 4.2.2 Quality-perception

### 4.2.2.1 Main effects

The conducted ANOVA in regards to quality-perception of the same center option revealed two significant main effects of both PPO ( $F(1, 291) = 7.01, p = .01$ ) and star-ratings ( $F(2, 291) = 4.33, p = .01$ ). Quality-perception of the same center option was significantly higher in conditions with a descending PPO ( $M = 4.75, SD = 0.95$ ), when compared to an ascending PPO ( $M = 4.48, SD = 0.82$ ). In regards to star-ratings, quality-perceptions of the same center option were significantly lower in conditions without any star-ratings at all ( $M = 4.40, SD = 0.94$ ) when compared to conditions with either descending ( $M = 4.72, SD = 0.85$ ) or ascending ( $M = 4.72, SD = 0.87$ ) star-ratings. Both main effects are illustrated by Figures 7 and 8. No significant main effect of product type on quality-perceptions has been found ( $F(1, 291) = 0.31, p = .58$ ). Tables 9 and 10 show both means and standard deviations, as well as main effects of the independent variables on quality-perceptions of the same center option.

Table 9. Means & standard deviations – quality-perception

Quality-perception		N	M	SD
PPO	Descending	152	4.75	0.95
	Ascending	151	4.48	0.82
Star-ratings	Descending	100	4.72	0.85
	Ascending	103	4.72	0.87
	None	100	4.40	0.94
Product type	High-knowledge (smartphones)	152	4.64	0.90
	Low-knowledge (Remote-controls)	151	4.58	0.90

Table 10. Results ANOVA main effects – quality-perception

Independent variable	df	F	$\eta^2$	Sig.
PPO	1, 291	7.01	0.02	0.01*
Star-ratings	2, 291	4.33	0.03	0.01*
Product type	1, 291	0.31	0.00	0.58

**Note:** \*Significant effect:  $p \leq 0.05$

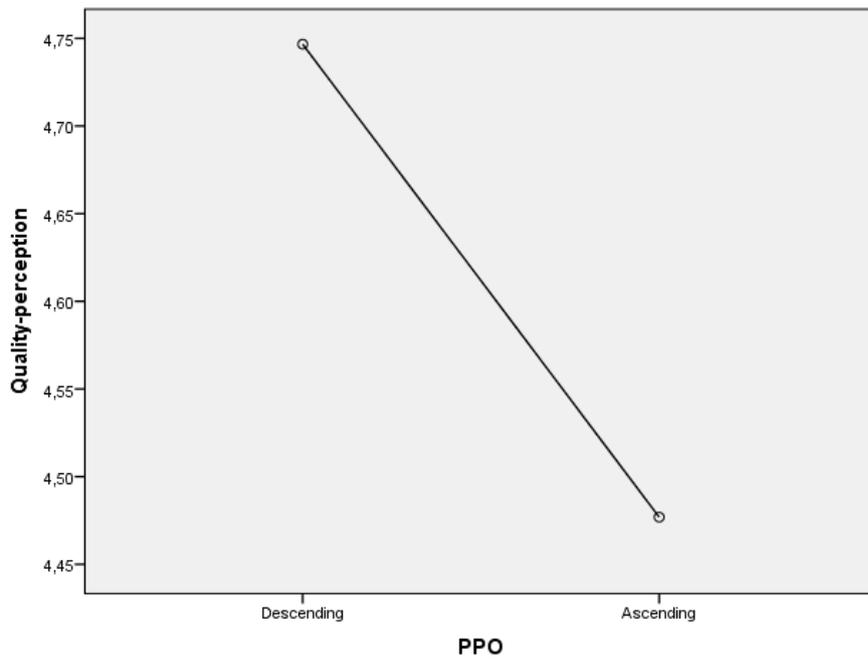


Figure 7. Main effect of PPO on quality-perception.

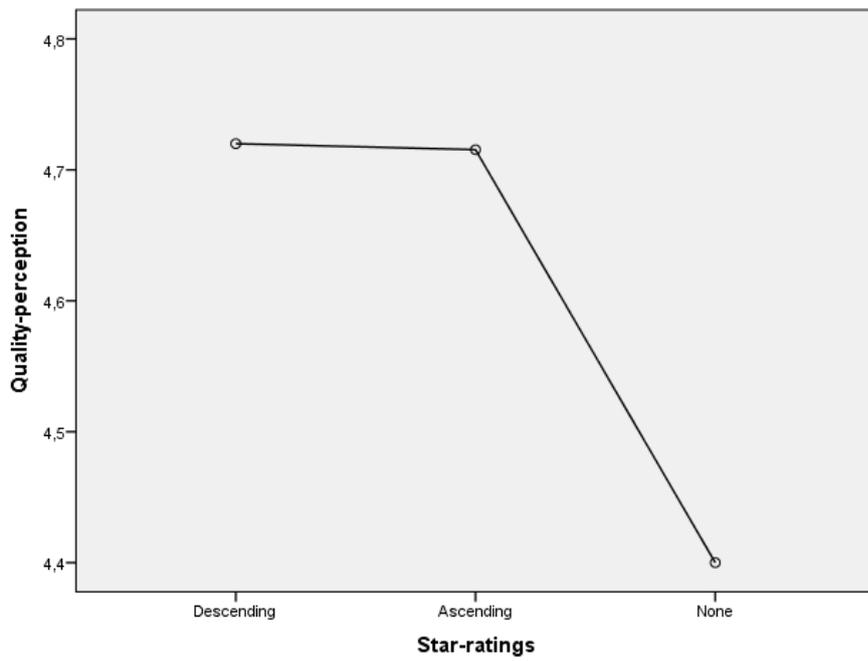


Figure 8. Main effect of star-ratings on quality-perception.

#### 4.2.2.2 Interaction effects

The ANOVA showed no significant interaction effects of PPO and star-ratings ( $F(2, 291) = 0.01, p = .92$ ), PPO and product type ( $F(1, 291) = 1.81, p = .18$ ), or star-ratings and product type ( $F(2, 291) = 0.69, p = .50$ ) on quality-perception of the same center option. Additionally, no significant three-way interaction has been found for PPO, star-ratings and product type ( $F(2, 291) = 1.01, p = .37$ ). Table 11 gives an overview of the performed ANOVA with regards to the examined interaction effects of the independent variables on quality-perception of the same center option.

Table 11. Results ANOVA interaction effects – quality-perception

Independent variable	df	F	$\eta^2$	Sig.
PPO x Star-ratings	2, 291	0.01	0.00	0.92
PPO x Product type	1, 291	1.81	0.01	0.18
Star-ratings x Product type	2, 291	0.69	0.01	0.50
PPO x Star-ratings x Product type	2, 291	1.01	0.01	0.37

**Note:** \*Significant effect:  $p \leq 0.05$

#### 4.2.3 Average revenue

##### 4.2.3.1 Main effects

Results of the performed ANOVA indicate no significant main effect ( $F(1, 291) = 0.00, p = .99$ ) of PPO on average revenue (in €). Also no significant main effect of star-ratings has been found ( $F(2, 291) = 1.52, p = .22$ ). Nevertheless, product type (high-knowledge product vs. low-knowledge product) had a significant main effect on average revenue ( $F(1, 291) = 16.87, p = .00$ ). The average revenue was significantly higher in high-knowledge product (smartphone) conditions ( $M = 171.56, SD = 63.79$ ) when compared to low-knowledge (remote-control) conditions ( $M = 146.07, SD = 63.06$ ). This significant main effect is illustrated by Figure 9. Tables 12 and 13 give an overview of the conducted ANOVA in regards to means and standard deviations, as well as the significance of the main effects of the independent variables on average revenue (in €).

Table 12. Means & standard deviations – average revenue (in €)

Average revenue in (€)		N	M	SD
PPO	Descending	152	158.57	64.93
	Ascending	151	159.14	64.48
Star-ratings	Descending	100	162.80	65.26
	Ascending	103	162.63	70.14
	None	100	151.03	57.53
Product type	High-knowledge (smartphones)	152	171.56	63.79
	Low-knowledge (Remote-controls)	151	146.07	63.06

Table 13. Results ANOVA main effects – average revenue (in €)

Independent variable	df	F	$\eta^2$	Sig.
PPO	1, 291	0.00	0.00	0.99
Star-ratings	2, 291	1.52	0.10	0.22
Product type	1, 291	16.87	0.06	0.00*

**Note:** \*Significant effect:  $p \leq 0.05$

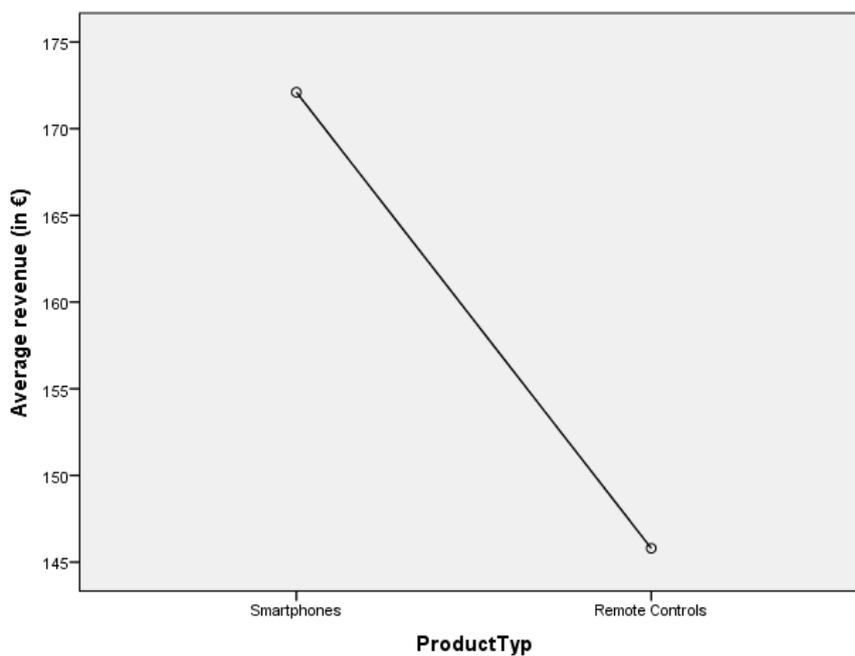


Figure 9. Main effect of product type on average revenue (in €).

#### 4.2.3.2 Interaction effects

Overall, the conducted ANOVA revealed one significant interaction effect between PPO and star-ratings ( $F(2, 291) = 45.81, p = .00$ ) on average revenue. In ‘incongruent’ conditions, PPO was either descending combined with ascending star-ratings ( $M = 123.63, SD = 55.07$ ), or ascending combined with descending star-ratings ( $M = 128.14, SD = 53.93$ ). Average revenue was significantly higher in ‘congruent’ conditions, in which PPO was either descending with descending star-ratings ( $M = 197.44, SD = 56.98$ ) or ascending with ascending star-ratings ( $M = 202.39, SD = 61.22$ ). The average revenue was in between ‘incongruent’ and ‘congruent’ conditions, when no star-ratings were presented at all for both descending PPO ( $M = 156.04, SD = 61.20$ ), as well as for ascending PPO ( $M = 146.02, SD = 53.77$ ). The interaction effect between PPO and star-ratings is illustrated by Figure 10.

No significant interaction effects on average revenue (in €) have been found for PPO and product type ( $F(1, 291) = 1.07, p = .30$ ), as well as for star-ratings and product type ( $F(2, 291) = 0.04, p = .96$ ). In addition, no significant three-way interaction has been found between PPO, star-ratings and product type ( $F(2, 291) = 1.54, p = .22$ ). Tables 14 and 15 represent an overview of the results as discussed here.

Table 14. Means & standard deviations – average revenue (in €)

Average revenue (in €)		N	M	SD
PPO - Star-ratings (incongruent)	Descending - Ascending	52	123.63	55.07
	Ascending - Descending	50	128.14	53.93
PPO - Star-ratings (congruent)	Descending - Descending	50	197.44	56.98
	Ascending - Ascending	51	202.39	61.22
PPO - No star-ratings	Descending	50	156.04	61.20
	Ascending	50	146.02	53.77

Table 15. Results ANOVA interaction effects – Average revenue (in €)

	df	F	$\eta^2$	Sig.
PPO x Star-ratings	2, 291	45.81	0.24	0.00*
PPO x Product type	1, 291	1.07	0.00	0.30
Star-ratings x Product type	2, 291	0.04	0.00	0.96
PPO x Star-ratings x Product type	2, 291	1.54	0.01	0.22

**Note:** \*Significant effect:  $p \leq 0.05$

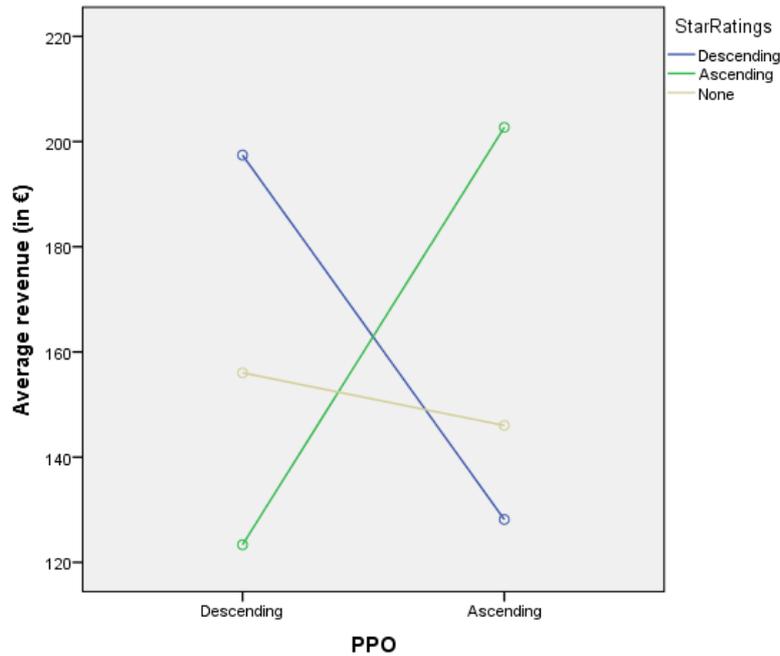


Figure 10. Interaction effect between PPO and star-ratings on average revenue (in €).

#### 4.3 Mediation analysis

Following the argumentation as presented by Baron and Kenny (1986), a significant ‘zero-order’ effect needs to be established between the independent and the dependent variable(s) in order to be able to perform a mediation analysis. Without an ‘effect to be mediated’ (e.g. Collins, Graham, & Flaherty, 1998), a mediation analysis is aimless.

Based on this argumentation, as the conducted study found no significant main effects of both horizontal PPO and star-ratings on average revenue (in €), no further mediation analysis for the effects of price- and quality-perceptions was conducted.

With regards to product type (high-knowledge product vs. low-knowledge product), the conducted study indicated a significant main effect of product type on average revenue ( $p = .00$ ). In addition, product type also seemed to significantly influence price-perception ( $p = .00$ ), one of the potentially mediating variables. Following the four-step approach for mediation as presented by Baron and Kenny (1986), it was therefore also tested if price-perceptions alone had a significant impact on average revenue (in €), in order to test if price-perceptions could indeed be mediating the effect of product type on average revenue. In order to do so a linear regression analysis was performed, indicating that indeed price-perception alone significantly influenced average revenue ( $p = .03$ ). Because of the results as presented here, all three requirements for a possible mediation effect of price-perception were met. As a consequence of this, the last step of the approach of Baron and Kenny

(1986) was performed, in which mediation would have been supported if the effect of price-perception on average revenue (in €) would have remained significant when controlling for product type. As the performed multiple regression analysis indicated that this has not been the case ( $p = .17$ ), it can be concluded that the effect of product type on average revenue (in €) is not being mediated by price-perceptions.

#### 4.4 Hypotheses

Table 16 gives an overview of the hypotheses as formulated by the conducted study. Based on the results as presented in this chapter, it is stated if the hypothesis in question is respectively rejected or supported. As a mediation analysis was only partially possible, hypotheses H2b and H7b remain unanswered, as they cannot be tested by the conducted study.

Table 16. *Overview of hypotheses*

H#	Hypotheses	Result
H1	<i>a. Price-perceptions of an equal center-option are significantly lower in horizontally descending PPOs when compared to ascending PPOs.</i>	Rejected
	<i>b. Quality-perceptions of an equal center-option are significantly lower in horizontally descending PPOs when compared to ascending PPOs.</i>	Rejected
H2	<i>a. Average revenue (in €) is significantly higher in horizontally descending PPOs when compared to horizontally ascending PPOs.</i>	Rejected
	<i>b. The effect of horizontal PPO on average revenue (in €) is mediated by both price- and quality-perceptions.</i>	Unanswered
H3	<i>a. Price-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and descending, or no star-ratings when compared to conditions with horizontally ascending PPOs and ascending, or no star-ratings.</i>	Rejected
	<i>b. Price-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and ascending star-ratings when compared to conditions with horizontally ascending PPOs and descending star-ratings.</i>	Rejected
	<i>c. Quality-perceptions of an equal center-option are significantly lower in conditions with horizontally descending PPOs and descending, or no star-ratings when compared to conditions with horizontally ascending PPOs and ascending, or no star-ratings.</i>	Rejected
	<i>d. Quality-perceptions of an equal center-option are significantly higher in conditions with horizontally descending PPOs and ascending star-ratings when compared to conditions with horizontally ascending PPOs and descending star-ratings.</i>	Rejected
H4	<i>Average revenue (in €) is significantly higher in congruent price-quality conditions when compared to incongruent price-quality conditions.</i>	Supported
H5	<i>a. High-knowledge products significantly decrease the effect of horizontal PPO on price-perceptions when compared to low-knowledge products.</i>	Rejected

	<i>b. High-knowledge products significantly decrease the effect of horizontal PPO on quality-perceptions when compared to low-knowledge products.</i>	Rejected
	<i>c. High-knowledge products significantly decrease the effect of horizontal PPO on average revenue (in €) when compared to low-knowledge products.</i>	Rejected
H6	<i>a. Price-perceptions of an equal center-option are significantly lower when star-ratings are ordered in a horizontally descending manner when compared to a horizontally ascending one.</i>	Rejected
	<i>b. Quality-perceptions of an equal center-option are significantly lower when star-ratings are ordered in a horizontally descending manner when compared to a horizontally ascending one.</i>	Rejected
H7	<i>a. Average revenue (in €) is significantly higher when star-ratings are presented in a horizontally descending manner when compared to horizontally ascending one.</i>	Rejected
	<i>b. The effect of star-ratings on average revenue (in €) is mediated by both price- and quality-perceptions.</i>	Unanswered
H8	<i>a. Price-perceptions for the same center option are significantly higher in low-knowledge product conditions when compared to high-knowledge product ones.</i>	Supported
	<i>b. Quality-perceptions for the same center option are significantly lower in low-knowledge product conditions when compared to high-knowledge product ones.</i>	Rejected
H9	<i>a. Average revenue (in €) is significantly lower in low-knowledge product conditions when compared to high-knowledge product ones.</i>	Supported
	<i>b. The effect of product type on average revenue (in €) is mediated by both price- and quality-perceptions.</i>	Rejected

## **5. Discussion**

The purpose of the conducted study was to investigate the extent to which price presentation order (PPO) influences average revenue (in €). In addition to this the conducted study expected that this effect would be influenced by both product type (high-knowledge product vs. low-knowledge product) and star-ratings (descending vs. ascending). Price-, as well as quality-perceptions were added into the picture as dependent variables, as the present study expected the effects of PPO, star-ratings and product type on average revenue (in €) to be mediated by both price- and quality-perceptions. In addition, respectively horizontal PPO, star-ratings and product type were expected to influence the dependent variables price- and quality-perceptions, as well as average revenue (in €), regardless of one another. Because of this, in the following, the results of the conducted study will be discussed in terms of the influence horizontal PPO, star-ratings and product type had on the dependent variables when analyzed isolated. Interaction effects between the variables as found by the conducted study will be discussed afterwards.

### **5.1 Main effects**

#### **5.1.1 Price presentation order (PPO)**

The conducted study found no significant main effect of horizontal PPO on average revenue (in €). As a consequence, in regards to the first research question, it can be concluded that it seemingly doesn't matter if the horizontal PPO is descending or ascending when it comes to influencing average revenue (in €). This study was therefore unable to reproduce findings similar to the ones as presented by Suk et al. (2012). As no 'zero-order' relationship (Baron & Kenny, 1986) between horizontal PPO and average revenue (in €) was found, potentially mediating effects of both price- and quality perceptions on this relationship have not been studied. There are various aspects worthy of discussion that might give an indication as to why horizontal PPO has seemingly no impact on average revenue (in €).

Firstly, this study argued that the theoretical foundation of the PPO-effect (information search patterns and reference pricing) should be the same regardless of the sequencing (horizontal vs. vertical) employed. This might very simply not be the case in practice. For instance, it might not be unrealistic to assume that in practice, participants did not use any of the information search patterns (ISPs) as discussed by the theoretical framework of this study, or that they only employed them in a more alleviated manner. Given the horizontal sequencing employed and the number of options presented to participants in those sequences, it might have been the case that participants created an overall impression of all the options rather quickly instead of scanning the various options presented to them one for one. This is further supported by the fact that the horizontal sequencing employed made it so that participants did not have to scroll up or down to see all options presented to them. Given the relatively low number of options to choose from when compared to similar studies by Suk

et al. (2012), scanning information from left-to-right as supposed by the theory presented by this study might simply (and unconsciously) have been perceived as unnecessary by participants. This might have nullified the foundation of the PPO-effect thus making it irrelevant for consumer choices and thus the average revenue (in €).

In addition to this, incomplete search as discussed by Suk et al. (2012) might have weakened any potential influences of PPO on consumer choices. Instead of considering all options available, participants might have selected the first option that seemed to satisfy their requirements and thus automatically discarded any other options from their consideration-set.

Horizontal PPO had no significant main effect on price-perceptions (of the same center option), indicating that price-perceptions seem to be relatively unaffected by the horizontal PPO employed.

This being said, interesting results in regard to the effect of horizontal PPO on quality-perceptions (of the same center option) have been found. While significant differences in the quality-perceptions of the same center-option have been found when horizontally descending PPOs were compared to ascending ones, the differences that have been brought to light are different than expected. This study has argued that as a higher 'reference value' is being established in horizontally descending PPOs, the center-option should be perceived as being cheaper and thus worse in quality as it is being compared to a higher 'reference value' on the left. Vice versa, in ascending PPOs, the same center-option should be seen as more expensive and thus better in quality as it is being compared to a lower 'reference value'.

The results regarding the quality-perceptions of the same center-option in respectively horizontally descending and ascending PPOs indicate that this is not the case. Results are actually asynchronous in regards to expectations, as the same center-option was perceived to be of higher quality in descending PPOs and of worse quality in ascending PPOs.

While normally discussed in different circumstances and contexts, the rub-off effect as mentioned by Meenaghan (1991) or Park and John (2010) might offer an explanation for this surprising result that contradicts the theoretical argumentation as presented by this study. Essentially, translated to the context of the conducted study, the rub-off effect would make it so that perceived attributes of a certain product (e.g. the perceived level of quality) 'rub-off' on another product that is being compared to it (Meenaghan, 1991; Park & John, 2010). Because of this, instead of looking worse or cheaper in comparison to a certain 'reference value' or anchor, as supposed by the principle of reference pricing, subsequent products in respectively horizontally descending or ascending PPOs 'adopt' characteristics and properties of 'reference points'. This would offer an explanation as to why the same center-option was actually perceived to be of higher quality in descending PPOs when

compared to ascending ones, as properties of the better 'reference point' were 'rubbing-off' on the center-option, making it appear to be of better quality in comparison instead of worse.

### **5.1.2 Star-ratings**

The results of the conducted study indicate no significant main effect of star-ratings (descending vs. ascending) on price-perceptions (of the same center-option), while a significant main effect of star-ratings on quality-perceptions (of the same center-option) has been found. This suggests that star-ratings do in fact primarily function as indicators of quality, that give consumers additional information to go on when evaluating different options to choose from (e.g. Israeli, 2002; Shepperd, Charnock, & Cook, 2002). This is supported by the findings of the conducted study, showing that quality-perceptions were significantly lower when star-ratings were missing. Nevertheless, different than expected by the present study, star-ratings on their own seem to be insufficient when it comes to influencing price-perceptions as well. This is supported by the fact that star-ratings alone do not have a significant influence on average revenue (in €). It is likely to assume that consumers make use of both price-, as well as quality-perceptions when it comes to making decisions. As star-ratings alone seems to only have a significant influence on quality-, but not on price-perceptions, no significant impact on average revenue (in €) is achieved as well. Nevertheless, as there was no significant 'zero-order' relationship (Baron & Kenny, 1986) between star-ratings and average revenue (in €), mediating effects of price- and quality perceptions have not been tested.

### **5.1.3 Product type**

As expected by the present study, results indicated that product type (high-knowledge product vs. low-knowledge product) had a significant main effect on price-perceptions (of the same center-option), as well as average revenue (in €). Low-knowledge products were perceived to be more expensive when compared to high-knowledge ones and average revenue (in €) was significantly lower for low-knowledge products when compared to high-knowledge ones. These findings support the argumentation that lack of knowledge about a certain product or product category can make people feel more sceptical, influencing price-perceptions (e.g. Biswas, 1992; Hardesty, Carlson, & Bearden, 2002). As average revenue (in €) was indeed significantly lower in low-knowledge conditions, it indeed seems to be the case that consumers tend to act more careful when it comes to making a purchase decision when their product knowledge is relatively low.

Interestingly, the product type displayed to people did not seem to affect quality-perceptions. A possible explanation for this might be that consumers do not always link price- with quality-perceptions as expected by the conducted study. This is further supported by the fact that the results of the conducted study indicate that the effect of product type on average revenue (in €) does not seem to be mediated by price- and quality-perceptions.

## **5.2 Interaction effects**

One interaction effect was found by the conducted study, being between horizontal PPO and star-ratings. Average revenue (in €) was significantly higher when price and quality were congruent (descending PPO x descending star-ratings; ascending PPO x ascending star-ratings) when compared to conditions in which the relationship between price and quality was incongruent (descending PPO x ascending star-ratings; ascending PPO x descending star-ratings).

These results were expected by the conducted study as it seems logical for consumers to choose more expensive product options significantly more often when those options are accompanied with information (star-ratings) that confirms that those options are indeed of better quality when compared to cheaper options. It would have been counter-intuitive for participants to choose more expensive products more often in conditions in which those options actually received worse star-ratings (and thus quality ratings) than cheaper priced options. This interaction between horizontal PPO and star-ratings was not influenced by the product type participants got to see, as no three-way interaction effect between horizontal PPO, star-ratings and product type has been found.

Surprisingly, no interaction effect of horizontal PPO and star-ratings on respectively price-, and quality-perceptions has been found by the conducted study. This creates room for the question to what extent consumers really employ both price- and quality-perceptions when making purchase decisions. In addition, no interaction effects of horizontal PPO and product type on average revenue (in €), price-, or quality-perceptions have been found. While some main effects of respectively horizontal PPO and product type have been discussed, those effects seemingly vanish as soon as horizontal PPO and product type are analysed together rather than in an isolated manner.

With regards to the second research question as formulated by the present study, it seems to be the case that only star-ratings have an impact on the effect of horizontal PPO on average revenue (in €). What is of special interest here is that neither horizontal PPO, nor star-ratings seems to have a significant main effect on average revenue (in €). Yet when both factors are combined, a significant main effect on average revenue (in €) can be found. This indicates a cross-over interaction<sup>5</sup> between horizontal PPO and star-ratings, meaning that the effect of horizontal PPO on average revenue (in €) is reversed, depending on the star-ratings employed and vice versa.

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<sup>5</sup> <http://www.theanalysisfactor.com/interactions-main-effects-not-significant/>

## **6. Implications**

### **6.1 Theoretical implications**

The theoretical aim of the conducted study was to further expand the still rather small knowledge regarding the principle of PPO by examining the degree to which the effects as suggested by it would still be noticeable when tested under different circumstances. As a consequence, the potential of the PPO-effect as described and supported by literature was investigated in horizontal rather than vertical sequences. Results were meant to indicate the level of flexibility of PPO, by showing to what extent the PPO-effect and the different theoretical aspects belonging to it can be generalized in order to fit into other contexts than previously tested.

Overall, it can be stated that the results of this study generally contradict large parts of the theoretical argumentation surrounding the PPO-effect. This study was unable to find any significant main effect of the horizontal PPO employed on consumer choices and thus average revenue (in €). Therefore, it needs to be stated that changes in the manipulation of variables regarding the PPO-effect, or the circumstances it is tested in can seemingly change the potential influence of the PPO-effect. As a consequence, theories as discussed by previous studies regarding this topic cannot be generalized at will and should be seen with a healthy amount of scepticism. In general, the concept of PPO seems to be especially sensitive to the manner of sequencing (vertical vs. horizontal) it is being employed in.

### **6.2 Practical implications**

The practical aim of this study was to provide the e-commerce industry and online marketers with new insights as to how offers can be presented efficiently in online web-shop environments. While consumers typically encounter vertical sequences of products and information that aim to gather their attention and interest, this study investigated how theoretical concepts of the PPO-effect influencing average revenue (in €) by influencing consumer choices would translate to horizontal settings. By doing so, online marketers would be provided with an adequate or eventually even better alternative for presenting offers and products in online-environments such as web-shops.

As discussed earlier, results of this study demonstrate that PPO does not seem to be an effective marketing-tool in horizontal sequences of offers and products. When it comes to selling their products online, marketers should therefore stick with the more 'old fashioned' manner of presenting prices and corresponding products by using the more classical vertical approach.

This being said, quality indicators in the form of star-ratings should always be presented to potential customers, as long as the star-ratings displayed confirm the commonly employed premise of higher-priced products being of better quality. This is based on the results of this study that showed that star-ratings in combination with PPO that confirm commonly held price-quality assumptions and are thus creating a 'congruent' price-quality relationship, can seemingly reduce uncertainty of

customers. Participants of the conducted study tended to choose more expensive product options more often when those options were accompanied by star-ratings that justified the products prices when compared to conditions in which this was not the case. It can therefore be stated that online-marketers should never hide 'congruent' star-ratings as quality indicators from the eyes of potential customers, as presenting those ratings in combination with PPO is likely to increase the average revenue (in €).

In addition, online-marketers should be aware of the fact that low-knowledge product types such as universal remote-controls can seemingly influence price-perceptions, making products appear to be relatively expensive when compared to high-knowledge product types. The present study showed that average revenue (in €) is significantly lower when low-knowledge products are displayed to potential consumers. Online-retailers should consider to give additional information about such product categories in order to possible counter this effect.

## ***7. Limitations & suggestions for further research***

Naturally, the conducted study comes with limitations that need to be kept in mind when interpreting and working with the results. Firstly, the extent to which the results of this study can be generalized needs to be discussed. The sample of this study consist mainly out of university students with a mean age of around 25 years. Therefore, most of the participants were highly educated (80.5% had obtained or were enrolled in a bachelor's or master's program). This might have caused a selection bias as highly educated people were overrepresented by the sample of the study, making the results not generalizable among broader groups of age and different levels of education. Especially people's level of education could have influenced their quality of information processing (Pressley, Borkwski, & Schneider, 1989), and thus possibly their approach regarding the questions and stimulus materials as presented to them by this study. In addition to this, participants of the conducted study were mainly female (62.4%) and of German nationality (52.1%). This might also have an impact on how results can be generalized as, for instance, differences in nationality and culture might influence people's approaches and concepts employed when confronted with information. (Hofstede & McCrae, 2004). Differences in gender on the other hand can influence perceptions of technology and products related to it (Gefen & Straub, 1997), which in turn might have also influenced the way participants approached the stimulus material presented to them in this study.

The aspects as mentioned above all potentially affect the external validity of the results as found by this study, making it rather unlikely that the results can be generalized in order to fit into a broader context. Because of this, future research could attempt to minimize this problem by working with a more average sample, representing the actual population more truthfully. Nevertheless, generalizability of the results of such a study will always remain a problem to some extent, as it will never be possible to question every member of a specific population.

Also, the conducted study focused on the use of horizontal PPO in online-settings by using images of an online web-shop environment. While results indicated that horizontal PPO does not seem to have an impact on average revenue (in €), it would be interesting to see if this might have been due to the context (online web-shop) as used in the conducted study. Further research could replace the concept of horizontal PPO into a different scenario in order to see if, and to what extent, this would impact results.

The use of pictures resembling online web-shop environments as used in this study might have created a limitation by itself, as participants were aware of the fact that they were not actually going to by a product in a real online-shop. The fact that a constructed reflection of online web-shops was used might have influenced participant's involvement, possibly blurring their reactions and choices. The fictitious brand (Koncom) as employed by the conducted study might also have made it more difficult for participant to imagine the scenarios presented to them as real web-shop environments.

Because of this, further research could either try to create more realistic scenarios or could attempt to let participants experience real online-environments in which horizontal PPO is being employed. Here, cooperation with online-retailers would be ideal, as this would provide both theoretical knowledge to research and, in particular, practical knowledge to retailers.

While the aspects as mentioned need to be considered as possible changes or improvements for future research, it should also be kept in mind that the conducted study and the questions, as well as stimulus material in it are the results of careful planning and adjustment based on feedback as received during the conducted preliminary test. Aspects of the stimulus material employed, as well as formulations of the questions that participants of the preliminary test perceived to be too vague have been adjusted in order to prevent misunderstandings as good as possible. Participant of the preliminary study have even been actively involved in the development of the employed stimulus material as they gave valuable opinions and insides regarding realistic product prices.

Validity and reliability of the study have been considered by working with items of scales as used in earlier studies wherever possible. As a consequence, all constructs have been measured with sufficient internal reliability. In addition, all manipulations of the performed study turned out to be successful which further ads up to the level of internal validity of the results of the present study.

## **8. Conclusion**

The results of the conducted study disconfirm previous studies regarding PPO, as no significant PPO-effect on average revenue (in €) has been found. This being said, results did confirm the potential influence of quality indicators in the form of star-ratings (quality-ratings) on horizontal PPO that either do or do not justify the prices of products to choose from. If both PPO and star-ratings create a congruent price-quality relationship, average revenue (in €) is significantly higher than when this is not the case. In addition to this, both PPO and star-ratings had a significant main effect on quality-perceptions of the same center option, indicating that the quality of products is perceived to be more positively when star-ratings are being displayed to consumers and when horizontally descending PPO is employed.

While no interaction effect between horizontal PPO and product type has been found, product type on its own significantly impacts both price-perceptions and average revenue (in €). It has been shown by the results that consumers generally perceive products to be more expensive and tend to choose relatively low-priced products more often when product knowledge is low.

It needs to be stated that the results as presented by this study do not necessarily diminish the results of previous studies, but simply show that the PPO-effect seemingly does not work when put into horizontal sequences of options and products to choose from. Future research could examine horizontal PPO in different circumstances (e.g. offline environments) in order to indicate if this has any influence on the effectiveness of horizontal PPO.

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## **Appendix A: Preliminary study**

Dear participant,

Thank you for your participation in this study. For the acquisition of my Master's degree in Marketing Communication I am interested in how potential consumers react to different online web-shop scenarios. My research therefore aims to gather information about factors that might influence this process.

The following research will take approximately 5 minutes to complete and consists of two parts. In the first part you will get to see a picture resembling a web-shop environment in which products are being advertised. Please try to imagine this as a real web-shop environment and carefully look at the picture, as you will have to answer questions about it afterwards. In the second and final part this research will be finished by a short demographic questionnaire.

This research is all about your personal opinion. As a consequence there are no right or wrong answers. As a researcher, I sincerely ask you to answer the upcoming questions honestly in order to truly reflect your own personal opinion. If you wish to receive further information about the research, now or in the future, please feel free to contact me via [f.j.rensner@student.utwente.nl](mailto:f.j.rensner@student.utwente.nl).

---

### **Informed consent form**

**Title research:** Consumer responses in online web-shop settings

**Responsible researcher:** Felix Rensner, s1353616

#### ***To be completed by the participant***

I declare in a manner obvious to me, to be informed about the nature, method and target of the investigation. I know that the data and results of the study will only be published anonymously and confidentially to third parties. My questions have been answered satisfactorily.

I voluntarily agree to take part in this study. While I reserve the right to terminate my participation in this study without giving a reason at any time.

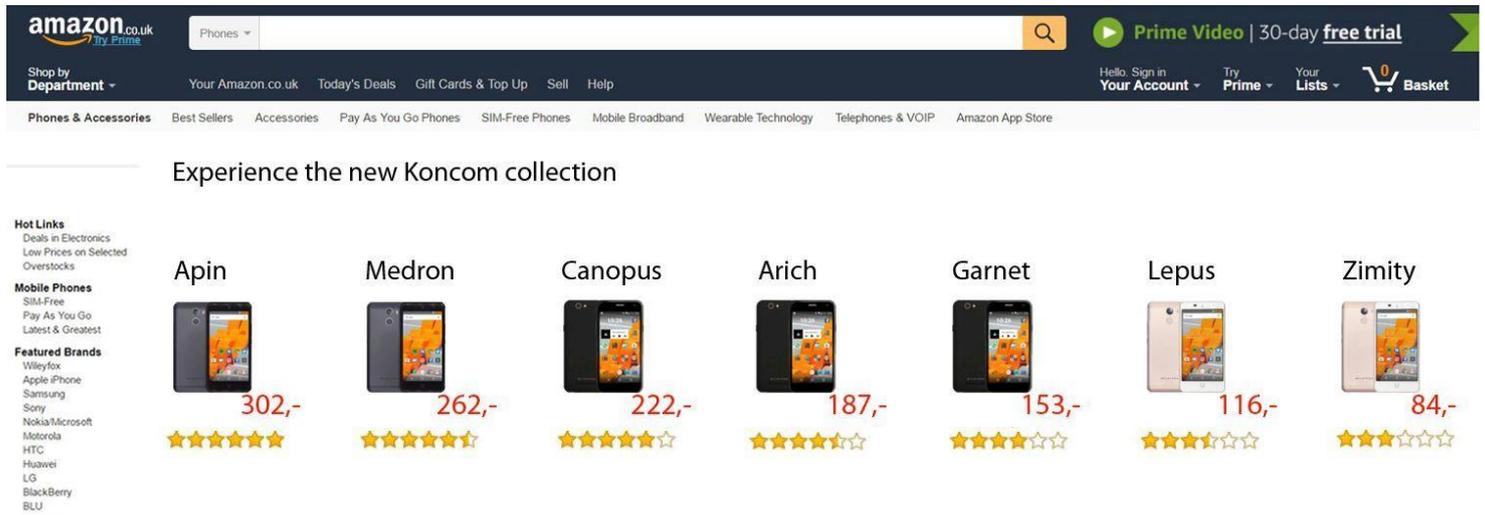
Date: ..... Signature participant: .....

#### ***To be completed by the executive researcher***

I have given a spoken and written explanation of the study. I will answer remaining questions about the investigation into power. The participant will not suffer any adverse consequences in case of any early termination of participation in this study.

Date: ..... Signature researcher: .....

The following picture shows a web-shop offering the new smartphone collection of Koncom, a brand that has just recently entered the smartphone-market. The ratings belonging to the different products are based on experiences of customers who have already bought the product.



The following questions are related to the web-shop environment you have just looked at and the products advertised in it. Feel free to look back at the picture if you feel like you need to in order to answer the upcoming questions. For each of the questions below, please circle the response that best characterizes how you feel about the statement.

**1. In the web-shop environment I just looked at ...**

	1	2	3	4	5	6	7
	Loss	...	...	...	...	...	Gain
Compared to product <b>Apin</b> , product <b>Arich</b> seems like a ... in quality	1	2	3	4	5	6	7
Compared to product <b>Apin</b> , product <b>Arich</b> seems like a ... in price (Example: A gain in price would mean that one would have to pay <b>less</b> for the product in question.)	1	2	3	4	5	6	7

**2. In the web-shop environment I just looked at ...**

	1	2	3	4	5	6	7
	Very Low	...	...	...	...	...	Very High
The quality of product <b>Arich</b> is ...	1	2	3	4	5	6	7
The price of product <b>Arich</b> is ...	1	2	3	4	5	6	7

**3. In the web-shop environment I just looked at ...**

	1	2	3	4	5	6	7
	Strongly Disagree	...	...	...	...	...	Strongly Agree
Higher-priced options have better quality.	1	2	3	4	5	6	7
Price and quality are not related.	1	2	3	4	5	6	7

**4. The following questions aim to investigate how much you generally know about the products advertised in the web-shop environment you looked at. Again, please highlight the statements that best fits your personal opinion.**

	1	2	3	4	5	6	7
	Strongly Disagree	...	...	...	...	...	Strongly Agree
I know pretty much about smartphones	1	2	3	4	5	6	7
I know how to judge the quality of smartphones	1	2	3	4	5	6	7
I think I know enough about smartphones to feel pretty confident when I make a purchase	1	2	3	4	5	6	7
I have heard of most of the new smartphones that are around	1	2	3	4	5	6	7
I do not feel very knowledgeable about smartphones	1	2	3	4	5	6	7

**5. The following questions aim to gather your opinion about the general level of realism and attractiveness of the material used in this study (the picture of the web-shop environment).**

	1	2	3	4	5	6	7
	Strongly Disagree	...	...	...	...	...	Strongly Agree
In general, I find the material used to be realistic.	1	2	3	4	5	6	7
In general, I find the material used to be appealing.	1	2	3	4	5	6	7

**6. Do you have any further comments or suggestions for improvement regarding the material used in this study?**

**7. Demographics**

What is your gender?

- Male
- Female

What is your nationality?

- Dutch
- German
- Other

What is the highest degree or level of education completed? *If currently enrolled, highest degree yet to receive?*

- No schooling completed
- High school graduate
- Bachelor's degree
- Master's degree
- Other

What is your age?

\_\_\_\_\_

This is the end of the questionnaire. Thanks you for your participation.

## Appendix A: Stimulus material preliminary study

The following overview gives a complete representation of the stimulus material as used in the different conditions of the conducted preliminary test. Note that only seven out of the twelve conditions of the final study have been pre-tested.

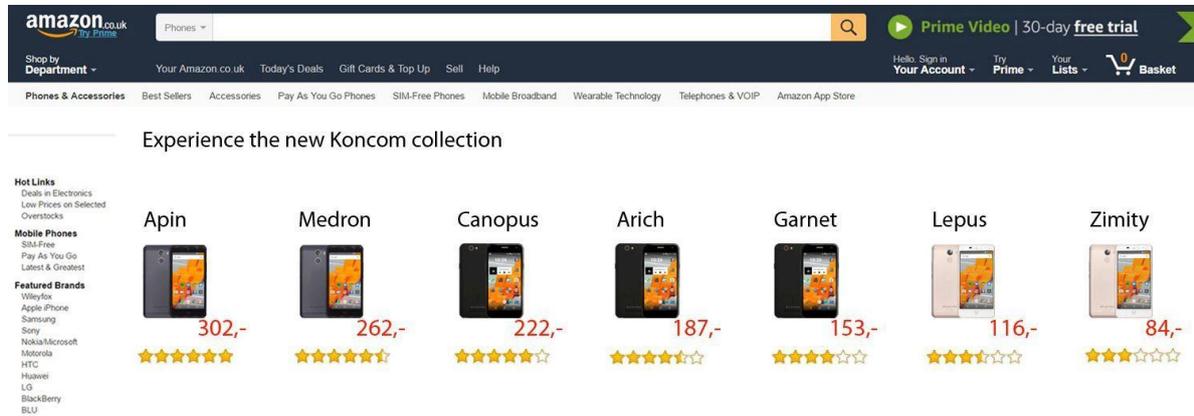


Figure 11. Stimulus material C1

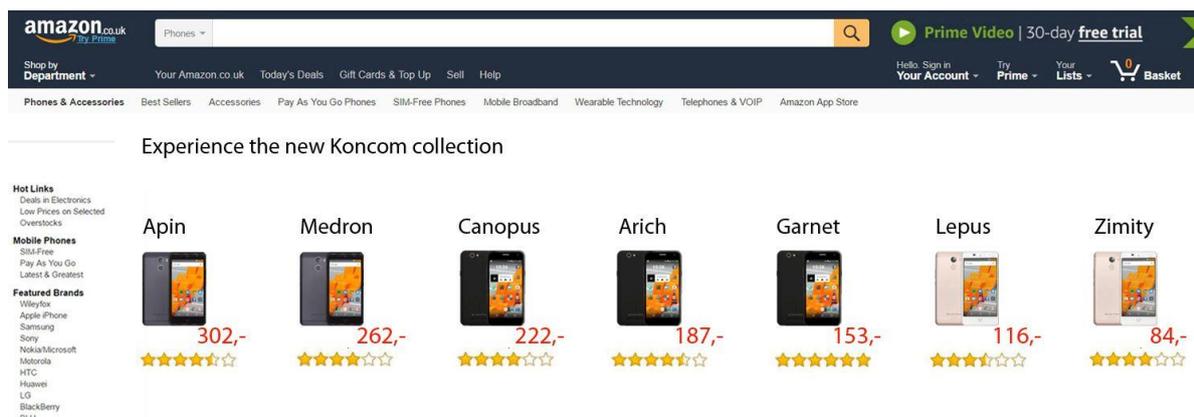


Figure 12. Stimulus material C2

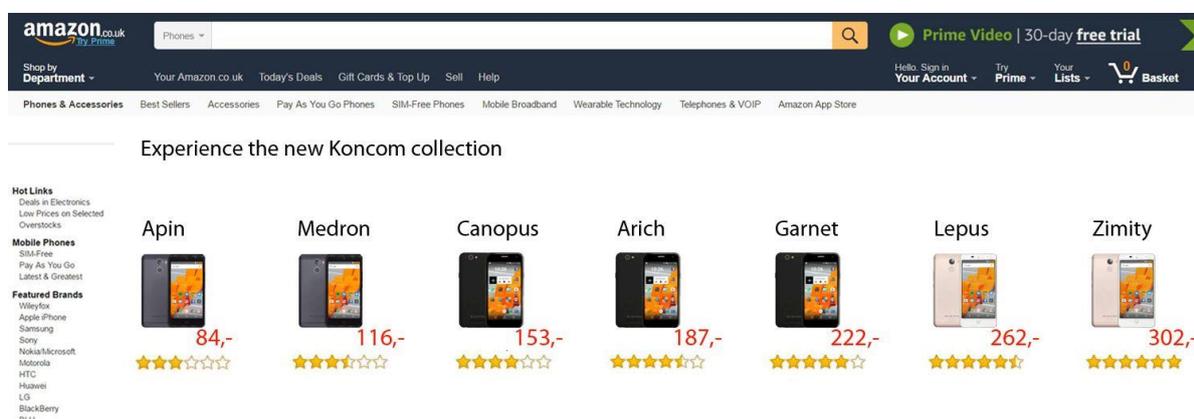


Figure 13. Stimulus material C4

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Apple iPhone  
Samsung  
Sony  
Nokia/Microsoft  
Motorola  
HTC  
Huawei  
LG  
BlackBerry  
BLU

Model	Price
Apin	84,-
Medron	116,-
Canopus	153,-
Arich	187,-
Garnet	222,-
Lepus	262,-
Zimity	302,-

Figure 14. Stimulus material C6

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**Feature Keywords**  
 Easy to Use (651)  
 Home Theater (472)  
 Backlit (188)  
 Windows (153)  
 TV DVD (278)  
 TV VCR (1,944)  
 Video (685)  
\* See more

**Brand**  
 RCA  
 Remote Control  
 Logitech  
 GE  
 Philips  
 Sony  
 Universal  
 One For All

Model	Price	Rating
Apin	302,-	★★★★★
Medron	262,-	★★★★★
Canopus	222,-	★★★★☆
Arich	187,-	★★★★☆
Garnet	153,-	★★★★☆
Lepus	116,-	★★★★☆
Zimity	84,-	★★★★☆

Figure 15. Stimulus material C7

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### Experience the new Koncom collection

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 Free Shipping by Amazon

**Feature Keywords**  
 Easy to Use (651)  
 Home Theater (472)  
 Backlit (188)  
 Windows (153)  
 TV DVD (278)  
 TV VCR (1,944)  
 Video (685)  
\* See more

**Brand**  
 RCA  
 Remote Control  
 Logitech  
 GE  
 Philips  
 Sony

Model	Price	Rating
Apin	302,-	★★★★☆
Medron	262,-	★★★★☆
Canopus	222,-	★★★★☆
Arich	187,-	★★★★☆
Garnet	153,-	★★★★★
Lepus	116,-	★★★★☆
Zimity	84,-	★★★★☆

Figure 16. Stimulus material C8

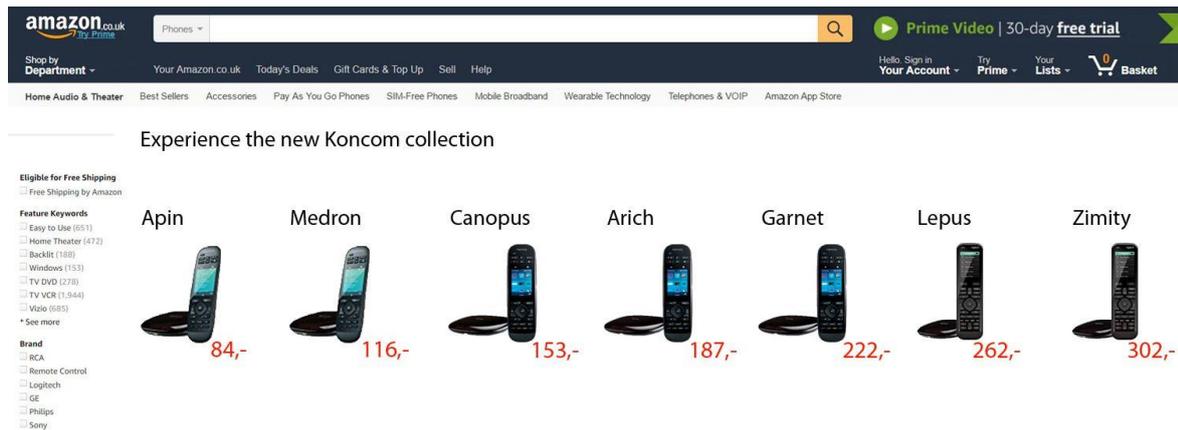


Figure 17. Stimulus material C12

## Appendix B: Demographics of participants of the main study

Table 17. Demographical information of participants

Demographics	N	%	M	SD
<b>Age</b>	303		25.61	6.47
<b>Gender</b>				
Male	114	37.6		
Female	189	62.4		
<b>Nationality</b>				
Dutch	89	29.4		
German	158	52.1		
Other	56	18.5		
<b>Level of education (completed or enrolled)</b>				
No schooling completed	0	0.00		
High school graduate	43	14.2		
Bachelor's degree	128	42.2		
Master's degree	116	38.3		
Other	16	5.3		

### **Appendix C: Main study**

The following shows the questions as well as the stimulus material as used for the purposes of the conducted study. It needs to be noted here that the pictures resembling the web-shop environments were presented to participants with every question directly related to the web-shop scenarios. The web-shop environments were thus always visible to participants when they were asked a question directly related to the scenarios. Also, the word 'smartphone' was replaced by 'remote-control' in respective conditions and the instruction regarding the star-ratings were discarded in conditions in which no star-ratings were shown to participants.

Dear participant,

Thank you for your participation in this study. For the acquisition of my Master's degree in Marketing Communication I am interested in how potential consumers react to different online web-shop scenarios. This research therefore aims to gather information about factors that might influence this process.

The following research will take approximately 10 minutes to complete. After answering some demographic questions, you will get to see a picture resembling a web-shop environment in which products are being advertised. Please try to imagine this as a real web-shop environment and carefully look at the picture, as you will have to answer questions about it afterwards.

There are no right or wrong answers. As a researcher, I sincerely ask you to answer the upcoming questions honestly in order to truly reflect your own personal opinion. If you wish to receive further information about the research, now or in the future, please feel free to contact me via [f.j.rensner@student.utwente.nl](mailto:f.j.rensner@student.utwente.nl).

Felix Rensner,

University of Twente

#### **By continuing with this questionnaire, you agree with the following terms and conditions:**

I declare in a manner obvious to me, to be informed about the nature, method and target of the study. I know that the data and results of the study will only be published anonymously and confidentially to third parties. My questions have been answered satisfactorily.

I voluntarily agree to take part in this study, while I reserve the right to terminate my participation in this study without giving a reason at any time.

What is your age?

---

What is your gender?

- Male
- Female

---

What is your nationality?

- Dutch
- German
- Other

---

What is your highest degree or level of education completed? *If currently enrolled, highest degree yet to receive?*

- No schooling completed
- High school graduate
- Bachelor's degree
- Master's degree
- Other

Figure 18. *Demographic questions*

In the following part of this study you will get to see a picture of a web-shop offering the new smartphone collection of Koncom, a brand that has just recently entered the smartphone-market. The star-ratings belonging to the different products represent the quality perceptions and experiences of customers who have already bought the products.

The following questions will be related to the web-shop environment you will get to see in the next part of this questionnaire. You will get to see the picture of the web-shop repeatedly with every question related to it. Please look at the picture carefully in order to answer the upcoming questions.

**On the following pages, please wait a few seconds for the picture to load if you are not seeing it straight away.**

Experience the new Koncom collection

- Hot Links**  
Deals in Electronics  
Low Prices on Selected Overstocks
- Mobile Phones**  
SIM-Free  
Pay As You Go  
Latest & Greatest
- Featured Brands**  
Wileyfox  
Apple iPhone  
Samsung  
Sony  
Nokia/Microsoft  
Motorola  
HTC  
Huawei  
LG  
BlackBerry  
BLU

<p><b>Apin</b></p>  <p>302,-</p> <p>★★★★★</p>	<p><b>Medron</b></p>  <p>262,-</p> <p>★★★★★</p>	<p><b>Canopus</b></p>  <p>222,-</p> <p>★★★★★</p>	<p><b>Nemlux</b></p>  <p>187,-</p> <p>★★★★★</p>	<p><b>Garnet</b></p>  <p>153,-</p> <p>★★★★★</p>	<p><b>Lepus</b></p>  <p>116,-</p> <p>★★★★★</p>	<p><b>Zimity</b></p>  <p>84,-</p> <p>★★★★★</p>
--	--	---	--	--	---	---

Figure 19. Stimulus material condition C1.

Out of the products offered in the web-shop above I would personally intend to buy product ...

Apin	Medron	Canopus	Nemlux	Garnet	Lepus	Zimity
<input type="radio"/>						

Figure 20. Question product choice

The following question is specifically related to the products **Apin**, **Nemlux** and **Zimity**, as offered in the web-shop above. Please indicate how you feel about the following statements.

Out of the products offered in the web-shop I just looked at the *quality* of product ... is

	Very low	...	...	...	...	...	Very high
Apin	<input type="radio"/>						
Nemlux	<input type="radio"/>						
Zimity	<input type="radio"/>						

Figure 21. Questions quality perception

The following question is specifically related to the products **Apin**, **Nemlux** and **Zimity**, as offered in the web-shop above. Please indicate how you feel about the following statements.

*Out of the products offered in the web-shop I just looked at the price of product ... is*

	Very low	...	...	...	...	...	Very high
Apin	<input type="radio"/>						
Nemlux	<input type="radio"/>						
Zimity	<input type="radio"/>						

Figure 22. Questions price perception

The following questions are related to the web-shop as displayed in the picture above. Please indicate to what extent you agree with the statements when looking at the picture of the web-shop.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
In the web-shop as displayed above, higher-priced products have better quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the web-shop as displayed above, a higher product price does <b>not</b> come with a better quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 23. Questions price-quality relationship (manipulation check)

The questions on the following pages aim to investigate your general opinion and are thus **not** related to the web-shop you looked at earlier. Please indicate to what extent you agree with the following statements.

The following statements aim to investigate your general level of knowledge about smartphones as a product category. Please indicate to what extent you agree with the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I know pretty much about smartphones.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to judge the quality of smartphones.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think I know enough about smartphones to feel pretty confident when I make a purchase.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have heard of most of the new smartphones that are around.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do <b>not</b> feel very knowledgeable about smartphones.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 24. Questions product knowledge. ‘Smartphones’ was replaced with ‘Remote-controls’ in respective conditions.

The following statements aim to investigate how you feel about the general relationship between price and quality. The statements are **not** related to the web-shop you looked at earlier. Please indicate to what extent you agree with the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
In general, higher-priced products have better quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In general, a higher product price does <b>not</b> come with a better quality.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 25. Questions general price-quality relationship

Thank you for your participation. If you have any questions regarding this study feel free to contact me via [f.j.rensner@student.utwente.nl](mailto:f.j.rensner@student.utwente.nl)

Please click through to the next page in order to submit your answers.

## Appendix C: Stimulus material main study

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Wileyfox  
Apple iPhone  
Samsung  
Sony  
Nokia/Microsoft  
Motorola  
HTC  
Huawei  
LG  
BlackBerry  
BLU

Model	Price	Rating
Apin	302,-	★★★★★
Medron	262,-	★★★★★
Canopus	222,-	★★★★★
Nemlux	187,-	★★★★★
Garnet	153,-	★★★★★
Lepus	116,-	★★★★★
Zimity	84,-	★★★★★

Figure 26. Stimulus material C1

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**Feature Keywords**  
 Easy to Use (653)  
 Home Theater (472)  
 Backlit (188)  
 Windows (153)  
 TV DVD (278)  
 TV VCR (1,344)  
 Vizio (685)  
\* See more

**Brand**  
 RCA  
 Remote Control  
 Logitech  
 GE  
 Philips  
 Sony

Model	Price	Rating
Apin	302,-	★★★★★
Medron	262,-	★★★★★
Canopus	222,-	★★★★★
Nemlux	187,-	★★★★★
Garnet	153,-	★★★★★
Lepus	116,-	★★★★★
Zimity	84,-	★★★★★

Figure 27. Stimulus material C2

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 Latest & Greatest

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 Wileyfox  
 Apple iPhone  
 Samsung  
 Sony  
 Nokia/Microsoft  
 Motorola  
 HTC  
 Huawei  
 LG  
 BlackBerry  
 BLU

Model	Price	Rating
Apin	302,-	4.5 stars
Medron	262,-	4.5 stars
Canopus	222,-	4.5 stars
Nemlux	187,-	4.5 stars
Garnet	153,-	4.5 stars
Lepus	116,-	4.5 stars
Zimity	84,-	4.5 stars

Figure 28. Stimulus material C3

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### Experience the new Koncom collection

**Eligible for Free Shipping**  
 Free Shipping by Amazon

**Feature Keywords**  
 Easy to Use (653)  
 Home Theater (472)  
 Backlit (188)  
 Windows (153)  
 TV DVD (278)  
 TV VCR (1,944)  
 Vizio (685)  
 \* See more

**Brand**  
 RCA  
 Remote Control  
 Logitech  
 GE  
 Philips  
 Sony

Model	Price	Rating
Apin	302,-	4.5 stars
Medron	262,-	4.5 stars
Canopus	222,-	4.5 stars
Nemlux	187,-	4.5 stars
Garnet	153,-	4.5 stars
Lepus	116,-	4.5 stars
Zimity	84,-	4.5 stars

Figure 29. Stimulus material C4

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Figure 30. Stimulus material C5

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Figure 31. Stimulus material C6

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Model	Price	Rating
Apin	84,-	★★★★★
Medron	116,-	★★★★★
Canopus	153,-	★★★★★
Nemlux	187,-	★★★★★
Garnet	222,-	★★★★★
Lepus	262,-	★★★★★
Zimity	302,-	★★★★★

Figure 32. Stimulus material C7

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Feature Keywords: Easy to Use (651) Home Theater (472) Backlit (188) Windows (153) TV DVD (278) TV VCR (1,944) Vizio (685) See more

Brand: RCA Remote Control Logitech GE Philips Sony

Model	Price	Rating
Apin	84,-	★★★★★
Medron	116,-	★★★★★
Canopus	153,-	★★★★★
Nemlux	187,-	★★★★★
Garnet	222,-	★★★★★
Lepus	262,-	★★★★★
Zimity	302,-	★★★★★

Figure 33. Stimulus material C8

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- Motorola
- HTC
- Heaven
- LG
- BlackBerry
- BLU

<b>Apin</b>	<b>Medron</b>	<b>Canopus</b>	<b>Nemlux</b>	<b>Garnet</b>	<b>Lepus</b>	<b>Zimity</b>
						
84,-	116,-	153,-	187,-	222,-	262,-	302,-
★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆

Figure 34. Stimulus material C9

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- Windows (153)
- TV DVD (278)
- TV VCR (1,944)
- Vizio (685)
- [\\* See more](#)

**Brand**

- RCA
- Remote Control
- Logitech
- GE
- Philips
- Sony

<b>Apin</b>	<b>Medron</b>	<b>Canopus</b>	<b>Nemlux</b>	<b>Garnet</b>	<b>Lepus</b>	<b>Zimity</b>
						
84,-	116,-	153,-	187,-	222,-	262,-	302,-
★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆

Figure 35. Stimulus material C10

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Model	Price
Apin	84,-
Medron	116,-
Canopus	153,-
Nemlux	187,-
Garnet	222,-
Lepus	262,-
Zimity	302,-

Figure 36. Stimulus material C11

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Feature Keywords: Easy to Use (6,51) Home Theater (472) Backlit (188) Windows (153) TV DVD (278) TV VCR (1,944) Vizio (685) See more

Brand: RCA Remote Control Logitech GE Philips Sony

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Canopus	153,-
Nemlux	187,-
Garnet	222,-
Lepus	262,-
Zimity	302,-

Figure 37. Stimulus material C12