

# BEST STRATEGIES FOR MITIGATING CHOICE OVERLOAD

Master's Thesis  
Hien Vu - 363925  
Aalto University School of Business  
Department of Information & Service Management  
Spring 2018

---

**Author** Hien Vu -363925

---

**Title of thesis** BEST STRATEGIES FOR MITIGATING CHOICE OVERLOAD

---

**Degree** Master of Science in Economics and Business Administration

---

**Degree programme** Information & Service Management

---

**Thesis advisor(s)** Jyrki Wallenius

---

**Year of approval** 2018

**Number of pages** 93

**Language** English

---

## Abstract

### *Objectives of the study*

As the growth in product variety and assortment continues to soar, consumers nowadays are more susceptible to choice overload. In order to attract and retain customers, retailers must take actions to mitigate the choice overload problem in their product assortments. Hence, this study aims to find out best strategies that enterprises can employ to mitigate choice overload.

### *Academic background and methodology*

Prior research has mainly concentrated on proving the existence of choice overload problem as well as the effects of assortment size reduction on mitigating the problem. However, little research has been done on examining additional mitigation strategies for choice overload. Therefore, this study aims to identify further approaches that enterprises can adopt to mitigate choice overload problem by examining different assortment strategies as well as the consumer groups in experienced choice overload level. The assortment strategies examined in the study are Assortment Size Reduction, Categorization, Provision of a Default Option and Unconscious Information Processing. As for consumer groups, different groups classified by Gender, Age, Education and Continent were compared.

The thesis employed a behavioral experiment to examine participants' degree of experienced choice overload when making their decisions in different assortment conditions. Participants were assigned to 9 different assortment scenarios corresponding to different combinations of mitigation approaches. After making their decision in the assortment, they were asked to evaluate their choice overload based on a set of statements. The experiment results revealed the effectiveness of different mitigation approaches and the differences among consumer groups in experienced choice overload.

### *Findings and conclusion*

First, the experiment confirmed the existence of choice overload effect. Second, the experiment suggested the effectiveness of assortment strategies. Third, we uncovered that most effective mitigation strategies are Reduction of Assortment Size and Unconscious Information Processing. Fourth, the mitigation strategies were discovered to be more effective when being in combination with each other instead of being stand-alone. Finally, regarding the differences among consumer groups in experienced choice overload, those who demonstrated low levels of choice overload are men, elders and highly educated people. These results suggest various actions that enterprises should consider to mitigate choice overload in their product assortments.

---

**Keywords** overchoice, choice overload, consumer psychology, consumer behavior, retail

---

## Acknowledgements

First of all, I would like to thank Professor Jyrki Wallenius for inspiring me to study consumer behavior, his enthusiastic guidance and support throughout the course of this research. I would also like to thank Professor Merja Halme for her valuable instructions on survey methods and for inspiring me to pick a career in Market Research.

I wish to give a special thank to my friend and “adoptive mother” Tri Tran for his patient proofreading as well as his accompaniment throughout my 5-year studies at Aalto.

Last but not least, I would like to acknowledge my friends and respondents who participated in the pilot study and actual experiment, as well as giving valuable feedbacks on the research. Had it not been for their support, this research would not have been finalized.

# Table of Contents

Acknowledgements .....	iv
<b>1 Introduction .....</b>	<b>11</b>
<b>2 Theoretical Background .....</b>	<b>12</b>
<b>2.1 Drawbacks and benefits of product variety.....</b>	<b>13</b>
2.1.1 Drawbacks of product variety and proofs of choice overload effect.....	13
2.1.2 Benefits of product variety .....	15
2.1.3 Conceptual framework on the two-sidedness of product variety.....	16
<b>2.2 Antecedents of choice overload effect .....</b>	<b>18</b>
<b>2.3 Assortment strategies for mitigating choice overload effect .....</b>	<b>22</b>
2.3.1 Assortment size reduction.....	22
2.3.2 Categorization.....	23
2.3.3 Provision of a Default Option.....	24
2.3.4 Unconscious information processing .....	25
<b>2.4 Measures of choice overload .....</b>	<b>27</b>
<b>2.5 Research goal.....</b>	<b>28</b>
<b>3 Research methodology .....</b>	<b>28</b>
<b>3.1 Overall method description.....</b>	<b>28</b>
<b>3.2 Pilot study and results .....</b>	<b>29</b>
3.2.1 Pilot study design .....	29
3.2.2 Pilot study results .....	33
3.2.3 Summary of pilot study outcomes.....	38
<b>3.3 Experiment design .....</b>	<b>39</b>
<b>4 Results.....</b>	<b>45</b>
<b>4.1 Allocation of responses .....</b>	<b>45</b>
4.1.1 By assortment scenarios.....	45
4.1.2 By participants' demographics .....	45
<b>4.2 Dependent variables .....</b>	<b>47</b>
4.2.1 Reliability of multi-item scales .....	48
4.2.2 Factor analysis of dependent variables.....	51
<b>4.3 Post-hoc tests by independent variables .....</b>	<b>54</b>
4.3.1 Post-hoc test by Assortment Scenarios .....	54
4.3.2 T-test by gender groups .....	58
4.3.3 Post-hoc test by age groups.....	60
4.3.4 Post-hoc test by education groups.....	65

4.3.5	Post-hoc test by continent groups .....	67
<b>5</b>	<b>Discussion and conclusion.....</b>	<b>69</b>
5.1	Summary of results.....	69
5.2	Managerial implications.....	70
5.3	Limitations.....	72
	<b>Works Cited .....</b>	<b>74</b>
	<b>Appendices .....</b>	<b>79</b>
	<b>Appendix A: Screenshots of pilot study survey.....</b>	<b>79</b>
	<b>Appendix B: Demonstration of 9 assortment scenarios .....</b>	<b>82</b>
	<b>Appendix C: Screenshots of actual experiment survey .....</b>	<b>88</b>

## List of Tables

Table 1: Criteria for product category selection.....	30
Table 2: Multi-item scale design in the pilot study.....	31
Table 3: Summary of pilot study design.....	32
Table 4: Number of responses to the pilot study, sorted by assortment conditions.....	33
Table 5: Cronbach's Alphas of multi-item scales in the pilot study.....	33
Table 6: Rotated component matrix of 11 choice overload measurement variables.....	35
Table 7: Comparison of different assistance scenarios with regards to their impacts on Perception of Variety.....	36
Table 8: Comparison of different assistance scenarios with regards to their impacts on Difficulty of Decision-making.....	36
Table 9: Comparison of different assistance scenarios with regards to their impacts on Satisfaction.....	37
Table 10: Comparison of different product categories with regards to their impacts on Perception of Variety.....	37
Table 11: Comparison of different product categories with regards to their impacts on Difficulty of Decision-making.....	38
Table 12: Comparison of different product categories with regards to their impacts on Satisfaction.....	38
Table 13: Multi-item scale design for measuring choice overload.....	41
Table 14: Design of background questions in the pilot study.....	44
Table 15: Allocation of responses by assortment scenarios.....	45
Table 16: Multi-item scale design and variable codes.....	48
Table 17: Reliability of the Perception of Variety scale.....	48
Table 18: Reliability of the Difficulty of Decision-making scale.....	49
Table 19: Reliability of the Satisfaction scale.....	50
Table 20: Reliability of the Remorse scale.....	50
Table 21: Communalities of the 13 original variables when 2 components are extracted....	52
Table 22: Rotated Component Matrix when 2 components are extracted.....	53
Table 23: Cronbach's Alphas of Aversion and Enjoyment scales.....	54
Table 24: Codings of assortment scenarios.....	55
Table 25: Levene's Test of Homogeneity of Variances by assortment scenarios.....	55
Table 26: Analysis of Variance by assortment scenarios.....	55

Table 27: Pairwise comparisons in post-hoc test by assortment scenarios .....	56
Table 28: Statistics of gender groups .....	58
Table 29: Independent T-test by gender groups .....	58
Table 30: Statistics of age groups.....	60
Table 31: Levene’s test of Homogeneity of Variances by age groups.....	61
Table 32: Welch’s ANOVA by age groups.....	61
Table 33: Pairwise comparisons in post-hoc test by age groups .....	62
Table 34: Statistics of education groups.....	65
Table 35: Levene's test of Homogeneity of Variances by education groups .....	65
Table 36: Analysis of Variances by education groups .....	65
Table 37: Pairwise comparisons in post-hoc test by education groups .....	66
Table 38: Statistics of continent groups .....	67
Table 39: Levene's test of Homogeneity of Variances by continent groups .....	68
Table 40: Welch’s ANOVA test by continent groups.....	68
Table 41: Demonstrations of 9 assortment scenarios .....	87



## List of Figures

Figure 1: Number of articles with key words "overchoice" or "choice overload" on Science Direct .....	12
Figure 2: Marginal benefits of increasing assortment size (Chernev, 2011) .....	16
Figure 3: Marginal costs from increasing assortment size (Chernev, 2011) .....	17
Figure 4: The U-shaped relationship between assortment size and customer value (Chernev, 2011) .....	17
Figure 5: Conceptual model of the impact of assortment size on choice overload (Chernev, et al., 2014) .....	20
Figure 6: Value function in Prospect Theory (Kahneman & Tversky, 1979) .....	25
Figure 7: Summary of pilot study's procedures .....	32
Figure 8: Principal component analysis of 11 choice overload measurement variables .....	34
Figure 9: A set of 12 statements for measuring choice overload that are presented after each assortment scenario .....	42
Figure 10: Statements for measuring "regret" that are presented after the participants completes all 2 assortment scenarios .....	43
Figure 11: Summary of experiment procedures .....	44
Figure 12: Allocation of participants by ethnic origins .....	46
Figure 13: Allocation of participants by gender .....	46
Figure 14: Allocation of participants by age groups .....	47
Figure 15: Allocation of participants by education levels .....	47
Figure 16: Scree plot of 13 choice overload measurement variables .....	52
Figure 17: Means of assortment scenarios when "aversion" variable is measured .....	56
Figure 18: Means of gender groups when "aversion" variable is measured .....	59
Figure 19: Means of gender groups when "enjoyment" variable is measured .....	60
Figure 20: Means of age groups when "aversion" variable is measured .....	63
Figure 21: Means of age groups when "enjoyment" variable is measured .....	63
Figure 22: Means of education groups when "enjoyment" is measured .....	66
Figure 23: Introduction to the pilot study survey .....	79
Figure 24: Background questions in the pilot study survey .....	79
Figure 25: Instruction about choice tasks in the pilot study survey .....	79
Figure 26: Illustration of a choice task scenario in the pilot study survey (in the picture is the Eye Glasses - Categorization scenario) .....	80

Figure 27: A set of statements for measuring choice overload that is presented after each choice task scenario in the pilot study survey .....	81
Figure 28: Closure of the pilot study survey .....	81
Figure 29: Introduction to the actual experiment survey.....	88
Figure 30: Background questions in the actual experiment survey.....	88
Figure 31: Instruction about choice tasks in the actual experiment survey.....	89
Figure 32: Illustration of a choice task scenario in the actual experiment survey (in the picture is the “catde” Categorization - Provision of Default Option condition) .....	90
Figure 33: A set of statements for measuring choice overload that is presented after each choice task scenario in the actual experiment survey.....	91
Figure 34: Statements for measuring "regret" that are presented after the participants completes all 2 choice task scenarios in the actual experiment survey .....	92
Figure 35: Closure of actual experiment survey.....	93

## 1 Introduction

Retailers assume that the more options they offer, the more likely consumers will be able to find the right product. Contrary to their assumption, research has proven that too much choice does not necessarily lead to more sales or higher consumer satisfaction. In fact, given too many options, consumers are less likely to make a purchasing decision, and if they do, they are less satisfied with their decision.

Nowadays consumers are overwhelmed with choices both online and offline as the growth in product variety and assortment continues to soar. To take a few examples, in the detergent category, the number of options increased from 65 in 1950 to 200 in 1963, and then reached 350 in 2004 (Boniwell, 2006). Another example of product overabundance is the grocery store called Draegers in California, with 75 types of olive oil, 250 types of mustard, and 350 types of jam (Iyengar, et al., 2003).

Given that there are various providers of the same type of products and consumers have an increasingly easy access to information, choice overload is getting worse and therefore not to be neglected in the retail environment. In order to compete against similar providers and convert consumers into buyers, retailers must take actions to mitigate the choice overload problem in their product assortments. Research into the topic of choice overload has been on the rise since 2010, mainly proving the existence of choice overload or investigating the remedy effect of reducing assortment size. However, reducing assortment size might not be the best solution to increasing purchases because there are acknowledged benefits of product variety. Additionally, businesses are often reluctant to cut down their assortment size due to merchandizing strategies and industry specifications.

As there has not been much research into additional mitigation strategies for choice overload, this thesis would fill the research gap by examining additional mitigation strategies for choice overload. Given that goal, we looked into the aspects of assortment strategies and differences among consumer demographic groups. We used a behavioral experiment to compare participants' levels of choice overload when making their decisions in different conditions of assortment strategies and demographic characteristics. By observing which

conditions resulted in low levels of choice overload, we could answer the following research questions:

*Q1. Does choice overload effect really exist?*

*Q2. Can assortment strategies mitigate choice overload?*

*Q3. What assortment strategies or combinations of assortment strategies are most effective in mitigating choice overload?*

*Q4. What demographic conditions can lead to low levels of choice overload?*

*Q5. What actions can managers take to mitigate choice overload in their product assortments?*

## 2 Theoretical Background

Overchoice or choice overload was first introduced by Alvin Toffler in the book Future Shock (Toffler, 1970). It refers to the fact that development in production and rising living standards are bringing more and more products to consumers. Given an overabundance of choices, consumers experience difficulty in making a decision, grow unhappy and remorseful with the decision or even opt out of choosing. However, research into the phenomenon of choice overload has been scarce and has not gained much attention until recent years. A full-text search using the key words “overchoice” and “choice overload” was conducted on the electronic database Science Direct on July 2017 and generated only a total of 184 related articles from 2006 to 2017 (Figure 1). The number of articles has been rising significantly since 2010, indicating the increasing relevance of choice overload topic in today’s world.

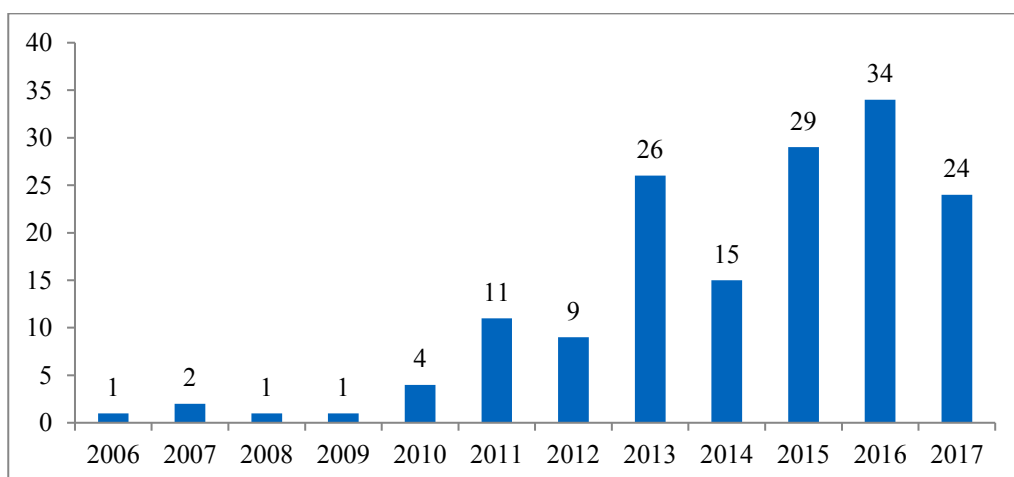


Figure 1: Number of articles with key words "overchoice" or "choice overload" on Science Direct

---

Several studies investigate the consequences of product variety and therefore prove the existence of choice overload effect by conducting experiments on decision-making in various domains, ranging from confectionaries and beverages to retirement plans and healthcare. Others examine the elements intrinsic to product variety that causes negative experience to consumers, or antecedents of choice overload. Some investigate the strategies to prevent choice overload's negative outcomes.

In this research, we aim to discover most effective strategies that firms and organizations can adopt to mitigate choice overload in their product or service assortments. Given this objective, it is beneficial to mention prior research in choice overload. Section 2.1 explores studies about the drawbacks as well as benefits of product variety. Section 2.2 examines antecedents of choice overload effect (or factors of product variety that might impact decision-making outcomes). Section 2.3 inspects different assortment strategies to cope with choice overload effect. Finally, section 2.4 looks into different ways to measure (or quantify) choice overload.

## **2.1 Drawbacks and benefits of product variety**

### **2.1.1 Drawbacks of product variety and proofs of choice overload effect**

One of the most famous studies on choice overload is the jam study by (Iyengar & Lepper, 2000). On two Saturdays, they set up a tasting booth containing either 6 or 24 flavors of jam in a grocery store. Shoppers were invited to try out the jams and then given a \$1 coupon to purchase the jam. The study then counted the number of people stopping by the tasting booth, and the number of coupons actually used. On the day that the booth had 24 flavors, more customers came up to the booth (60%) than on the day that the booth had only 6 flavors (40%). However, the study showed an interesting result when the number of purchases were counted. Out of those who stopped by the booth with 6 flavors, 30% ended up purchasing jam; while out of those who stopped by the booth with 24 flavors, only 3% ended up purchasing jam.

(Iyengar & Lepper, 2000) further facilitate the theory of choice overload by conducting another study using chocolate. The study involved two groups: one was asked to choose one among 6 types of chocolate (limited-choice condition), the other was asked to choose one among 30 types of chocolate (extensive-choice condition). After making their decisions, respondents ranked a number of statements on a Likert scale of 1-7 to indicate their

---

enjoyment, satisfaction and regret. At the end, the experiment offered the subject a choice of receiving either a \$5 payment or a box of chocolate. The chocolate study produced rather similar results to the jam study. Participants in the extensive-choice condition found the decision-making process more enjoyable, but more difficult and were less satisfied about their choices than those in the limited-choice condition. As a result, participants in the limited-choice condition were significantly more likely to choose a box of chocolate as compensation (48%), compared to those in the extensive-choice condition (12%).

When it comes to more significant purchasing decisions than just jams or chocolates, choice overload effect still holds. In a study by Iyengar, et al. (2003), they analyzed how the participation rates in retirement savings plan is influenced by the number of options within the plan. The results of this study are consistent with the results of the jam and chocolate studies. When there were only 5 options, the probability of participation was 72%; however, when there were 35 options, the probability decreased to 67.5% and when there were 40 options, the probability was only 65.4%. In short, the probability of participation declined by 2% on average for every 10 options added to a plan.

An exploratory study by Schwartz, et al. (2002) provides further proof of choice overload. Borrowing the term “satisficers” from Simon (1956), the study made a distinction between maximizers (those who aim for making the best possible choice) and satisficers (those who aim for making a “good enough” choice) on the basis of satisfaction and regret. The study created a survey with a set of statements that measure respondents’ Maximization tendency, Satisfaction and Regret on a Likert scale of 1-7. They eventually found that maximization is positively correlated with regret and depression, and negatively correlated with happiness, optimism and satisfaction.

A more macroeconomic view of choice overload was investigated by Myers (2001) and Lane (2001). They discovered that increases in choice and affluence have nevertheless led to decline in happiness in the United States and other affluent societies. Although the GDP in the United States has doubled over a 30-year period, the proportion of the population describing themselves as “very happy” has decreased by 5%. That translates to 14 million Americans feeling less happy than their peers 30 years before when given more choices in life.

Studies in various domains have demonstrated that large assortment size leaves decision-makers with negative experience. Schwartz (2000) offered some explanations to such phenomenon. First, too many options create an intractable information problem. For instance, when there are only 6 options, it is already difficult enough to deliberately go through each option in order to decide the best choice. When there are 30 options, it is truly exhausting to choose the best among them. Therefore, rather than attempting to go through all the options, people may choose arbitrarily to get over with the process. As a result, they might end up with a non-optimal selection. Second, the more options there are, the less likely it is that people will make an optimal choice. Hence, it weakens the satisfaction they will get from their choice. Third, people aim for making an optimal choice and if such goal is not achieved, people have only themselves to blame.

### **2.1.2 Benefits of product variety**

On the other hand, some studies have also pointed out that consumers can benefit from large assortment in several ways. First, a large assortment size can accommodate consumers' variety-seeking behavior (Kahn, 1995). In other words, consumers experience additional utility by simply choosing from a large number of options. Second, it can provide an opportunity of match between the consumer's preference and the available options in the choice set (Schwartz, 2005). The more options there are, the higher the probability that the consumer will find his or her ideal option. Third, it can allow consumers to maintain freedom when making a selection (Kahn & Lehmann, 1991). In this sense, when consumers are unsure about their preference, an abundance of options can offer them the flexibility to reconsider their original selection. On the other hand, a lack of options can generate negative sentiment to consumers who feel constrained by the limit. Fourth, it can reduce the uncertainty of whether the choice set adequately presents all possible options (Karni & Schwartz, 1977). This means that consumers may feel confident when selecting from a large assortment because it is less likely that a possible option is missed out in the choice set at hand.

Additionally, having a large assortment is essential to certain types of merchandizing strategies and industries. For instance, the Deep Assortment Strategy refers to when the retailer carries vast variants of colors, sizes, flavors and other options of a particular product category. Having a deep assortment allows the retailer to cater to heterogeneous customer needs, therefore, attracts more customers of the specific product category and build up

customer loyalty. This strategy is typical for the classic bakery, ice cream stand, shoe shop and hardware store. Another merchandizing strategy that utilizes large assortments is Mass Market Assortment Strategy. It refers to when the retailer covers many product categories and carries a wide variety of options for each category. This allows the retailer to be a one-stop shop so that anyone can find anything they need. This strategy is typical for megastores such as Walmart, Target, IKEA and Amazon.

### 2.1.3 Conceptual framework on the two-sidedness of product variety

Some studies point out the drawbacks of product variety, while others acknowledge its benefits. This two-sidedness of product variety is illustrated by a conceptual framework (Chernev, 2011). According to the framework, consumer value is a function of benefits and cognitive costs. On the benefit aspect, value is a concave function of assortment size (Figure 2). As the number of options increases, the match between one of the options and the decision-maker's ideal option narrows, hence the marginal benefit that each additional option brings is smaller. However, on the cognitive cost aspect, value is a convex function of assortment size (Figure 3). As the number of options increases, the number of information units exceeds the decision-maker's short-term memory; hence, additional cognitive efforts are required to process additional information units.

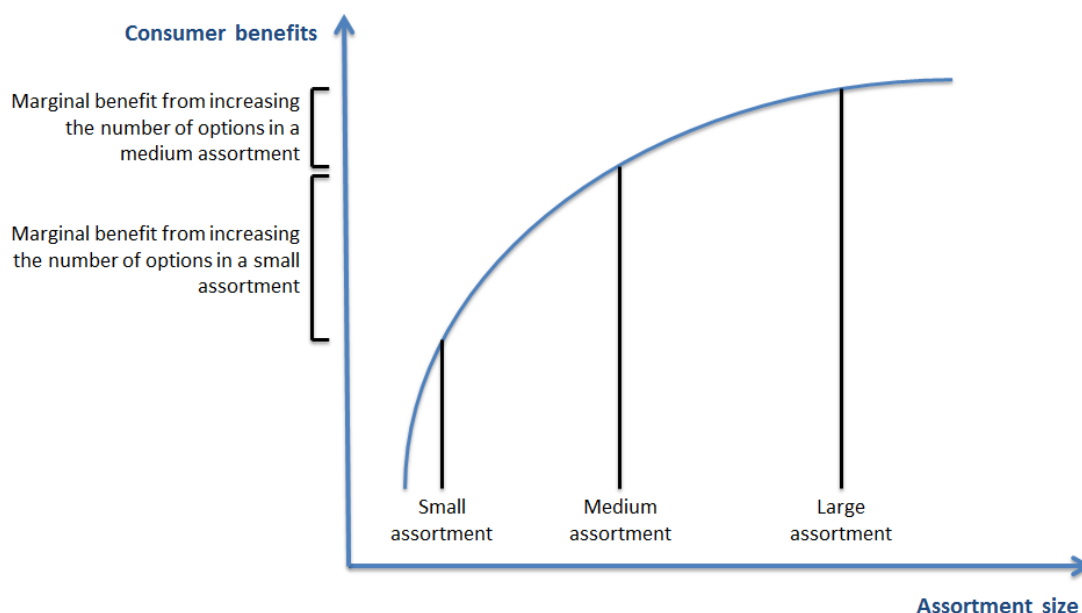


Figure 2: Marginal benefits of increasing assortment size (Chernev, 2011)



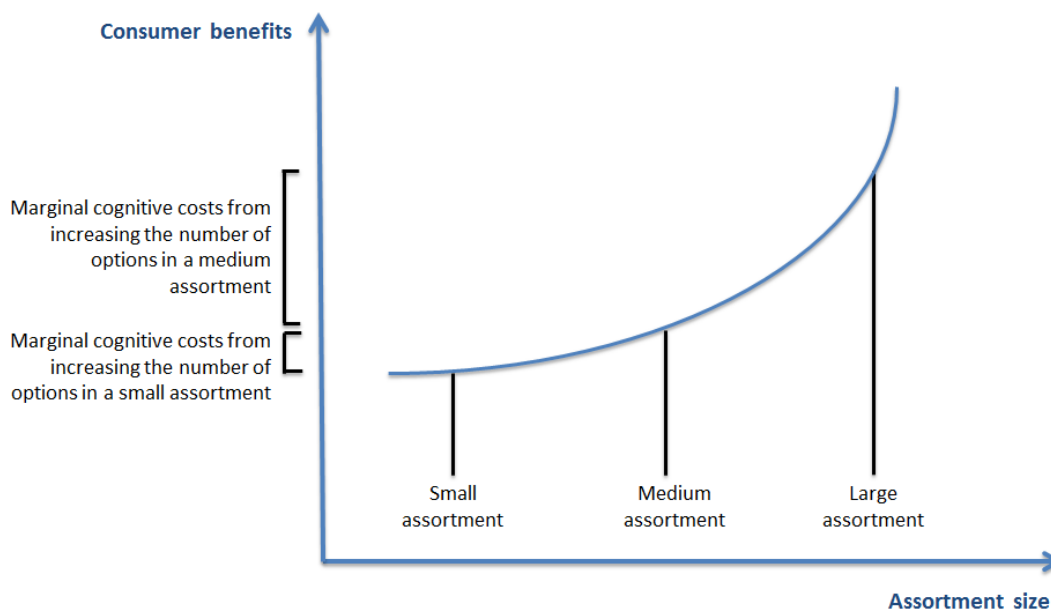


Figure 3: Marginal costs from increasing assortment size (Chernev, 2011)

Given that the benefits of product variety increase at a reduced rate while cognitive costs increase exponentially, the function of assortment size and consumer value is an inverted U-shape (Figure 4). This means that when assortment size remains small, the consumer value from an increasing number of options grows; however when assortment size crosses a certain threshold, the consumer value from an increasing number of options drops.

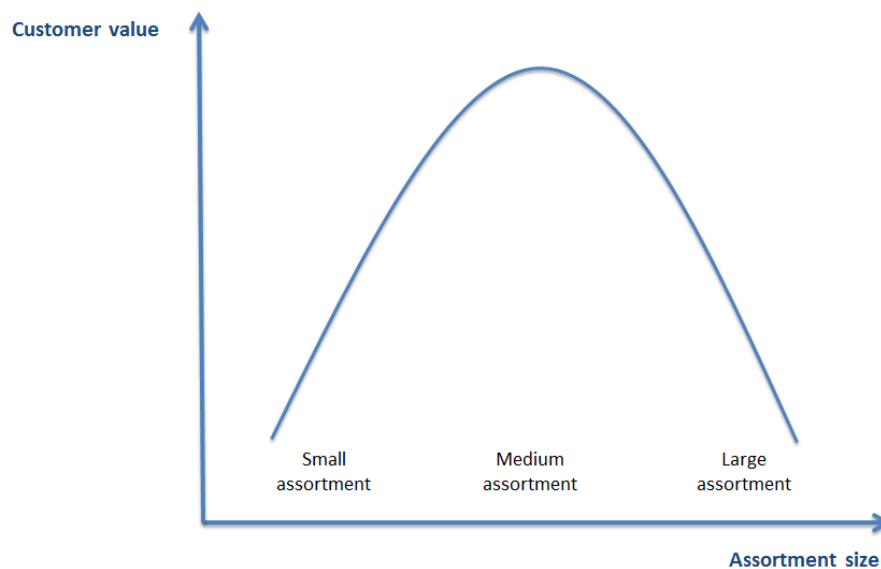


Figure 4: The U-shaped relationship between assortment size and customer value (Chernev, 2011)

---

## 2.2 Antecedents of choice overload effect

To explain when and why a large assortment is harmful to decision outcomes, research has examined the antecedents of choice overload. In other words, the antecedents are **factors of product variety** that might impact decision-making outcomes such as ease of decision-making, satisfaction, remorse and choice deferral.

A key factor identified by Chernev (2003) is **ideal point availability**, which is the situation that consumers have readily available criteria for evaluating choice alternatives when facing a choice set. The study found that in the context of large assortments, ideal point availability can help strengthen preferences: consumers with ideal point availability are likely to have higher confidence with their decision and lower switching behavior than those without ideal point availability. However, in the context of small assortments, ideal point availability has the opposite effect: consumers with ideal point availability are likely to have lower confidence with their selection and higher switching behavior than those without ideal point availability.

Gourville & Soman (2005) proved that the **alignability** of the assortment influences the impact of assortment size on the decision-making outcomes. In the study's context, an "alignable" assortment is one whose alternatives differ in terms of a single attribute, hence choosing from such assortment only requires within-attribute trade-offs. On the other hand, an "nonalignable" assortment is one whose alternatives differ in terms of multiple attributes, hence choosing from such assortment requires between-attribute trade-offs. For instance, an alignable assortment of cars contains identical cars that only differ on engine size: 2.2-liter, 2.6-liter and 3.0-liter engines. A nonalignable assortment of cars contains ones that vary in their options such as one with a sunproof, one with an alarm system and one with a leather interior. The study discovered that when an assortment is alignable, the likelihood of purchase increases as the assortment size increases. However when an assortment is nonalignable, the likelihood of purchase decreases as the assortment size increases. The negative impact of nonalignable assortment is due to both the increasing cognitive efforts required to evaluate such assortment, and the increasing potential for regret inherent in the assortment.

---

Another factor that manipulates the impact of large assortment on decision-making outcomes is **product familiarity** (Beneke, 2015). Product familiarity refers to the consumer's knowledge and experience in purchasing a particular product. The study found that when consumers are highly familiar with the product, reducing assortment size while keeping their favorite items has no impact on consumer satisfaction; while when consumers are not familiar with the product, reducing assortment size has a positive effect. This suggests that consumers are bewildered by a variety of choice especially when they are unfamiliar with the products.

Yan, et al., (2015) explored the impact of **number of categories** on the decision-making outcomes. Given a fixed assortment, as the number of categories increases, satisfaction level increases accordingly. However, when the number of categories reaches a certain threshold, the excessive variety overwhelms consumers and causes them to have low satisfaction and high regret with their choices. These results showed that a high number of categories has the same effect as a high number of options, both leading to choice overload when crossing a certain threshold.

Chernev, et al. (2014) identified four key factors that control the impact of assortment size on choice overload: **choice set complexity, decision task difficulty, preference unsurety and decision goal** (Figure 5). Choice set complexity and decision task difficulty belong to extrinsic factors, which are similar across individuals and define the decision problem. Preference uncertainty and decision goal belong to intrinsic factors, which are specific to each individual and reflect their knowledge and motivation.

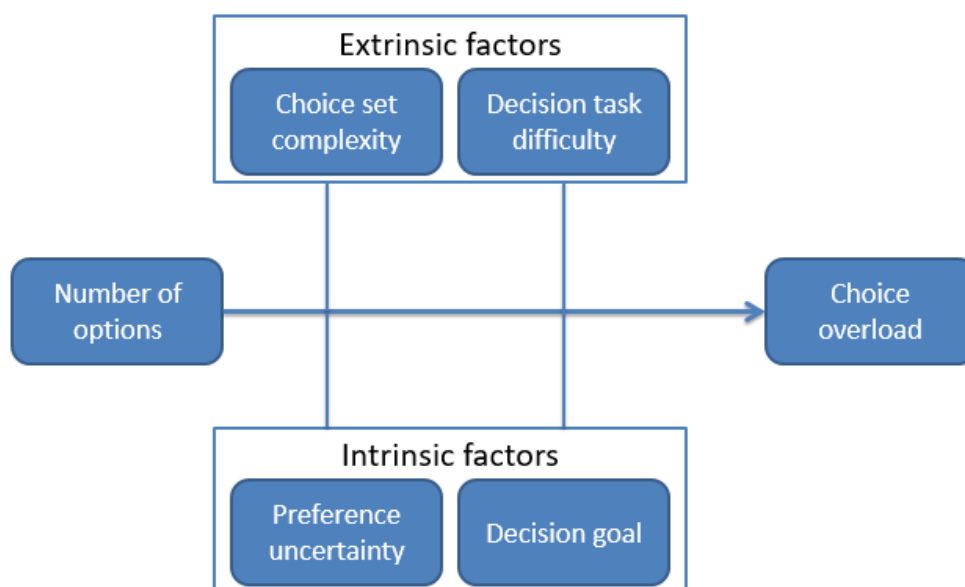


Figure 5: Conceptual model of the impact of assortment size on choice overload (Chernev, et al., 2014)

First, **preference uncertainty** is the extent to which individuals have constructed preferences concerning the decision at hand. This is in line with other studies about ideal point availability (Chernev, 2003) and product familiarity (Beneke, 2015). Specifically, high levels of preference uncertainty, defined by low product expertise and the lack of an ideal point, result in greater choice overload.

Second, **decision goal** refers to the degree to which individuals aim to minimize their cognitive efforts in the decision-making process. There are three factors that determine whether consumers minimize cognitive effort: decision intent, decision focus, and level of construal. Regarding decision intent, decisions associated with browsing intention (i.e. learn more about the available options or their own preferences) are less likely to lead to choice overload compared to decisions associated with buying intention (i.e. making a choice). Regarding decision focus, the decision might involve choosing among the assortments themselves rather than choosing among available options. Decisions associated with choosing among assortments are less likely to result in choice overload compared to decisions associated with choosing among options. Regarding level of construal, the way consumers conceptualize the decision process – as high-level and abstract or low-level and concrete – can influence their preference for large or small assortments. Overall, when consumers aim to spend little cognitive efforts in decision-making, they are more likely to face choice overload.

---

Third, **choice set complexity** concerns the aspects of the decision task that influence the values of the choice options. This includes the presence of a dominant option, the overall attractiveness of the choice set, and the relationship between individual options in the choice set. Regarding the presence of a dominant option, consumers are more likely to purchase from an assortment when it contains a dominant option. In this sense, adding inferior options to enhance the dominance of one existing options can increase the likelihood of purchase, while adding equally attractive options have the opposite effect. As for the overall attractiveness of the choice set, assortments that contain options that are of higher quality are likely to be perceived as more attractive. The relationship between individual options in the choice refers to the alignability of the options as elaborated by Gourville & Soman (2005) and feature complementarity – which is when increasing an assortment size by adding complementary options tends to decrease purchase likelihood (Chernev, 2005). Overall, higher levels of choice set complexity leads to greater choice overload.

Fourth, **decision task difficulty** denotes the general structural characteristics of the decision problem including time constraints, decision accountability, number of attributes describing each option and presentation format. Regarding time constraints, it has been claimed that a limit on the decision-making period increases the cognitive challenge and lowers consumer satisfaction and confidence in their decision. Regarding decision accountability, it has been shown that preference for a larger assortment decreases when consumers are expected to justify their choice from the available assortments. Another decision task factor that influences the impact of assortment size is the number of attributes describing each option. In fact, the more attributes there are, the more complex the choice becomes. Last but not least, the presentation format of the individual options also influences the impact of assortment size on choice satisfaction and regret. It has been shown that consumers are more likely to purchase from assortments that offer a high variety of options displayed in an organized manner than in a random manner. In general, higher levels of decision task difficulty leads to greater choice overload.

The antecedents of choice overload describe in which conditions large assortment causes negative decision-making experience, and in which conditions it does not. Hence, they might give suppliers implications on how to control their choice set so as to reduce negative decision-making experience. These implications are: ensuring decision-makers preference certainty, encouraging their cognitive efforts, reducing choice set complexity and reducing

---

decision task difficulty. However, these implications are rather difficult to translate into direct implementable and feasible actions. As for factors intrinsic to each individual such as preference certainty and cognitive efforts, suppliers are unable to influence these factors unless they have strong customer relationships. As for extrinsic factors in the outside environment such as choice set complexity and decision task difficulty, they are under direct control of suppliers. However, more specific actions than “reducing choice set complexity” and “reducing decision task difficulty” should be defined. Therefore, in section 2.3, we would examine in details some specific mitigation strategies for choice overload effect.

## 2.3 Assortment strategies for mitigating choice overload effect

Although various studies have been done to prove the existence of choice overload effect and to explain when and why such phenomenon occurs, only a few studies have looked into direct managerial suggestions on how firms and organizations can construct their assortments to mitigate choice overload effect. In this research, we would explore different assortment strategies that firms and organizations can adopt to mitigate choice overload.

### 2.3.1 Assortment size reduction

Since choice overload is associated with the situation that a large assortment size increases cognitive costs, decreases satisfaction and increases regret, various studies have looked into assortment size reduction as a possible mitigation strategy for choice overload.

Some studies have explored the impacts on assortment size reduction on **consumer assortment perception**. It has been found that when most favorite (or highest selling) items are kept, consumers’ assortment perception remains unchanged in the context of assortment size reduction. On the other hand, when most favorite items are eliminated, consumers’ assortment perception falls in the context of assortment size reduction. In this sense, by maintaining most favorite items, businesses can reduce assortment size without negatively affecting consumer satisfaction. These results were first discovered in an experiment by Broniarczyk, et al. (1998) using four product categories (popcorn, salty snacks, laundry detergent and soft drinks), and later confirmed in another experiment by Beneke, et al. (2013) using red wine product category.

Other studies have explored the positive impact of assortment size reduction on **sales**. Boatwright & Nunes (2001) conducted an experiment at an online grocery, in which 94% of

---

the categories experience between 20% to 80% cuts in the number of SKUs (stock-keeping units) offered. The study found that due to the heterogeneity of consumer preferences, product cuts caused some consumers to stop purchasing. However, many of the loyal consumers switched to alternate products within the same category. The cuts helped reduce consumers' cognitive costs and led to sales increases, which outweighed the loss in sales from churned consumers. As a result, sales increased in more than two-thirds of the product categories, half of which experienced an increase of more than 10%.

Syam & Bhatnagar (2015) developed a decision support model to determine an optimal level of product variety, taking into account both marketing and supply chain perspectives. While the marketing perspective concentrates on the appeal and repulsion of variety to consumers, the supply chain perspective concentrates on inventory and distribution costs. As product variety increases, the total revenue increases but at decreasing rate; while production cost per unit increases at increasing rate. Hence, the study developed a piecewise ILP (integer linear program) model that allowed decision-makers to incorporate their company-specific cost and revenue functions, and therefore identify the optimal level of product variety.

### **2.3.2 Categorization**

An alternative to assortment size reduction in mitigating choice overload effect is categorization. Research has widely acknowledged the various benefits of this strategy. First, categorization suggests the basic characteristics of products to help consumer differentiate between product types (Howard & Sheth, 1969), (Bettman, 1979), (Johnson & Payne, 1985), (Nedungadi, 1990), (Alba, et al., 1991), (Huber & Kline, 1991), (Roberts & Lattin, 1991). In this regard, categorization benefits consumers by directing them to their favorite options. For instance, a study by Diehl, et al. (2003) found that consumers who had the access to a ranking system of available options were able to choose better products at lower prices than those who are presented the available options at a random order.

Second, the categorization influences consumers' perception of variety. As proven by linguistics research (Zhang & Schmitt, 1998), items under different classifiers are perceived to be different. A study by Kahn & Wansink (2004) found that consumers perceive different levels of variety when the options are organized into categories than when the options are disorganized. In the study, consumers were presented with assortments of chocolate candies and were allowed to take as many candies as they want. Those who encountered an

---

assortment sorted by 6 colors picked fewer candies than those who encountered a disorganized assortment. On the other hand, those who encountered an assortment sorted by 24 colors picked more candies than those who encountered a disorganized assortment. The study confirmed that consumers' perception of variety changes according to the number of categories, even though the number of options remain the same.

With unorganized choice sets, consumers are unable to identify the trade-offs between options, hence have less feeling of control over their selection. It is this lack of autonomy that results in lower satisfaction with their choice. For this reason, categorization can benefit consumers by creating a perception of variety and a sense of control over their selection.

### **2.3.3 Provision of a Default Option**

Research also suggests that another choice overload mitigation strategy is to provide a default option – an option that is automatically selected unless an alternative is chosen (Rooij & Teppa, 2008) (Chernev, 2011), (Murphy & Cotteleer, 2015).

This approach makes choosing easier because consumers enjoy a low-effort way of making a decision instead of squandering their energy on a thorough search. Research shows that when facing complex decisions, individuals adopt simplifying decision strategies (Payne, et al., 1993). To speed up the decision, individuals may only consider a subset of information and at an extreme, they may avoid all choices altogether by accepting a default option.

Moreover, a default option eases the decision-making process by serving as a reference point for evaluating other options in the choice set. Deciding whether an option is better or worse than the default option is much easier than to compare it against all other available options. The argument that product evaluation is dependent on reference points traces its roots to prospect theory (Kahneman & Tversky, 1979). According to prospect theory, the value of an option is defined by deviations from the reference point: the value function is concave in the domain of gains and convex in the domain of loss (Figure 7). In the context of product evaluation in relation to a default option, this means that if a product is better than the default option, an additional even better product is enjoyed less due to diminishing sensitivity; and if a product is worse than the default option, an additional worse product will be even more aversive.



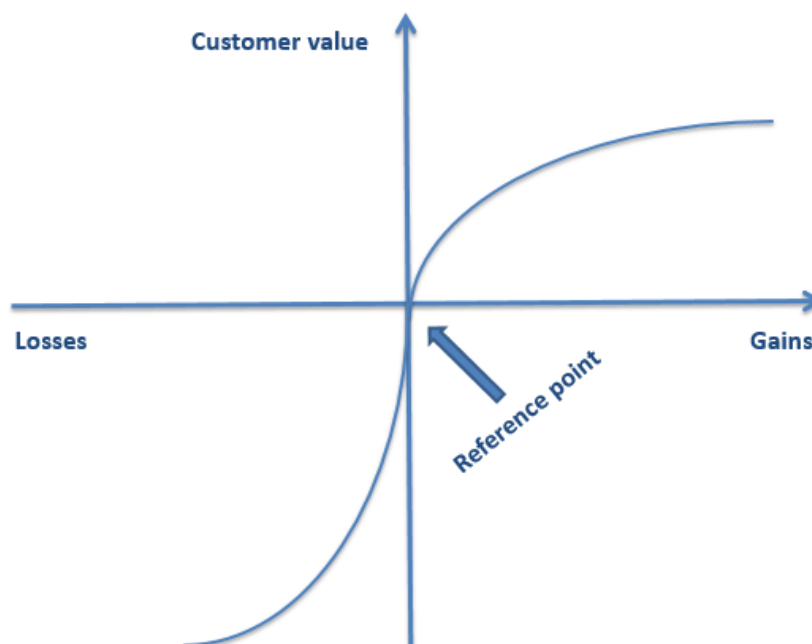


Figure 6: Value function in Prospect Theory (Kahneman & Tversky, 1979)

Such approach of providing a default option, also called as “soft paternalism”, has often been utilized by organizations and governments to influence behaviors. A classic example is the case of organ donation (Johnson & Goldstein, 2003). In Europe, countries have very different levels of organ donations, which might suggest that culture and religion are causes of such differences. However, some countries such as Denmark and Sweden, Netherlands and Belgium, Austria and Germany still have different levels of organ donations despite sharing rather similar cultures, languages and religions. It turned out that the differences are attributed to how the question is framed. In countries with enrollment by default, 82% of citizens opted in to be organ donors, compared to only 42% in countries with enrollment by choice. Hence, making an option a default greatly increases the probability that it will be chosen. The default option approach has applications in various other domains, including retirement plan design (Madrian & Shea, 2001), email marketing (Johnson, et al., 2002), healthcare (Halpern, et al., 2007), healthclub memberships (Vigna & Malmendier, 2006), and insurance (Johnson, et al., 1993).

#### 2.3.4 Unconscious information processing

As previously explained, dissatisfaction and regret arise from large assortments since there is a high possibility that two or more options have equivalent utility yet different benefits to the decision-maker, hence choosing one option means abandoning other benefits.

---

Interestingly, research shows that more elaborative thinking exacerbates such conflicts. Overthinking on an option makes decision-makers to overweight irrelevant attributes, which does not contribute to the overall choice satisfaction (Wilson & Schooler, 1991), (Wilson, et al., 1993). In this regard, unconscious information processing is another alternative to mitigating the choice overload effect.

Unconscious information processing refers to the situation when after being temporarily distracted from the decision problem, the decision maker can find it easier to make up his/her mind. As a result, unconscious information processing can increase satisfaction with choices from large assortments. This approach is built up on Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006), which states that although conscious attention is shifted away from the decision problem, information processing still continues as long as the decision goal is kept. This is different from spontaneous decision-making. While spontaneous decision-making involves little information processing and is based on heuristics, unconscious information processing is an active information integration that takes place outside an individual's focused awareness (Messner & Wanke, 2010).

Compared to conscious information processing, unconscious information processing has a much larger processing capacity and prevents overweighting of irrelevant attributes (Bos, et al., 2011). Therefore, unconscious information processing is helpful when dealing with complex decision problems that involve many comparisons.

An experiment by Messner & Wanke (2010) provided evidence that unconscious information processing can lead to higher satisfaction than conscious and spontaneous decision-making when dealing with large assortments. Using Swiss Lindt pralines as choice targets, the experiment set up a large assortment size of 24 pralines and employed 3 selection conditions: spontaneous condition, conscious condition and unconscious condition. After being shown an assortment of pralines, the spontaneous condition group had to choose one option immediately; the conscious condition group had to write down their thoughts about the options for 5 minutes before making their selection; and the unconscious group had to solve an anagram for 5 minutes before making their selection. After the selection, the participants tasted the chosen pralines and evaluated their experience about the selection. The results showed that in terms of product satisfaction, participants in the unconscious condition evaluated the selection more favorably than those in conscious and spontaneous

---

conditions. In terms of frustration, participants in the conscious conditions reported the highest frustration; those in the spontaneous condition reported the least frustration; and those in the unconscious condition fell in between. However, in terms of regret, participants in unconscious condition demonstrated least regret compared to participants in other conditions. Therefore, it is suggested that when facing with conflicting alternatives, consumers may interrupt their decision process, do something else and eventually return with better idea about what they want.

## 2.4 Measures of choice overload

Studies on choice overload share relatively similar findings on what the consequences of choice overload are. In terms of behavioral consequences, compared to those who do not experience choice overload, those who experience it are: less likely to make a choice from a given assortment, more likely to alter their original choice, less likely to prefer large assortments, and more likely to choose an option that can be easily justified. In terms of post-decision evaluation, those who experience choice overload are likely to be: less satisfied about their decision, less confident that they have chosen the best option, and more regretful of their decision.

These consequences serve as measures of choice overload (or dependent variables) in the research studies on the topic of choice overload. However, different studies utilize different sets and labels of measures. Chernev, et al. (2014) included **Satisfaction**, **Confidence**, **Choice Deferral**, and **Switching Likelihood**. Misuraca, et al. (2015) included **Satisfaction**, **Regret** and **Perception of Variety**. Beneke (2015) included Assortment Perception and Assortment Costs. Yan, et al. (2015) included **Variety Perception** and **Satisfaction**. Mittal (2016) included **Choice Satisfaction**, **Post-Purchase Doubt**, and **Happiness**. Yun & Duff (2017) included **Perceived Similarity**, **Frustration**, **Ease of Choice** and **Satisfaction**.

Furthermore, all studies utilize multi-item scales for measuring each dependent variable. A multi-item scale aims to capture the respondent' evaluation of a variable through multiple attributes related to that particular variable. It comprises multiple statements that present a similar idea in different ways and respondents need to evaluate these statements on a Likert scale of 1-5, 1-7 or 1-10. The use of multi-item measurement scales traces back to 40 years ago when Jacoby (1978) argued that researchers cannot rely on single items to measure concepts and arrive at conclusions. Since then, academia has been using multi-item

---

measurement as a standard practice in research. The use of multi-item measurement has some advantages. First, a set of multiple items can represent the variable more comprehensively than a single item. Second, combining various items can prevent idiosyncratic influence of a particular item. Third, aggregating across multiple items can increase the reliability of the variable's evaluation.

## **2.5 Research goal**

Given the purpose of identifying best mitigation approaches for choice overload, this research examined the effects of different assortment strategies as well as the distinctions between consumer demographic groups in experiencing choice overload. Therefore, the research involved a behavioral experiment that measured and compared choice overload levels of different assortment strategies as well as consumer demographic groups. In order to design proper measures of choice overload and multi-item scales for the experiment, we referred to previous literature, employed a pilot study in addition to the main study and utilized factor analysis. Details of the research methodology will be presented in Section 3.

## **3 Research methodology**

This section presents the research methodology that we applied to find out the best mitigation strategies for choice overload effect. Section 3.1 describes the overall method used in both the pilot study and the actual experiment. Section 3.2 elaborates on the design of the pilot study and the study results, which are the basis for the design of the actual experiment. Finally, section 3.3 presents the design of the actual experiment.

### **3.1 Overall method description**

Some methods employed by previous studies on choice overload include exploratory study, meta-analysis, managerial simulation study, and behavioral experiments. While exploratory study, meta-analysis and managerial study are scarce, behavioral experiments are commonly used. In behavioral experiments on choice overload, participants are presented with an assortment of products, typically consumer goods such as jam (Iyengar & Lepper, 2000), chocolate (Iyengar & Lepper, 2000) (Kahn & Wansink, 2004), cookies (Messner & Wanke, 2010), red wine (Beneke, et al., 2013), microwave ovens (Gourville & Soman, 2005), digital cameras (Gourville & Soman, 2005), souvenirs and magazines (Yan, et al., 2015). Participants are typically asked to choose one option within the assortment, try the option

---

and then answer some questions that measure their degree of choice overload with the assortment.

In this research, we also used a behavioral experiment to examine participants' degree of experienced choice overload when making their decisions in different assortment conditions. Following previous behavioral experiments on choice overload, this research employed a type of consumer good for the experiment product. Participants were assigned to different assortment scenarios, and after making their decision in the product assortment, would be asked to evaluate a set of statements about their experience with the assortment. The statements corresponded to a number of dependent variables that measured participants' degree of choice overload on multi-item scales. Due to insufficient resources, we were unable to conduct a laboratory-based experiment and therefore resorted to a web-based experiment in the form of an online questionnaire.

The assortment strategies in this research are: Assortment Size Reduction, Categorization, Provision of a Default Option and Unconscious Information Processing. These strategies were also compared against the controlled condition of no assortment strategy.

## **3.2 Pilot study and results**

### **3.2.1 Pilot study design**

Before conducting the actual experiment with a large sample of respondents, we conducted a pilot study with a small sample of respondents. For the pilot study, the respondents are the author's friends. In order to prevent bias in choice overload evaluation, the respondents were not informed about the study's topic when taking the survey. The pilot study served a number of purposes, based on which we design the actual experiment.

The first and foremost purpose of the pilot study was to identify the most suitable product category for the experiment. As the actual experiment would examine the mitigation effects on choice overload level of different strategies, we needed to choose a product category that normally creates high level of choice overload. According to section 2.2, low ideal point availability, low alignability and low product familiarity result in high choice overload. Hence, we tested with product categories that satisfy these characteristics in the pilot study. The product category that generated most choice overload in the pilot study would be chosen for the main experiment.

First, to generate low ideal point availability, we chose product categories that consumers do not have to buy often and therefore do not have existing criteria for evaluating the options. Second, to have low alignability in the assortment, we included products whose options can differ in multiple attributes. In terms of product familiarity, we however applied medium product familiarity in order to avoid consumers being completely unable to make a decision. Hence, we chose product categories that everyone is familiar with but unlikely to own many versions. Additionally, to ensure the same level of familiarity among participants, we also chose product categories that are gender-neutral, meaning that the products would appear in the same level of favorability to all genders. Given the characteristics above, we chose to experiment with 3 product categories: eye glasses, desk lamps and office chairs in the pilot study (Table 1).

<b>Factor affecting levels of choice overload</b>	<b>Intensity</b>	<b>Criteria for product category selection</b>
Ideal point availability	Low	Consumers don't have to buy the product often
Product familiarity	Medium	Everyone is familiar with but doesn't own many versions of one product; Gender-neutral
Alignability	Low	Products within the assortment have low alignability

*Table 1: Criteria for product category selection*

Second, the pilot study aimed to validate if the assortment strategies indeed differed from each other and the unassisted condition in their impacts on choice overload. Therefore, in the pilot study, we experimented with 2 assortment strategies: Categorization and Provision of a Default Option. Adding an unassisted condition without any assortment strategy, we had 3 different assortment conditions. Since the pilot study experimented with 3 product categories and 3 assortment conditions for each product category, we had in total  $3 \times 3 = 9$  assortment scenarios. In order to reduce the effort of recruiting sufficient respondents for each scenario, each participant was randomly assigned to complete 3 out of these 9 scenarios.

Third, the pilot study served as a trial for the multi-item scale design. We presumed that participants' choice overload can be best represented by 4 measures: **Assortment Perception, Ease of Decision-making, Satisfaction** and **Remorse**. Each measure was quantified by a multi-item scale that included 2-4 statements expressing the variable in different ways. Participants were required to evaluate these statements on a Likert scale of

1-7 (1= “strongly disagree”, 7= “strongly agree”). There were a total of 11 statements that were presented to participants in randomized order after they had decided which option to take in each product assortment. The multi-item scales were designed as follows (Table 2):

Scale	Item within the scale
Assortment Perception	The products are different from each other
	There is a wide variety of products to choose from.
	There are enough options for me to choose from.
	There are too many options to choose from.
Difficulty of Decision-making	I feel overwhelmed when reviewing the choices.
	I feel frustrated when making the decision.
	Choosing the right one is difficult.
Satisfaction	I am satisfied with my choice.
	The choice well matches my style.
Remorse	I regret my choice.
	If I had to pay 25% extra in order to make the product returnable, I would choose to do so.

Table 2: Multi-item scale design in the pilot study

Regarding background questions, the study included **gender** and **age**. In the product assortments, there were price tags under each option, so as to make the choosing experience more realistic.

A more succinct and comprehensible explanation of the pilot study design is as follows (Table 3, Figure 8):

Type of question	Variable	Description
Background questions	Gender	What is your gender? (1) Male, (2) Female, (3) Other
	Age	What is your age? (1) Under 13, (2) 13-17, (3) 18-25, (4) 26-34, (5) 35-54, (6) 55-64, (7) 65 or over
Product choice task	Lamp – no assortment strategy	There were 9 scenarios of product choice task. Each scenario featured 30 options and under each option, there is a hypothetical product price. Respondents were required to choose only 1 option per scenario. Each respondent was randomly assigned to 3 out these 9 scenarios.
	Lamp - Categorization	
	Lamp - Provision of Default Option	
	Eye glasses - no assortment strategy	

	Eye glasses - Categorization	
	Eye glasses - Provision of Default Option	
	Office chair - no assortment strategy	
	Office chair - Categorization	
	Office chair - Provision of Default Option	
Choice overload measurement	Assortment Perception	Choice overload measurement variables were presented after respondents finish with each product choice task to evaluate their experience with the assortment. Each choice overload variable was measured by a multi-item scale that includes 2-4 statements expressing the variable in different ways. There were a total of 16 statements that would be presented to participants in randomized order. Participants were required to evaluate these statements on a Likert scale of 1-7. (1="strongly disagree", 7="strongly agree").
	Difficulty of Decision-making	
	Satisfaction	
	Remorse	

Table 3: Summary of pilot study design

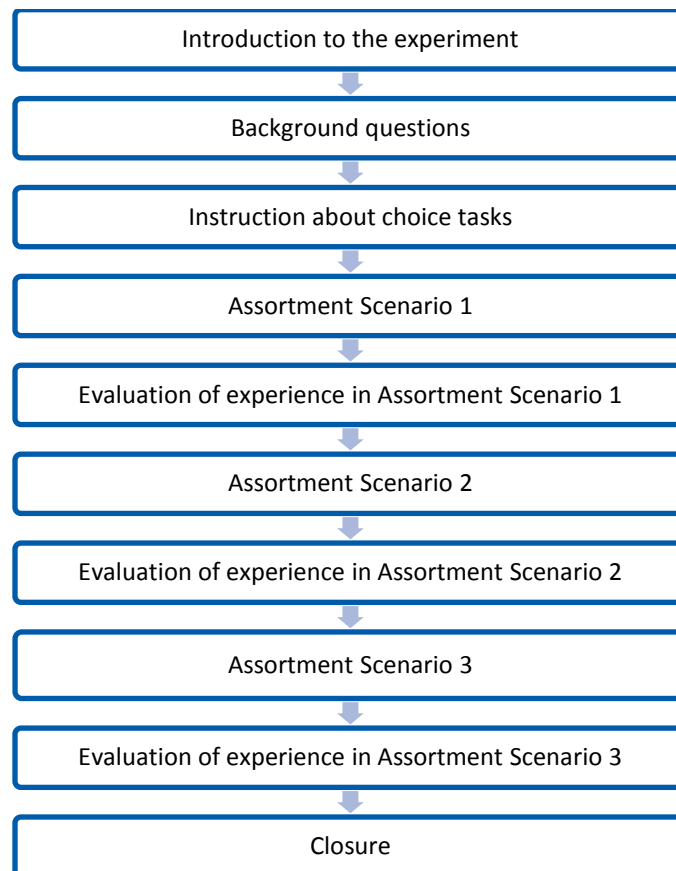


Figure 7: Summary of pilot study's procedures



### 3.2.2 Pilot study results

The pilot study gathered 21 participants, who altogether provided 63 responses to the product choice task and subsequent sets of choice overload measurement statements. The allocation of the responses was as follows:

	<b>Controlled condition (no assortment strategy)</b>	<b>Categorization</b>	<b>Provision of default option</b>	<b>Total</b>
<b>Desk lamp</b>	9	10	6	25
<b>Eye glasses</b>	8	5	10	23
<b>Office chair</b>	6	3	6	15
<b>Total</b>	23	18	22	63

Table 4: Number of responses to the pilot study, sorted by assortment conditions

Using responses to the choice overload measurement statements, we conducted different tests to reach the 3 main purposes of the pilot study: identify most suitable product category, validate if the assortment strategies differ from each other and the unassisted condition in their impacts on choice overload and examine the appropriateness of multi-item scale design.

#### 3.2.2.1 Examination of the multi-item scale design

First, we assessed the reliability of the multi-item scales by looking at the Cronbach's alphas. Cronbach's alpha measures how closely related a set of statements are as a group. The Cronbach's alpha threshold for a multi-item scale to be considered reliable is 0.7. The alphas (Table 5) show that except for Remorse, all other scales are reliable. Hence, we must revise the Remorse scale design.

<b>Scale</b>	<b>Statements within the scale</b>	<b>Variable name</b>	<b>Cronbach's Alpha</b>
Perception of Variety	The products are different from each other	<i>different</i>	0.701
	There is a wide variety of products to choose from.	<i>variety</i>	
	There are enough options for me to choose from.	<i>enough</i>	
	There are too many options to choose from.	<i>toomany</i>	
Difficulty of Decision-making	I feel overwhelmed when reviewing the choices.	<i>overwhelmed</i>	0.747
	I feel frustrated when making the decision.	<i>frustrated</i>	
	Choosing the right one is difficult.	<i>difficult</i>	
Satisfaction	I am satisfied with my choice.	<i>satisfied</i>	0.729
	The choice well matches my style.	<i>match</i>	
Remorse	I regret my choice.	<i>regret</i>	-0.351
	If I had to pay 25% extra in order to make the product returnable, I would choose to do so.	<i>return</i>	

Table 5: Cronbach's Alphas of multi-item scales in the pilot study

Additionally, we conducted Principal Component Analysis (PCA) to further assess whether the multi-item scale design into 4 scales (Perception of Variety, Difficulty of Decision-making, Satisfaction and Remorse) is most appropriate. PCA is a variable-reduction technique that aims to reduce a larger set of variables into a smaller set of artificial variables – or components - which account for most of the variance in the original variables. In our case, we need to extract components from the 11 original variables.

To identify the optimal number of artificial variables to be extracted, we looked at the Scree Plot. The horizontal axis shows the number of components – or the number of variables that can be extracted from the original 11 variables. The vertical axis shows the Eigenvalues, which measure the cumulative variance explained by the corresponding number of components. A common heuristic is to select the number of components with Eigenvalues of more than or equal to 1.00. The Scree Plot (Figure 8) indicates that there are 4 components with Eigenvalues more than 1.00. Therefore, we can could extract 4 components that explained most variance from the original 11 variables.

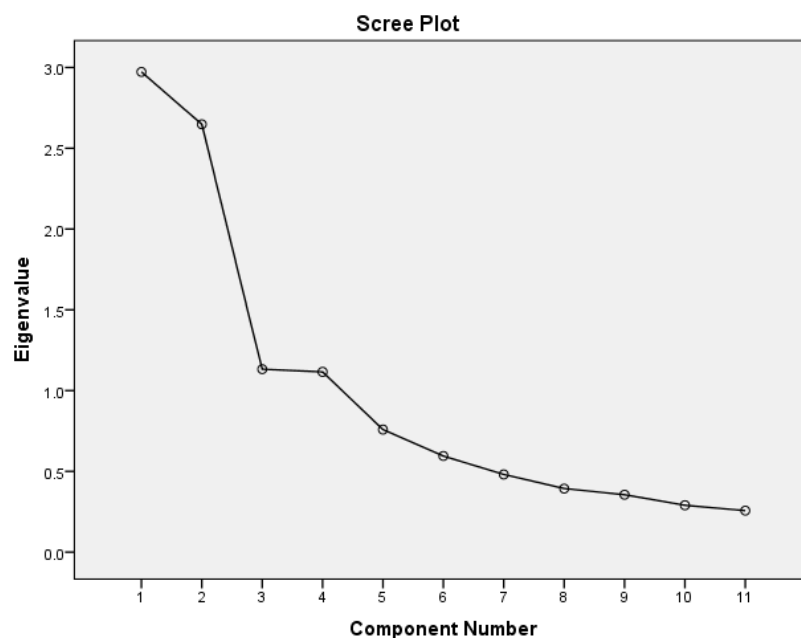


Figure 8: Principal component analysis of 11 choice overload measurement variables

After recognizing that there are 4 components to be extracted from the original 11 variables, we identified which original variables each component is correlated to by looking at the Rotated Component Matrix (Table 6).

<b>Rotated Component Matrix<sup>a</sup></b>					
<b>Variable name</b>	<b>Original statement</b>	<b>Component</b>			
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<i>different</i>	The products are different from each other	0.072	0.220	<b>0.787</b>	0.156
<i>variety</i>	There is a wide variety of products to choose from.	0.197	<b>0.503</b>	<b>0.614</b>	-0.067
<i>enough</i>	There are enough options for me to choose from.	0.192	<b>0.500</b>	<b>0.554</b>	0.118
<i>toomany</i>	There are too many options to choose from.	<b>0.810</b>	0.222	0.093	-0.144
<i>overwhelmed</i>	I feel overwhelmed when reviewing the choices.	<b>0.781</b>	-0.106	0.213	-0.307
<i>frustrated</i>	I feel frustrated when making the decision.	<b>0.660</b>	-0.431	0.047	-0.317
<i>difficult</i>	Choosing the right one is difficult.	<b>0.795</b>	-0.103	-0.012	0.238
<i>satisfied</i>	I am satisfied with my choice.	-0.068	<b>0.838</b>	0.126	-0.253
<i>match</i>	The choice well matches my style.	-0.145	<b>0.783</b>	0.076	0.102
<i>regret</i>	I regret my choice.	-0.021	-0.299	<b>0.697</b>	-0.339
<i>return</i>	If I had to pay 25% extra in order to make the product returnable, I would choose to do so.	-0.169	-0.092	0.021	<b>0.899</b>
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 17 iterations.					

Table 6: Rotated component matrix of 11 choice overload measurement variables

Using a cut-off value of 0.4 for the PCA loadings, we could see in the Rotated Component Matrix (Table 6) that Component 1 strongly correlated with *toomany*, *overwhelmed*, *frustrated* and *difficult*, therefore reflected how difficult the participant found the choosing experience and corresponds to the Difficulty of Decision-making scale. It also indicated that the statement “There are too many options to choose from” despite was initially assumed to reflect Perception of Variety, more closely reflected participants’ Difficulty of Decision-making. Component 2 strongly correlated with *variety*, *enough*, *satisfied* and *match*, therefore reflected how satisfied the participant was with his/ her decision and matched the original Satisfaction scale. Component 3 strongly correlated to *different*, *regret*, *variety* and *enough*, therefore suggested how varied the participant perceived the choice set was and corresponded to the original Perception of Variety scale. However, it was odd that *regret* despite being unrelated, belonged to the same group as *different*, *variety* and *enough*. Furthermore, Component 4 only strongly correlated to *return*, which suggested that participants did not perceive the statement “If I had to pay 25% extra in order to make the product returnable, I would choose to do so.” to indicate Remorse. This further confirmed that the Remorse scale must be revised.

### 3.2.2.2 Validate whether the assortment strategies can indeed mitigate choice overload

To find out whether the assortment strategies can indeed mitigate choice overload, we compared the means of choice overload measurement variables resulted from the scenarios.

We coded the scenarios as follows: 1 indicates Controlled Condition, 2 indicates Categorization, and 3 indicates Provision of a Default Option. Since the sample size was small for the pilot study, we didn't conduct ANOVA and post-hoc test to identify the statistical differences between group means. However, by simply looking at the means, we could get a grasp of how participants' evaluation of assistance scenarios might differ.

#### Perception of Variety

different			variety			enough		
assistance_scenario	N	Means	assistance_scenario	N	Means	assistance_scenario	N	Means
2.00	18	4.3333	2.00	18	5.2222	2.00	18	5.0000
3.00	22	4.8182	3.00	22	5.3182	3.00	22	5.2273
1.00	23	5.2609	1.00	23	5.6522	1.00	23	5.3478

Table 7: Comparison of different assistance scenarios with regards to their impacts on Perception of Variety

On average, the participants' evaluation of all items in the scale consistently showed that Categorization (code 2) generated least perception of variety while Controlled Condition (code 1) generated most perception of variety. This means that having mitigation strategies can reduce perception of variety.

#### Difficulty of Decision-Making

toomany			overwhelmed			frustrated			difficult		
assistance_scenario	N	Means	assistance_scenario	N	Means	assistance_scenario	N	Means	assistance_scenario	N	Means
3.00	22	4.6364	2.00	18	3.9444	3.00	22	3.3182	3.00	22	4.0000
1.00	23	4.9565	3.00	22	4.0909	2.00	18	3.8333	2.00	18	4.6667
2.00	18	5.1667	1.00	23	4.6087	1.00	23	4.3478	1.00	23	5.1304

Table 8: Comparison of different assistance scenarios with regards to their impacts on Difficulty of Decision-making

On average, the evaluations of four items in the scale generally indicated that the Controlled Condition (code 1) generated higher difficulty of decision-making than other scenarios (codes 2 and 3). This means that having assortment strategies can help improve the ease of choosing.

## Satisfaction

satisfied			match		
assistance_scenario	N	Means	assistance_scenario	N	Means
1.00	23	5.0870	2.00	18	4.8889
2.00	18	5.1111	3.00	22	5.2273
3.00	22	5.2727	1.00	23	5.3913

Table 9: Comparison of different assistance scenarios with regards to their impacts on Satisfaction

Due to small sample size and low number of statements in the Satisfaction scale, the effects of different product categories on satisfaction were unclear. Hence, we needed to revise Satisfaction scale.

## Remorse

As previously explained, the Remorse scale in this pilot study was unreliable and needed to be revised. Hence, the effects of different assistance scenarios on regret were unclear in the pilot study.

### 3.2.2.3 Identification of most suitable product category

The product category that generated most choice overload in the pilot study would be chosen for the actual experiment. We coded the product categories as follows: 4 indicates eye glasses, 5 indicates desk lamp, and 6 indicates office chair. Since the sample size was small for the pilot study, we didn't conduct ANOVA and post-hoc test to identify the statistical differences between group means. However, by simply looking at the means, we could still obtain suggestion of the product category that generated most choice overload.

## Perception of Variety

different			variety			enough		
product_category	N	Means	product_category	N	Means	product_category	N	Means
5.00	25	4.5600	4.00	23	4.9130	4.00	23	4.5652
4.00	23	4.6957	5.00	25	5.5600	5.00	25	5.3600
6.00	15	5.5333	6.00	15	5.9333	6.00	15	5.9333

Table 10: Comparison of different product categories with regards to their impacts on Perception of Variety

The average evaluations of all items in this scale unanimously pointed out that office chair (code 6) generated the largest perception of variety.

### Difficulty of Decision-making

toomany			overwhelmed			frustrated			difficult		
product_category	N	Means	product_category	N	Means	product_category	N	Means	product_category	N	Means
4.00	23	4.5217	5.00	25	3.7600	5.00	25	3.6800	5.00	25	3.9600
5.00	25	4.9200	4.00	23	4.1739	4.00	23	3.7826	4.00	23	5.0000
6.00	15	5.4667	6.00	15	5.1333	6.00	15	4.2000	6.00	15	5.0667

Table 11: Comparison of different product categories with regards to their impacts on Difficulty of Decision-making

The average evaluations of all items in the Difficulty of Decision-making scale also consistently demonstrated that office chair (code 6) generated highest difficulty of decision-making.

### Satisfaction

satisfied			match		
product_category	N	Means	product_category	N	Means
4.00	23	4.8261	5.00	25	5.0800
6.00	15	5.2000	4.00	23	5.2174
5.00	25	5.4400	6.00	15	5.3333

Table 12: Comparison of different product categories with regards to their impacts on Satisfaction

Due to small sample size and low number of items in the satisfaction scale, the effects of different product categories on satisfaction were unclear. Hence, we needed to revise Satisfaction scale.

### Remorse

As previously explained, the Remorse scale in this pilot study was unreliable and needs to be revised. Hence, the effects of different product categories on regret were also unclear in the pilot study.

### 3.2.3 Summary of pilot study outcomes

To summarize, regarding multi-item scales, we needed to **revise Satisfaction and Regret scales** by rewriting the statements within those scales. Regarding the assortment strategies, there were some indications that the assortment strategies differed from having none strategy in terms of experienced choice overload. And regarding product category, there were strong

indications that office chair generated more choice overload than eye glasses and desk lamps. Hence, **office chair** was the most suitable product category for the actual experiment.

### 3.3 Experiment design

This experiment aimed to find out best assortment strategies for mitigating choice overload, as well as identify the differences among demographic groups in experienced choice overload. In addition to most commonly known strategies **Assortment Size Reduction**, other assortment strategies examined in this research were: **Categorization**, **Provision of a Default Option**, and **Unconscious Information Processing**. In fact, these strategies were not mutually exclusive; in other words, firms could employ more than one aforementioned strategy in their product assortments. Hence, instead of having the assortment strategies as stand-alone conditions, we would experiment with different combinations of them. By experimenting with different combinations, we could obtain further insights into how the strategies could complement each other, which strategy had dominant influence on mitigating choice overload, and which combinations were more effective than others.

Since having all possible combinations from 4 strategies would overcomplicate the research, we only experimented with different combinations generated from the 3 strategies: **Categorization**, **Provision of a Default Option**, and **Unconscious Information Processing**. Given the 3 strategies, we could generate  $\binom{3}{1} + \binom{3}{2} + \binom{3}{3} = 3 + 3 + 1 = 7$  combinations of mitigation strategies. The experiment simulated 7 assortment scenarios corresponding to those 7 combinations of assortment strategies, each with a large assortment size (30 options). In addition, the experiment included 1 scenario with the Reduction of Assortment Size strategy (only 6 options in the assortment) and 1 scenario without any mitigation strategy and with a large assortment size (30 options in the assortment). Hence, there were altogether 9 different assortment scenarios that respondents would be randomly assigned to. In order to reduce the effort of recruiting sufficient respondents for each scenario, each participant was randomly assigned to complete 2 out of these 9 scenarios.

As verified in the pilot study, we used office chair as the product category for the experiment. For each office chair option, there was a picture of the chair and a hypothetical product price. So as to make the choosing experience realistically challenging, the price range was rather narrow, starting from 70 EUR to 300 EUR.

To simulate Categorization strategy, we allocated the 30 chair options into 4 types based on their styles: Ergonomic<sup>1</sup>, Executive-style<sup>2</sup>, Mesh<sup>3</sup> and Task<sup>4</sup>. To simulate Provision of a Default Option strategy, we highlighted one “recommended” option in the assortment, or one “recommended” option for each product type in case the scenario also included Categorization strategy. To simulate Unconscious Information Processing Strategy, we first presented the assortment to participants and instruct them to select up to 5 options that they most prefer. After viewing the initial assortment, participants were assigned to complete an anagram game in which they had to find 12 correct words about a certain topic. The anagram game served to distract participants from pondering about the assortment. After completing the anagram game, participants were again presented with the initial assortment but this time they have to select only one option. Such method of simulating Unconscious Information Processing condition has been done by (Messner & Wanke, 2010) and (Bos, et al., 2011).

The participants were recruited via posts on social network, survey-sharing forums and within the author’s circle of friends and acquaintances. In order to incentivize participation in the study, we offered a lucky draw of 10 Amazon gift cards, each was worth \$20. Furthermore, to prevent bias in choice overload evaluation, the participants were not informed about the study’s topic when taking the survey. Demonstration of the assortment scenarios can be found in Appendix B.

After having made their decisions in each product assortment, participants evaluated their experience with the assortment with a set of statements on a Likert scale of 1-7 (1= “strongly disagree”, 7= “strongly agree”). These statements corresponded to 4 multi-item scales that measured choice overload: **Perception of Variety**, **Difficulty of Decision-making**, **Satisfaction** and **Remorse**. There were 12 statements presented to participants in randomized order right after the product choice task. After participants had completed 2 product choice tasks and 2 subsequent sets of 12 evaluation statements, a page with 2 additional questions about Regret was presented. Each question featured a picture of the chosen chairs and asked participants to evaluate on a scale of 1-7 how strongly they regret

---

<sup>1</sup> Ergonomic chair: chairs with adjustable features to fit its user

<sup>2</sup> Executive-style chair: tall and wide chairs often seen being used by corporate executives and managers

<sup>3</sup> Mesh chair: chairs with backrests made of mesh structure

<sup>4</sup> Task chair: basic and simple-looking office chairs



their decision (1= “not at all”, 7= “strongly regret”). The multi-item scales were designed as follows:

<b>Scale</b>	<b>Items within the scale</b>
Assortment perception	There is a wide variety of chairs to choose from.
	The chairs are different from each other.
	There are too many options.
Difficulty of decision-making	I was overwhelmed when reviewing the choices.
	I felt frustrated when making the decision.
	Choosing the right one is difficult.
Satisfaction	I am satisfied with my choice.
	The choice is close to my ideal.
	The chosen chair is a good purchase.
	If I had to make the decision again, I would choose the same thing.
Remorse	I am unsure if I made the best choice.
	During the decision-making process, I changed my mind a few times.
	(This question is asked after participants complete all choice tasks) You previously chose [option]. How strongly do you regret this decision?

*Table 13: Multi-item scale design for measuring choice overload*

Please respond to the following statements about your experience with the assortment.

I felt frustrated when making the decision.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

I am satisfied with my choice.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

The chosen chair is a good purchase.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

Choosing the right one is difficult.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

I was overwhelmed when reviewing the choices.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

There is a wide variety of chairs to choose from.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

The chairs are different from each other.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

I am uncertain if I made the best choice.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

During the decision-making process, I changed my mind a few times.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

If I had to make the decision again, I would choose the same thing.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

There are too many options.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree

The choice is close to my ideal.

	1	2	3	4	5	6	7	
Strongly disagree	<input type="range"/>							Strongly agree




0%  100%



Figure 9: A set of 12 statements for measuring choice overload that are presented after each assortment scenario

**Price: 165C**




You previously chose . How strongly do you regret this decision?

1   2   3   4   5   6   7

Not at all  Strongly regret

**Price: 140C**



You previously chose . How strongly do you regret this decision?

1   2   3   4   5   6   7

Not at all  Strongly regret

← 0%  100% →

*Figure 10: Statements for measuring "regret" that are presented after the participants completes all 2 assortment scenarios*

To identify the differences among demographic groups in their experienced choice overload, we looked at the demographic groups classified by Gender, Age, Education and Geographical Origin. Therefore, the experiment included Gender, Age, Education and Country of Origin in the Background questions (Table 14).

Type of question	Variable	Description
Background questions	Gender	Question: "What is your gender?" Answer options: "(1) Male, (2) Female, (3) Other".
	Age	Question: "What is your age?" Answers: "(1) Under 13, (2) 13-17, (3) 18-25, (4) 26-34, (5) 35-54, (6) 55-64, (7) 65 or over".
	Education	Question: "What is the highest level of education you have complete?" Answers: "(1) High School, (2) Bachelor's Degree, (3) Master's Degree, (4) Doctorate Degree, (5) Professional Degree (6) Other"
	Country of origin	Question: "What country are you from?"

Table 14: Design of background questions in the pilot study

In short, the experiment proceeded as follows:

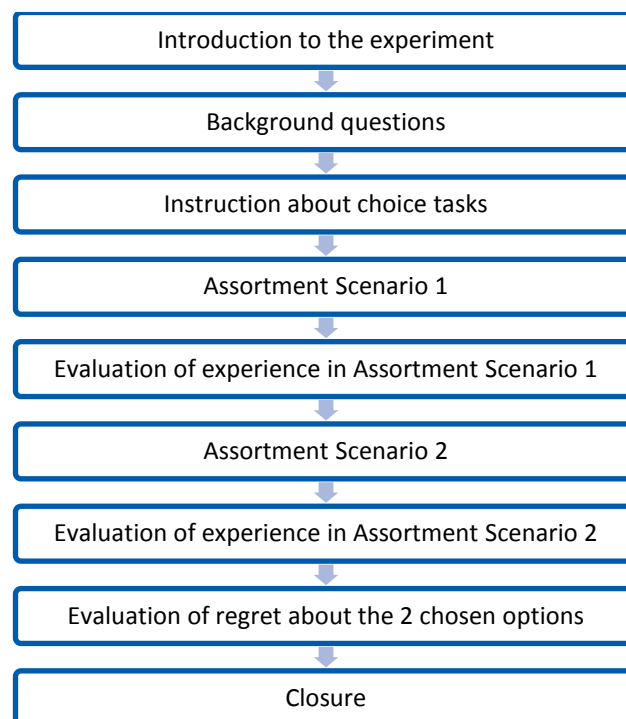


Figure 11: Summary of experiment procedures

## 4 Results

### 4.1 Allocation of responses

The experiment had gathered 211 participants, who altogether provided 422 different responses to the 9 assortment scenarios.

#### 4.1.1 By assortment scenarios

The allocation of responses by assortment scenarios is as follows:

Scenario	Number of responses
Scenario 1 (coded " <b>big</b> "): control condition without any mitigation strategy	55
Scenario 2 (coded " <b>small</b> "): Reduction of Assortment Size	47
Scenario 3 (coded " <b>cat</b> "): Categorization	51
Scenario 4 (coded " <b>de</b> "): Provision of Default Option	38
Scenario 5 (coded " <b>uncon</b> "): Unconscious Information Processing	50
Scenario 6 (coded " <b>catde</b> "): Categorization and Provision of Default option	51
Scenario 7 (coded " <b>deuncon</b> "): Provision of Default Option and Unconscious Information Processing	46
Scenario 8 (coded " <b>catuncon</b> "): Categorization and Unconscious Information Processing	45
Scenario 9 (coded " <b>catdeuncon</b> "): Categorization, Provision of Default Option and Unconscious Information Processing	39

*Table 15: Allocation of responses by assortment scenarios*

#### 4.1.2 By participants' demographics

In terms participants' demographics, we gathered 422 participants from 40 different countries, at ages 18-64. The allocation of participants according to country of origin, gender, age and education is as follows:

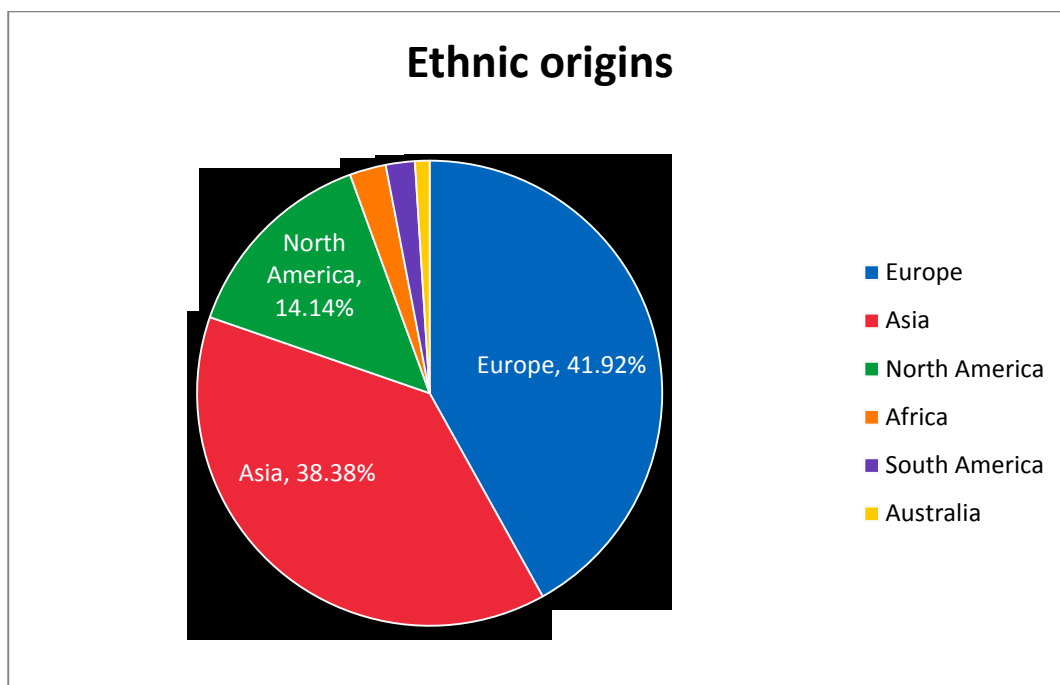


Figure 12: Allocation of participants by ethnic origins

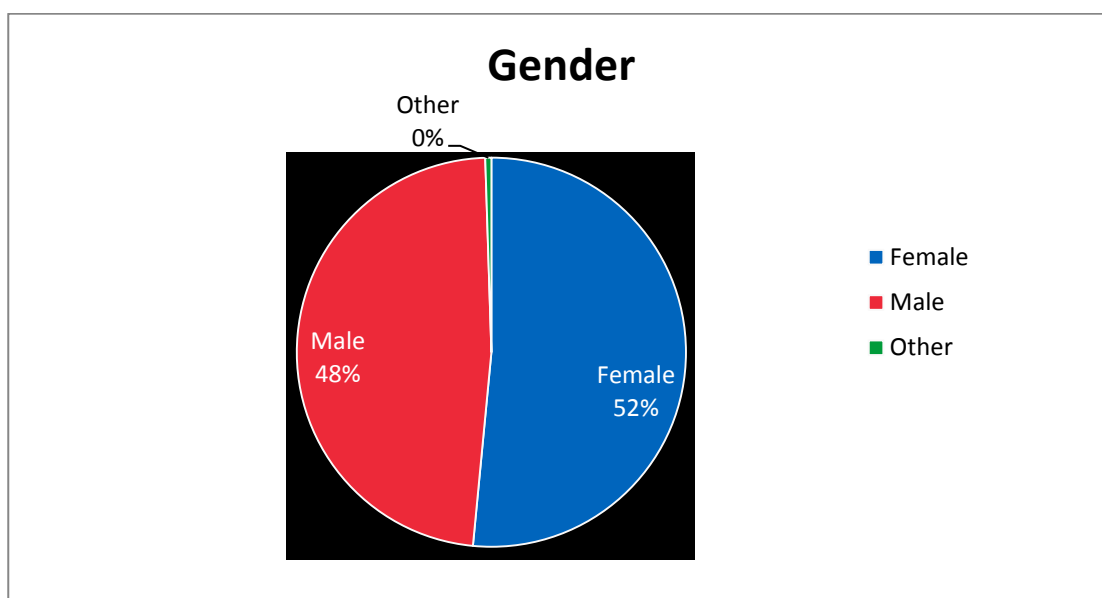


Figure 13: Allocation of participants by gender

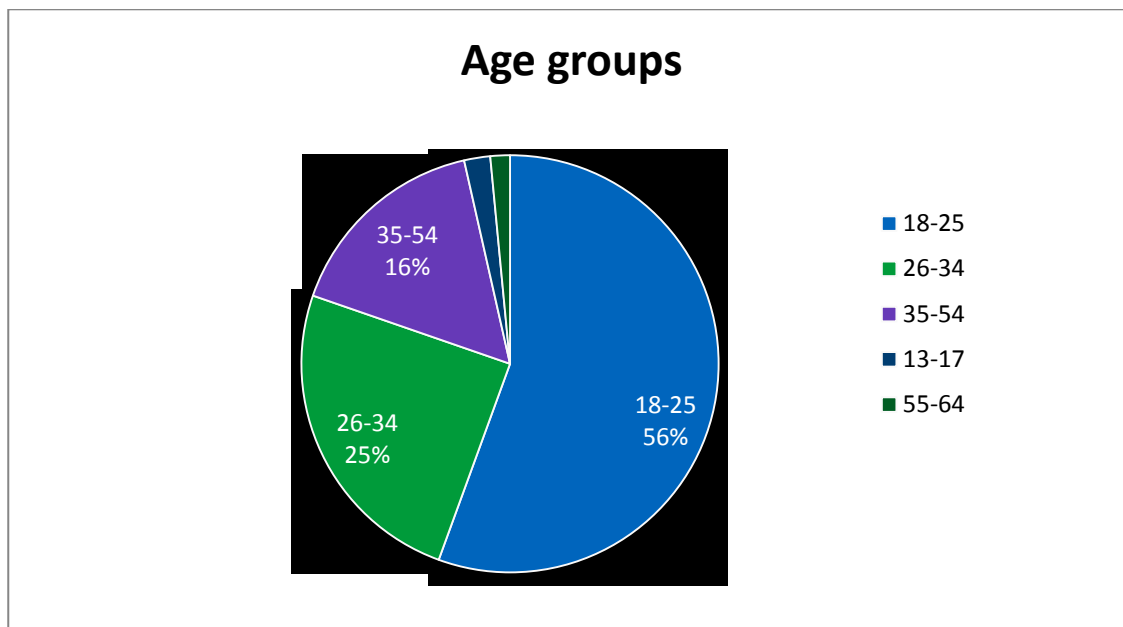


Figure 14: Allocation of participants by age groups

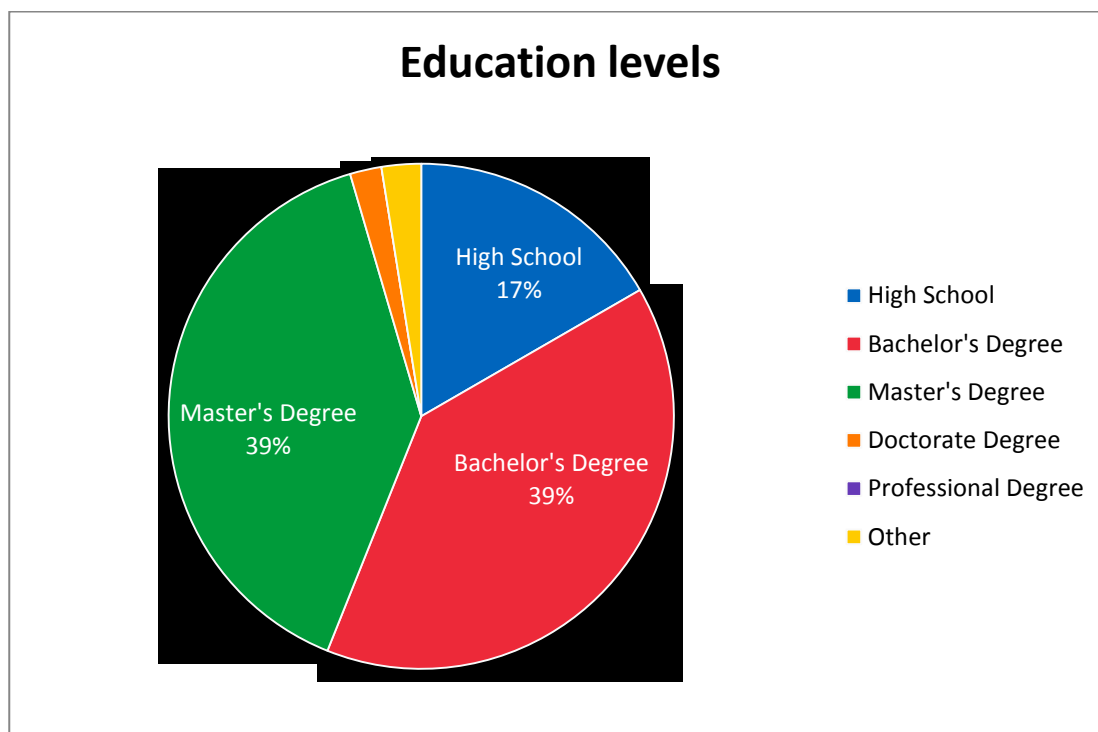


Figure 15: Allocation of participants by education levels

## 4.2 Dependent variables

In this research, the 4 measures of choice overload were: Perception of Variety, Difficulty of Decision-making, Satisfaction and Remorse (Table 16). This section would confirm whether these 4 measures were reliable in indicating choice overload and if not, the section would propose alternative measures of choice overload.

Scale	Items within the scale	Code
Perception of Variety	There is a wide variety of chairs to choose from.	<b>variety</b>
	The chairs are different from each other.	<b>different</b>
	There are too many options.	<b>toomany</b>
Difficulty of Decision-making	I was overwhelmed when reviewing the choices.	<b>overwhelmed</b>
	I felt frustrated when making the decision.	<b>frustrating</b>
	Choosing the right one is difficult.	<b>difficult</b>
Satisfaction	I am satisfied with my choice.	<b>satisfied</b>
	The choice is close to my ideal.	<b>ideal</b>
	The chosen chair is a good purchase.	<b>goodchoice</b>
	If I had to make the decision again, I would choose the same thing.	<b>same</b>
Remorse	I am unsure if I made the best choice.	<b>unsure</b>
	During the decision-making process, I changed my mind a few times.	<b>change</b>
	(This question is asked after participants complete all choice tasks) You previously chose [option]. How strongly do you regret this decision?	<b>regret</b>

Table 16: Multi-item scale design and variable codes

#### 4.2.1 Reliability of multi-item scales

We assessed the reliability of the multi-item scales by looking at Cronbach's alphas. Cronbach's alpha measures how closely related a set of items are as a group. The Cronbach's alpha threshold for a multi-item scale to be considered reliable is 0.7.

##### 4.2.1.1 Perception of Variety

Items within the scale	Cronbach's Alpha
<i>variety, different, toomany</i> (original scale)	0.474
<i>toomany, variety</i>	0.592
<i>variety, different</i>	0.392
<i>different, toomany</i>	0.041

Table 17: Reliability of the Perception of Variety scale

For the original Perception of Variety scale that consisted of *variety*, *different* and *toomany*, the Cronbach's Alpha was only 0.474, falling far below the acceptance level of 0.7. Even when we tried the scale with different combinations of 2 items, the Cronbach's Alpha still didn't reach the acceptance level of 0.7. These Cronbach's Alpha results showed that participants did not comprehend the statements ("There is a wide variety of chairs to choose from", "The chairs are different from each other", and "There are too many options") to be similar.



In fact, the 3 statements within the Perception of Variety scale might have generated different sentiments to the participants. The statement “There is a wide variety of chairs to choose from” might have generated positive sentiment, implying that the product variety is enjoyable to the participants. The statement “The chairs are different from each other” might have generated neutral or even confusing sentiment to participants. This was because although there were indeed no identical options in the choice sets, the fact that the options shared similar features (such as black color, armrests and wheels) might have made some participants perceive the options to be similar. Lastly, the statement “There are too many options” might have generated negative sentiment, implying that the product variety is frustrating to the participants. Therefore, the 3 statements were not consistent enough to make the Perception of Variety Scale reliable.

#### 4.2.1.2 *Difficulty of Decision-making*

Items within the scale	Cronbach’s Alpha
<i>overwhelmed, frustrating, difficult</i> (original scale)	0.785
<b><i>toomany, overwhelmed, frustrating, difficult</i></b>	<b>0.819</b>

Table 18: Reliability of the Difficulty of Decision-making scale

The original scale for Difficulty of Decision-making had a Cronbach’s Alpha of 0.785, above the accepted threshold of 0.7. By adding the item *toomany* to the scale, we could even improve the Cronbach’s Alpha to 0.819. This showed that the statement “There are too many options” more accurately reflected Difficulty of Decision-making than Perception of Variety.

The Cronbach’s Alpha results indicated that the statements (“There are too many options”, “I was overwhelmed when reviewing the choices”, “I felt frustrated when making the decision” and “Choosing the right one is difficult”) consistently reflected the participants’ difficulty of decision-making. Therefore, the Difficulty of Decision-making scale was most reliable when consisted of *toomany, overwhelmed, frustrating* and *difficult*.

#### 4.2.1.3 Satisfaction

Items within the scale	Cronbach's Alpha
<i>satisfied, ideal, goodchoice, same</i> (original scale)	0.750
<b><i>satisfied, ideal, goodchoice</i></b>	<b>0.794</b>

Table 19: Reliability of the Satisfaction scale

The original scale for Satisfaction had a Cronbach's Alpha of 0.750, above the accepted threshold of 0.7. By removing the item *same* from the scale, we could even improve the Cronbach's Alpha to 0.794. This showed that the statement "If I had to make the decision again, I would choose the same thing" did not as strongly reflect participants' satisfaction as other statements in the scale.

The Cronbach's Alpha results indicated that the statements ("I am satisfied with my choice", "The choice is close to my ideal" and "The chosen chair is a good purchase") consistently reflected the participants' satisfaction. Therefore, the Satisfaction scale was most reliable when consisted of *satisfied, ideal* and *goodchoice*.

#### 4.2.1.4 Remorse

Items within the scale	Cronbach's Alpha
<i>unsure, change, regret</i> (original scale)	0.518
<i>unsure, change</i>	0.592
<i>not_same<sup>5</sup>, unsure, change</i>	0.647

Table 20: Reliability of the Remorse scale

The original scale for Regret had a Cronbach's Alpha of 0.518, below the accepted threshold of 0.7. By removing the item *regret*, we could actually slightly improve the Cronbach's Alpha to 0.592; this indicated that participants' evaluation of *regret* did not align with their evaluation of *unsure* and *change*.

Since the item *same* ("If I had to make the decision again, I would choose the same thing") did not strongly reflect Satisfaction, we suspected that the item actually suited more to the

---

<sup>5</sup> *not\_same* is a variable that was calculated by taking the results of 8 minus the original score of *same*. *not\_same* was regarded to represent the statement "If I had to make the decision, I would choose a different option".

Remorse scale. In order to align with *unsure* and *change*, in which higher scores indicating higher remorse, we reversed the scores of *same* by taking results of 8 minus the original score. We then called the reversed scores by the code *not\_same* and the item could be regarded to represent the statement “**If I had to make the decision, I would choose a different option**”.

When having the items *not\_same*, *unsure* and *change* in the Remorse scale, we had a Cronbach’s Alpha of 0.647, almost reaching the accepted threshold of 0.7. This demonstrated that participants generally perceived the statements “If I had to make the decision again, I would choose a different option”, “I am unsure if I made the best choice”, and “During the decision-making process, I changed my mind a few times” to be similar and indicative of decision remorse. Therefore, we can say that the Remorse scale is slightly reliable when consisted of *not\_same*, *unsure* and *change*.

#### 4.2.1.5 Summary of multi-item scales’ reliability

The reliability check of multi-item scales demonstrated that Difficulty of Decision-making, Satisfaction and Remorse scales were reliable, while the Perception of Variety scale was not reliable.

#### 4.2.2 Factor analysis of dependent variables

We conducted Principal Component Analysis (PCA) to further assess whether the multi-item scale design into 4 scales (Assortment Perception, Difficulty of Decision-making, Satisfaction and Remorse) was most appropriate. PCA is a variable-reduction technique that aims to reduce a larger set of variables into a smaller set of artificial variables – or components - which account for most of the variance in the original variables. In our case, we needed to extract components from the 13 original variables.

To identify the optimal number of components to be extracted, we looked at the Scree Plot. The horizontal axis shows the number of components – or the number of variables that could be extracted from the original 13 variables. The vertical axis shows the Eigenvalues, which measure the cumulative variance explained by the corresponding component. A common heuristic is to select the number of components with Eigenvalues of more than or equal to 1.00. The Scree Plot (Figure 16) indicated that there were only 2 components with

Eigenvalues more than 1.00. Therefore, we could extract 2 components that explained most variance from the original 13 variables.

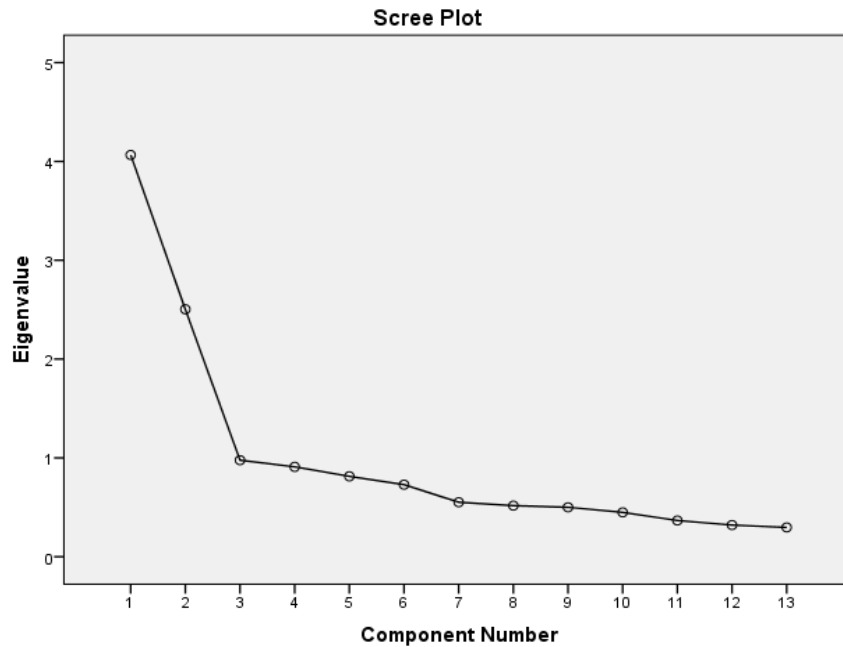


Figure 16: Scree plot of 13 choice overload measurement variables

Next, we looked at the communalities, which identified how much proportion of variation in the 13 original variables was explained by the 2 extracted components. By applying a cut-off of 0.4, the communality results (Table 21) indicated that extracting into 2 components could retain most of the original variables, except for *different*, *not\_same* and *regret*.

Communalities		
	Initial	Extraction
<i>variety</i>	1.000	0.516
<i>different</i>	1.000	0.213
<i>toomany</i>	1.000	0.598
<i>overwhelmed</i>	1.000	0.683
<i>frustrating</i>	1.000	0.564
<i>difficult</i>	1.000	0.625
<i>satisfied</i>	1.000	0.677
<i>ideal</i>	1.000	0.642
<i>goodchoice</i>	1.000	0.600
<i>not_same</i>	1.000	0.352
<i>unsure</i>	1.000	0.561
<i>change</i>	1.000	0.415
<i>regret</i>	1.000	0.124

Table 21: Communalities of the 13 original variables when 2 components are extracted

Then, we looked at the Rotated Component Matrix (Table 22), which demonstrated the correlations of the 13 original variables to the 2 extracted components. Using a cut-off value of 0.4 for the loadings, we could see that Component 1 strongly correlated with *variety*, *different*, *toomany*, *overwhelmed*, *frustrating*, *difficult*, *not\_same*, *unsure* and *change*. As *toomany*, *overwhelmed*, *frustrating* and *difficult* belonged to the Difficulty of Decision-making scale, and *not\_same*, *unsure* and *change* belonged to the Remorse scale, we could infer that Component 1 indicated both difficulty of decision making and remorse. We then regarded Component 1 to represent aversion to the decision-making experience and coded it as *Aversion*.

Component 2 strongly correlated with *variety*, *different*, *satisfied*, *ideal* and *goodchoice*. Except for *variety* and *different*, all other variables belonged to the Satisfaction scale. Hence, we could infer that Component 2 indicated satisfaction, recognition of product variety and identification of differences between options. We then regarded Component 2 to represent enjoyment of the decision-making experience and coded it as *Enjoyment*.

<b>Rotated Component Matrix<sup>a</sup></b>		
	Component	
	1	2
<i>variety</i>	<b>0.501</b>	<b>0.515</b>
<i>different</i>	0.048	<b>0.459</b>
<i>toomany</i>	<b>0.756</b>	0.161
<i>overwhelmed</i>	<b>0.825</b>	0.054
<i>frustrating</i>	<b>0.676</b>	-0.329
<i>difficult</i>	<b>0.786</b>	-0.084
<i>satisfied</i>	-0.264	<b>0.779</b>
<i>ideal</i>	-0.046	<b>0.800</b>
<i>goodchoice</i>	-0.051	<b>0.773</b>
<i>not_same</i>	<b>0.432</b>	-0.406
<i>unsure</i>	<b>0.693</b>	-0.283
<i>change</i>	<b>0.640</b>	-0.069
<i>regret</i>	0.227	-0.269
Extraction Method: Principal Component Analysis.		
Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Table 22: Rotated Component Matrix when 2 components are extracted

To confirm whether aggregating the original variables into Aversion and Enjoyment scales was reliable, we conducted reliability check by calculating the Cronbach's Alphas of the 2

scales. Cronbach's alpha measures how closely related a set of items are as a group. The Cronbach's alpha threshold for a multi-item scale to be considered reliable is 0.7.

Scale	Items within the scale	Cronbach's Alpha
Aversion	<i>overwhelmed, difficult, toomany, unsure, frustrating, change, not_same, variety</i>	<b>0.829</b>
Enjoyment	<i>ideal, satisfied, goodchoice, variety, different</i>	<b>0.703</b>

Table 23: Cronbach's Alphas of Aversion and Enjoyment scales

According to Table 24, the Cronbach's Alphas of the 2 scales both crossed the accepted threshold of 0.7. This confirmed that we could integrate the dependent variables into 2 main factors: Aversion and Enjoyment. Accordingly, the factor scores for Aversion and Enjoyment measurements were calculated.

### 4.3 Post-hoc tests by independent variables

In our analysis, we aimed to compare choice overload levels experienced by different groups of participants. Choice overload was indicated by the 2 factors: Aversion and Enjoyment. To identify whether there were overall differences between groups and confirm which groups differed from which ones, we conducted post-hoc tests. The appropriate post-hoc test in our case is Games-Howell post-hoc test, since the groups under all independent variables were of unequal variances and sizes.

#### 4.3.1 Post-hoc test by Assortment Scenarios

The numbers of observations for assortment scenarios were as follows.

Scenario	Code	Number of responses
Large assortment size – absence of mitigation strategy	<i>big</i>	55
Reduction of Assortment Size	<i>small</i>	47
Categorization	<i>cat</i>	50
Provision of Default Option	<i>de</i>	38
Unconscious Information Processing	<i>uncon</i>	50
Categorization and Provision of Default Option	<i>catde</i>	49
Provision of Default Option and Unconscious Information Processing	<i>deuncon</i>	45

Categorization and Unconscious Information Processing	<i>catuncon</i>	45
Categorization, Provision of Default Option and Unconscious Information Processing	<i>catdeuncon</i>	38

Table 24: Codings of assortment scenarios

#### 4.3.1.1 Homogeneity of variance

In order to recognize which variables have statistical differences between the group means, we conducted ANOVA Test. Since the ANOVA test requires homogeneity of variance, we first looked at Levene's test of homogeneity of variance.

<b>Levene's Test of Homogeneity of Variances</b>				
	Levene Statistic	df1	df2	Sig.
<i>aversion</i>	0.818	8	408	0.587
<i>enjoyment</i>	0.258	8	408	0.979

Table 25: Levene's Test of Homogeneity of Variances by assortment scenarios

A variable is considered to have homogeneity of variance if its significance value is larger than 0.05. We could see that both variables had significance values larger than 0.05 and therefore had homogeneity of variance.

#### 4.3.1.2 ANOVA (Analysis of Variance)

<b>ANOVA (Analysis of Variance)</b>						
		Sum of Squares	df	Mean Square	F	Sig.
<i>aversion</i>	Between Groups	15.005	8	1.876	1.889	0.060
<i>enjoyment</i>	Between Groups	7.218	8	0.902	0.894	0.521

Table 26: Analysis of Variance by assortment scenarios

A variable was considered to have statistical difference between the group means when its ANOVA significance value is less than the significance level. Although a significance level of 0.05 is typically used, we used a significance level of 0.1 since our sample size of more than 400 observations was fairly modest.

The ANOVA results indicated that *aversion* had statistical differences between the group means.

#### 4.3.1.3 Homogenous subsets

We already identified that *aversion* variable had statistical difference between the group means. In order to specifically identify which groups (or assortment scenarios) differ from which ones, we first looked at the pairwise comparisons of the groups.

Multiple Comparisons								
Dependent Variable	Method	Pair		Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
							Lower Bound	Upper Bound
aversion	Games-Howell	big	small	.65929025*	0.17481751	0.008	0.1512605	1.1673200

Table 27: Pairwise comparisons in post-hoc test by assortment scenarios

Two groups are considered to be statistically different when their pairwise significance value is less than the significance level. Using a significance level of 0.1, we could observe that only *big-small* are statistically different (Table 27). This result showed that choice overload is strongly different when having no mitigation strategy versus when reducing assortment size.

To further observe the Aversion levels of all scenarios, we looked at the means of each:

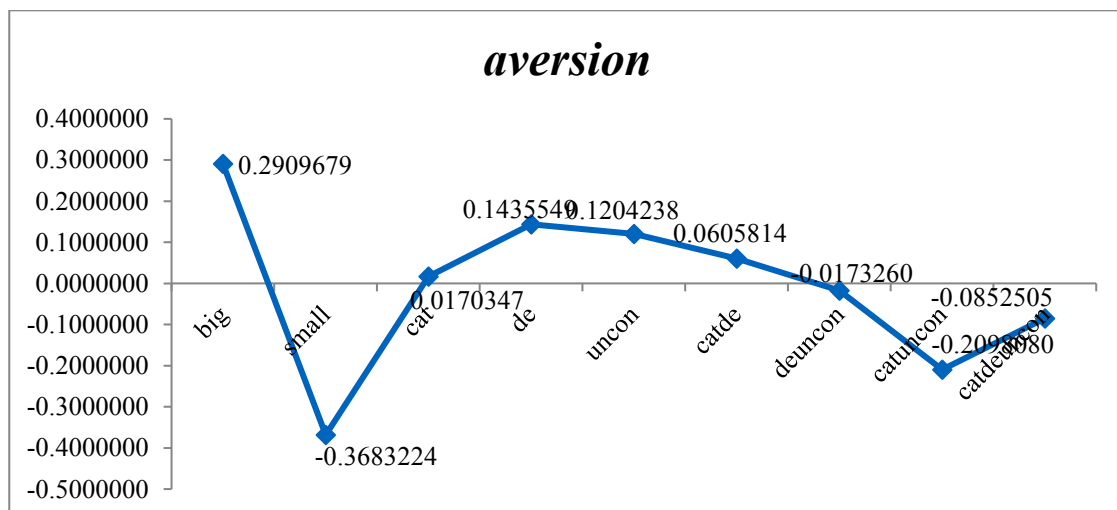


Figure 17: Means of assortment scenarios when "aversion" variable is measured

Scenario *big* (Large assortment size – absence of mitigation strategy) was observed to cause most Aversion. Scenarios *small* (Reduction of Assortment Size), *deuncon* (Provision of



Default Option and Unconscious Information Processing), *catuncon* (Categorization and Unconscious Information Processing), *catdeuncon* (Categorization, Provision of Default Option and Unconscious Information Processing) were observed to have negative Aversion scores. As zero Aversion score meant that participants didn't have any aversive feeling to the decision-making experience, negative Aversion scores indicated that participants even liked the decision-making experience. While scenario *small* (Reduction of Assortment Size) had the lowest Aversion score of all, scenarios *deuncon*, *catuncon* and *catdeuncon* all had Unconscious Information Processing and were all combinations of different assortment strategies.

#### 4.3.1.4 Summary of post-hoc test by assortment scenarios

By conducting post-hoc tests subject to 9 different assortment scenarios, we uncover the effectiveness of different assortment strategies.

All assortment strategies were suggested to be effective in reducing aversion to the decision-making experience (specifically decision difficulty and remorse), as Scenario *big* (Large assortment size – absence of mitigation strategy) generated the highest aversion towards the decision-making experience. Among the mitigation strategies, Scenario *small* (Reduction of Assortment Size) demonstrated the lowest aversion and is statistically different from Scenario *big*. The experiment validated previous literature (Broniarczyk, et al., 1998), (Beneke, et al., 2013) and (Boatwright & Nunes, 2001) that Reduction of Assortment Size can mitigate aversion towards decision-making process without negatively affecting satisfaction. We can also conclude that although this strategy is simple, it is more effective in mitigating choice overload than other strategies being examined in this study.

When excluding Reduction of Assortment Size strategy and keeping the assortment at a large size, scenarios *catdeuncon* (Categorization, Provision of Default Option and Unconscious Information Processing), *catuncon* (Categorization and Unconscious Information Processing) and *deuncon* (Provision of Default Option and Unconscious Information Processing) generated lowest levels of aversion. Since all of these scenarios have Unconscious Information Processing, we can deduce that this strategy might have more impact than Categorization and Provision of Default Option in mitigating choice overload of the decision-making process.

To explain such result, while Categorization and Provision of Default Option help customers differentiate the options and identify their preferences more easily, customers are forced to make their decisions on the spot. Hence, they cannot avoid overthinking of decision alternatives and overweighting of irrelevant attributes in order to come up with a final decision. On the other hand, Unconscious Information Processing is the result of temporarily interrupting the decision process. Such interruption allows customers to give less weight to unimportant attributes and more weight to important attributes (Bos, et al., 2011). As a result, when facing the decision problem again, they will find more ease in making a decision. This finding about the influence of Unconscious Information Processing is highly interesting, revealing that despite choice deferral is a consequence of choice overload (Chernev, et al., 2014), it can actually mitigate decision difficulty and remorse resulted from choice overload and its mitigation impact is even very high. Nevertheless, the strategy is most effective when being in combination with other strategies rather than being stand-alone.

#### 4.3.2 T-test by gender groups

The gender groups were as follows

Gender	Number of responses
<i>Male</i>	201
<i>Female</i>	214
<i>Other</i>	2

Table 28: Statistics of gender groups

Since only 1 respondent identified with “Other” in their response for “What is your gender?” question, this led to only 2 observations with value *Other* in gender and the sample size for *Other* group was insufficient for analysis. Hence, we removed all observations with value *Other* in gender.

Independent Samples Test								
	Levene's Test for Equality of Variances	t-test for Equality of Means						
	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	90% Confidence Interval of the Difference	
							Lower	Upper
aversion	<b>0.321</b>	-1.672	413	<b>0.095</b>	-0.16482671	0.09860490	-0.32738197	-0.00227146
enjoyment	<b>0.830</b>	1.769	413	<b>0.078</b>	0.17266090	0.09761076	0.01174454	0.33357726

Table 29: Independent T-test by gender groups

#### 4.3.2.1 Homogeneity of variance

In order to recognize which variables have statistical differences between the group means, we conducted an Independent T- test. Since the T-test requires homogeneity of variance, we first looked at Levene's test of homogeneity of variance. A variable is considered to have homogeneity of variance if its significance value is larger than 0.05. We could see that both variables had significance values larger than 0.05 and therefore had homogeneity of variance. (Table 29)

#### 4.3.2.2 Independent T-test

A variable is considered to have statistical difference between the group means when its T-test significance value is less than the significance level. Although a significance level of 0.05 is typically used, we use a significance level of 0.1 since our sample size of more than 400 is fairly modest.

The T-test results indicated that both variables had significance values less than 0.1 and therefore statistical differences between the group means. (Table 29)

#### 4.3.2.3 Homogenous subsets

We already identified that *aversion* and *enjoyment* variables have statistical difference between the group means. In order to specifically identify which gender groups differ from which ones, we looked at the means of the homogenous subsets.

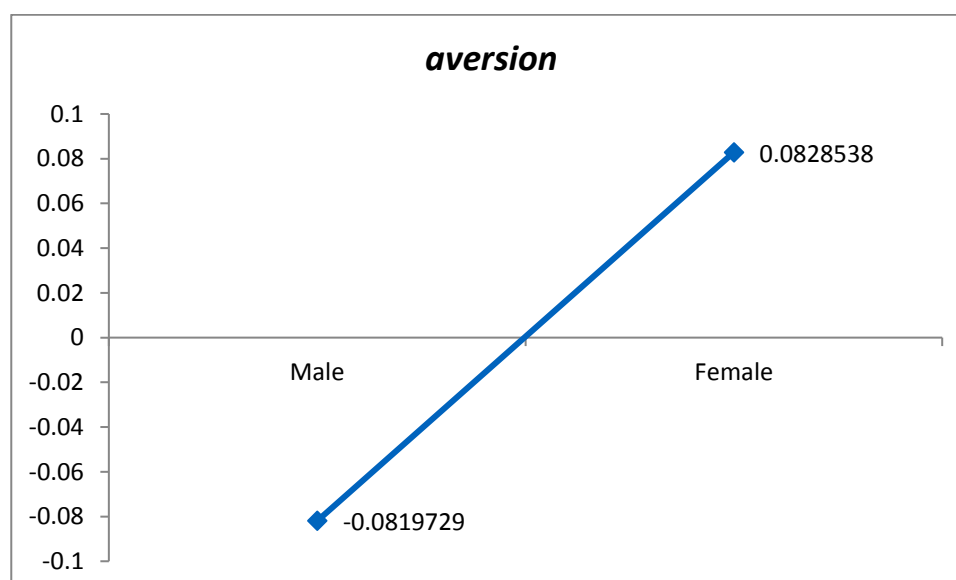


Figure 18: Means of gender groups when "aversion" variable is measured

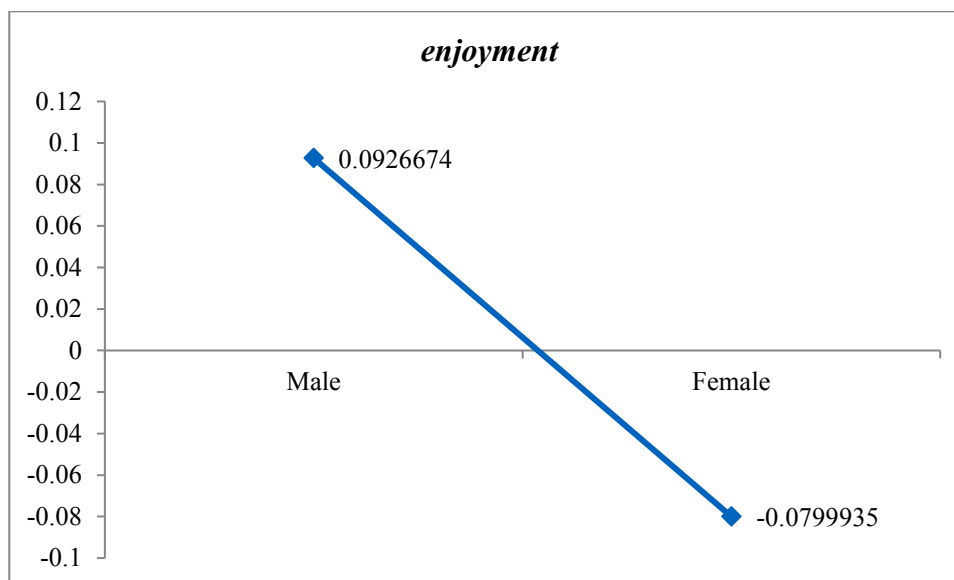


Figure 19: Means of gender groups when "enjoyment" variable is measured

The results of *aversion* and *enjoyment* showed that females had more Aversion and less Enjoyment towards the decision-making experience than males.

#### 4.3.2.4 Summary of T-test by gender groups

The study demonstrated that in general, females experience more choice overload than males, specifically more aversion and less enjoyment towards the decision-making experience. As we did not find any previous literature verifying such finding, this thesis calls for further research on gender differences in decision-making experience and outcomes.

#### 4.3.3 Post-hoc test by age groups

The age groups were as follows:

Age group	Number of responses
Under 13	0
13-17	9
18-25	227
26-34	109
35-54	66
55-64	6
65 or over	0

Table 30: Statistics of age groups

Since we did not obtain many respondents in the age groups Under 13, 13-17, 55-64 and 65 or over, the sample sizes of these groups were insufficient for analysis. Hence, we removed all observations of those groups in our post-hoc test for Age.

#### 4.3.3.1 Homogeneity of variances

In order to recognize which variables have statistical differences between the group means, we conduct ANOVA Test. Since the ANOVA test requires homogeneity of variance, we first look at Levene's test of homogeneity of variance.

Levene's test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
<i>aversion</i>	0.679	2	399	0.508
<i>enjoyment</i>	10.008	2	399	0.000

Table 31: Levene's test of Homogeneity of Variances by age groups

A variable is considered to have homogeneity of variance if its significance value is larger than 0.05. We saw *aversion* variable had significance value more than 0.05 and therefore it had homogeneity of variance.

#### 4.3.3.2 Welch's ANOVA

Robust Tests of Equality of Means					
Dependent Variable	Method	Statistic <sup>a</sup>	df1	df2	Sig.
<i>aversion</i>	Welch	8.004	2	159.856	0.000
<i>enjoyment</i>	Welch	2.961	2	150.637	0.055

a. Asymptotically F distributed.

Table 32: Welch's ANOVA by age groups

As *enjoyment* didn't have homogeneity of variance, we conducted Welch's ANOVA test instead of a classic ANOVA test. Welch's ANOVA serves to identify statistical difference between group means in case of unequal variances.

A variable is considered to have statistical difference between the group means when its Welch's ANOVA significance value is less than the significance level. Although a significance level of 0.05 is typically used, we used a significance level of 0.1 since our sample size of more than 400 was fairly modest.

The Welch's ANOVA results indicated that both *aversion* and *enjoyment* had significance values less than 0.1. Therefore, both *aversion* and *enjoyment* had statistically differences between group means.

#### 4.3.3.3 Homogenous subsets

We already identified that *aversion* and *enjoyment* had statistical difference between the group means. In order to specifically identify which age groups differed from which ones, we first looked at the pairwise comparisons of the groups.

Multiple Comparisons								
Dependent Variable	Method	Pair		Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
							Lower Bound	Upper Bound
<i>aversion</i>	Games-Howell	18-25	35-54	.55312094*	0.13827093	<b>0.000</b>	0.2662009	0.8400409
		26-34	35-54	.40016096*	0.15721899	<b>0.032</b>	0.0748682	0.7254537
<i>enjoyment</i>	Games-Howell	18-25	35-54	-.29510027*	0.13190054	<b>0.070</b>	-0.5689835	-0.0212170
		26-34	35-54	-.36201009*	0.16650968	<b>0.079</b>	-0.7061840	-0.0178362

Table 33: Pairwise comparisons in post-hoc test by age groups

Two groups are considered to be statistically different when their pairwise significance value is less than the significance level. Using a significance level of 0.1, we could observe that the oldest age group (35-54 year-olds) is statistically different from both 18-25 year-old and 26-34 year-old groups with regards to both Aversion and Enjoyment (Table 33).

To further observe the Aversion and Enjoyment levels of all age groups, we also looked at the means of each:

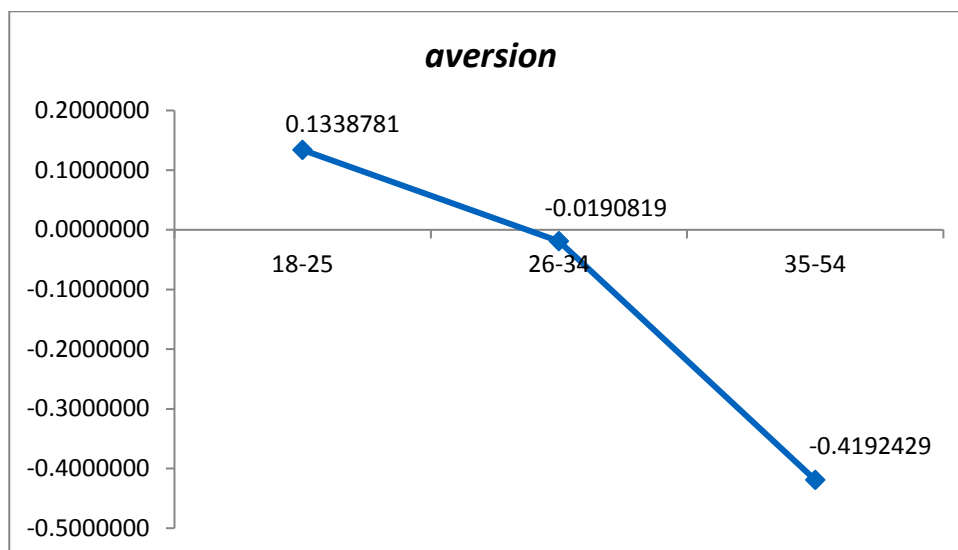


Figure 20: Means of age groups when "aversion" variable is measured

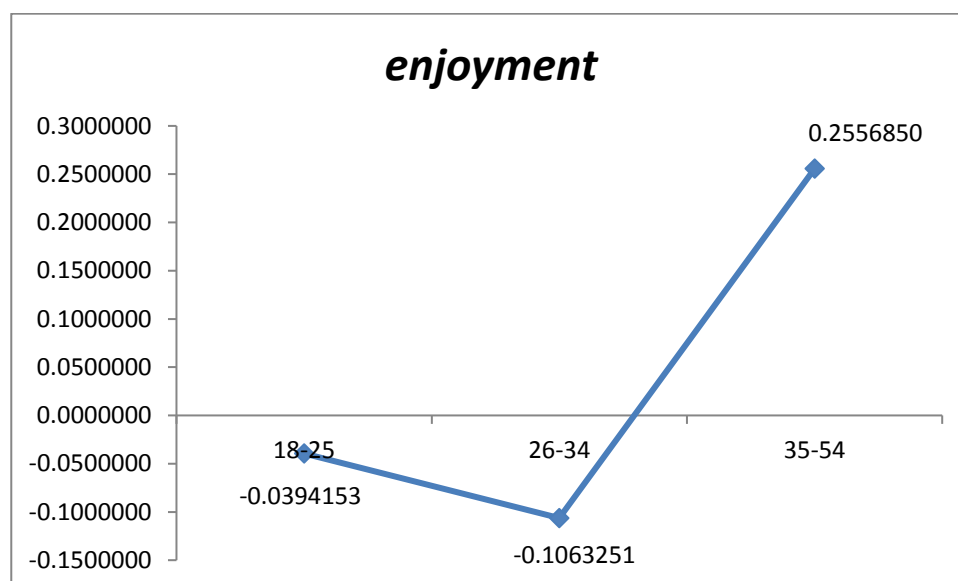


Figure 21: Means of age groups when "enjoyment" variable is measured

The factor scores for *aversion* and *enjoyment* showed that 35-54 year-old group had notably lowest level of Aversion and highest level of Enjoyment towards the decision-making experience compared to other 2 groups. The scores gave further proof that the older people get, the less decision difficulty and remorse as well as the more enjoyment they have in decision-making.

#### 4.3.3.4 Summary of post-hoc test by age groups

By examining middle-aged, adult and young adult age groups, the experiment found out that older people have less choice overload (specifically less decision difficulty, less remorse and

---

more enjoyment) than younger people. This finding is in line with previous literature. (Skelton & Allwood, 2017) found that remorse reduces with age as people learn from their previous purchase experience and become better at choosing with age. (Misuraca, et al., 2015) also found that adults and adolescents express the highest levels of difficulty and dissatisfaction, while seniors seem to suffer fewer negative consequences of choice overabundance.

In fact, seniors adopt additional heuristics to reduce the decision problem to a manageable level and in the process, are more able to eliminate bad options (Besedes, et al., 2012). This explains the low level of decision difficulty experienced by older respondents in the experiment. Additionally, compared to younger adults, seniors are more likely to adopt satisficing behavior (Tanius, et al., 2009), to have less negative emotions (Mather & Carstensen, 2005) and to be overconfident in their judgments (Crawford & Stankov, 1996). This is why older respondents are more satisfied and feel less remorse with their decision.

Another way to explain the study result is to look at the level of multitasking when respondents take the online survey. People are found to have background distractions (in the form of music, video, or conversation) when taking an online survey, and such background distractions tend to decline with age (Zwarun & Hall, 2014). Given that younger people are more occupied with distractions, they will be more impatient at decision-making tasks while taking the online survey. As a result, they will find more difficulty in decision-making.

However, (Misuraca, et al., 2015) found that choice overload does not equally extend to all age groups. In fact, the function of choice overload and age follows an inverted U shape, in which children and seniors suffer lower choice overload while adults experience higher choice overload. As our experiment did not manage to get sufficient sample size for all age groups, it did not produce a comprehensive picture about the relation between age and choice overload.



#### 4.3.4 Post-hoc test by education groups

Education group (highest education that one has completed)	Number of responses
High school	69
Bachelor's Degree	165
Master's Degree	165
Doctorate Degree	8
Professional Degree	0
Other	40

Table 34: Statistics of education groups

Since we did not obtain many respondents in the education groups Doctorate Degree, Professional Degree and Other, the sample sizes of these groups were insufficient for analysis. Hence, we removed all observations in those education groups in our post-hoc test.

##### 4.3.4.1 Homogeneity of Variance

In order to recognize which variables have statistical differences between the group means, we conducted ANOVA Test. Since the ANOVA test requires homogeneity of variance, we first looked at Levene's test of homogeneity of variance.

Levene's test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
<i>aversion</i>	0.113	2	396	0.894
<i>enjoyment</i>	0.458	2	396	0.633

Table 35: Levene's test of Homogeneity of Variances by education groups

A variable is considered to have homogeneity of variance if its significance value is larger than 0.05. We saw that both variables had significance value larger than 0.05 and therefore had homogeneity of variance.

##### 4.3.4.2 ANOVA (Analysis of Variance)

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
<i>aversion</i>	Between Groups	0.011	2	0.005	0.005	0.995
<i>enjoyment</i>	Between Groups	6.714	2	3.357	3.357	0.036

Table 36: Analysis of Variances by education groups

A variable is considered to have statistical difference between the group means when its ANOVA significance value is less than the significance level. Although a significance level of 0.05 is typically used, we used a significance level of 0.1 since our sample size of more than 400 was fairly modest. The ANOVA results indicated that *enjoyment* had statistical differences between the group means.

#### 4.3.4.3 Homogenous subsets

We already identified that *enjoyment* had statistical difference between the group means. In order to specifically identify which education groups differed from which ones, we first looked at the pairwise comparisons of the groups.

Multiple Comparisons								
Dependent Variable	Method	Pair		Mean Difference (I-J)	Std. Error	Sig.	90% Confidence Interval	
							Lower Bound	Upper Bound
enjoyment	Games-Howell	Bachelor's Degree	Master's Degree	-.27490424*	0.11061784	0.036	-0.5027247	-0.0470838

Table 37: Pairwise comparisons in post-hoc test by education groups

Two groups are considered to be statistically different when their pairwise significance value is less than the significance level. Using a significance level of 0.1, we could observe that only Bachelor's Degree graduate group and Master's Degree graduate group are statistically different.

To further observe the Enjoyment levels of all education groups, we also looked at the means of each:

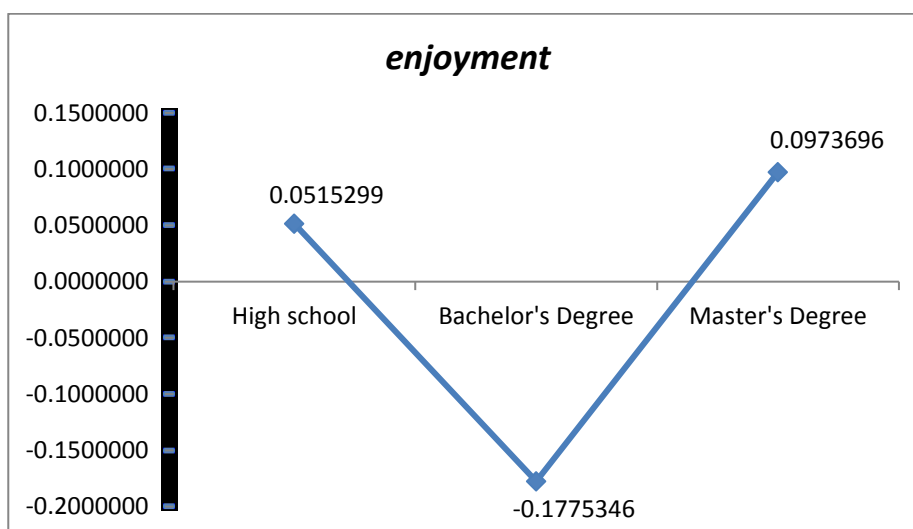


Figure 22: Means of education groups when "enjoyment" is measured

The result indicated that Bachelor's Degree graduates had the lowest and even negative *enjoyment*. On the other hand, High School and Master's Degree graduates both have positive *enjoyment*, with Master's Degree graduates having the highest *enjoyment*.

#### 4.3.4.4 Summary of post-hoc test by education groups

Post-hoc test by education groups showed that Bachelor's Degree graduates had least enjoyment with the decision-making experience while Master's Degree graduates and to some extent High School graduates were more easily satisfied.

In order to explain the result from the post-hoc test by education groups, we can refer to section 4.3.3.4 about background distraction while taking the online survey. It was argued that as younger people have more distractions in life, they would be more impatient at decision-making tasks in the survey and experience more difficulty and dissatisfaction. Putting this argument in the context of education, we can deduce that the more distractions a person has while completing a certain education level, the less satisfaction he/she experiences with the decision task. In fact, those who have completed Bachelor's Degree have most types of life concerns such as graduate studies, career settlement and social life. These lead to most background distractions occurring at the time of survey taking, hence least patience with the choice tasks and least satisfaction. Meanwhile, those who have only completed High School only have less heavy concerns such as undergraduate studies and social life. These translate to less background distractions occurring at the time of survey taking, therefore more patience with the choice tasks and more satisfaction. On the other hand, those who have completed Master's Degree are more likely to have a fulfilled life with stable jobs and families. Hence, they have little life distractions and have good ability to concentrate in decision-making, and as a result experience most satisfaction.

#### 4.3.5 Post-hoc test by continent groups

Based on the responses for Country of Origin, we aggregated the countries into continent groups. Since there were not many responses from North America, South America, Africa and Australia, we aggregated these continents into 1 group.

Continent group	Number of responses
Asia	165
Europe	168
Other (North America, South America, Africa and Australia)	84

Table 38: Statistics of continent groups

#### 4.3.5.1 Homogeneity of variance

In order to recognize which variables had statistical differences between the group means, we conducted ANOVA Test. Since the ANOVA test requires homogeneity of variance, we first look at Levene's test of Homogeneity of Variances.

Levene's test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
<i>aversion</i>	2.222	2	414	0.110
<i>enjoyment</i>	6.857	2	414	0.001

Table 39: Levene's test of Homogeneity of Variances by continent groups

A variable is considered to have homogeneity of variance if its significance value is larger than 0.05. We saw that only *aversion* had significance value larger than 0.05 and therefore it had homogeneity of variance.

#### 4.3.5.2 Welch's ANOVA

Robust Tests of Equality of Means					
Dependent Variable	Method	Statistic <sup>a</sup>	df1	df2	Sig.
<i>aversion</i>	Welch	0.086	2	223.496	0.918
<i>enjoyment</i>	Welch	2.278	2	233.166	0.105

a. Asymptotically F distributed.

Table 40: Welch's ANOVA test by continent groups

As *enjoyment* didn't have homogeneity of variance, we conducted Welch's ANOVA test instead of a classic ANOVA test. Welch's ANOVA serves to identify statistical difference between group means in case of unequal variances.

A variable is considered to have statistical difference between the group means when its Welch's ANOVA significance value is less than the significance level. Although a significance level of 0.05 is typically used, we used a significance level of 0.1 since our sample size of more than 400 was fairly modest.

We saw that both *aversion* and *enjoyment* had significance values of more than 0.1. Therefore, we could say that when conducting post-hoc test by continent groups, there was no statistically difference between the group means.

#### 4.3.5.3 Summary of post-hoc test by continent groups

When conducting post-hoc test by continent groups, there was no statistically difference between the group means. In other words, the decision-making experience was generally uniform across people of various geographical backgrounds.

## 5 Discussion and conclusion

### 5.1 Summary of results

As the growth in product variety and assortment continues to soar, consumers nowadays are more susceptible to choice overload. The choice overload problem has recently drawn attention, with research into this topic rising significantly since 2010. In order to attract and retain customers, retailers must take actions to mitigate the choice overload problem in their product assortments. Reduction of assortment size appears to be an obvious solution to the problem and has attracted much research, however little research has been done on examining additional mitigation approaches for choice overload. The purpose of this thesis is to fill this gap by examining different approaches that enterprises can adopt to mitigate choice overload problem, as well as identify different customer demographical conditions in which choice overload is less severe.

The thesis used a behavioral experiment to examine participants' degree of experience choice overload when making their decisions in different assortment conditions. Participants were assigned to 9 different assortment scenarios corresponding to different mitigation approach conditions. After making their decision in the assortment, they were asked to evaluate their choice overload based on a set of statements. The experiment results revealed the effectiveness of different mitigation approaches and the differences among groups of respondents in experienced choice overload.

#### *Q1. Does choice overload effect really exist?*

The experiment proved the existence of choice overload effect. A large assortment size was found to cause more difficulty of decision-making, more dissatisfaction and more remorse than a small assortment size.

---

*Q2. Can assortment strategies mitigate choice overload?*

The experiment provided some proofs to the effectiveness of assortment strategies. Compared to the control scenario with absence of assortment strategy, all assortment scenarios with presence of assortment strategies generated lower degree of choice overload. However, except to Assortment Size Reduction, all other strategies didn't have statistically difference from the controlled scenario.

*Q3. What assortment strategies or combinations of assortment strategies are most effective in mitigating choice overload?*

We uncovered that most effective assortment strategies are Reduction of Assortment Size and Unconscious Information Processing. While other strategies require much careful design and organization of product assortment, Reduction of Assortment Size is the most simple yet most effective strategy to combating choice overload effect. On the other hand, Unconscious Information Processing differentiates from other strategies by preventing overthinking of alternatives and overweighting of irrelevant attributes. Furthermore, the assortment strategies were discovered to be more effective when being in combination with each other instead of being stand-alone.

*Q4. What demographic conditions can lead to low levels of choice overload?*

Regarding the differences among groups of respondents in experienced choice overload, those who demonstrated low levels of choice overload are men, elders and highly educated people. There is no statistical difference in choice overload among people of different geographical backgrounds.

## **5.2 Managerial implications**

*Q5. What actions can managers take to mitigate choice overload in their product assortments?*

For managers, the main takeaway is that choice overload problem is real: when too many options are offered, customers will find difficulty in making decision, become dissatisfied and remorseful of their decision. In order to improve customer experience and retention, managers should pay attention to the design and organization of their product assortments. The simplest yet most effective strategy is to reduce the assortment size. In reducing assortment size, managers should discover beforehand which most frequently bought or

---

most favorite items are, and only keep those. It was found that when most favorite items are kept, customers satisfaction remains largely unchanged (Broniarczyk, et al., 1998) (Beneke, et al., 2013).

Nevertheless, product variety has many alleged benefits such as allowing variety-seeking behavior (Kahn, 1995), an opportunity of match between the customer's preference and the available options (Schwartz, 2005), freedom when making a selection (Kahn & Lehmann, 1991) and the assurance that the choice set adequately presents all possible options (Karni & Schwartz, 1977). Additionally, having a large assortment is essential to certain types of merchandizing strategies and industries such as the Deep Assortment Strategy in the classic bakery, ice cream stand and shoe shop, or the Mass Market Assortment Strategy in megastores like Walmart, Target, IKEA and Amazon. Therefore, managers could be reluctant to reduce their assortment size. In such case, they can utilize Categorization, Provision of a Default Option or Unconscious Information Processing. Among these 3 strategies, Unconscious Information Processing might be the least known yet most influential one. While Categorization and Provision of Default Option help customers differentiate the options and identify their preferences more easily, customers are forced to make their decisions on the spot, leading to overthinking and overweighting of irrelevant attributes. On the other hand, Unconscious Information Processing is the result of temporarily interrupting the decision process. Such interruption allows customers to avoid overthinking and overweighting of irrelevant attributes, and helps them have a better idea of what they want when returning to the choice task. To managers, it means that they should design a shopping environment that facilitates customer comeback. In terms of layout, for online stores it is the user interface, and for brick & mortar stores it is the lighting, color and aisle design. In terms of visibility, online stores can utilize the pop-up function that reminds shoppers of their previously viewed products and brick & mortar stores can invest in logos and banners positioned nearby their location in order to boost visibility. In terms of customer service, brick and mortar stores should avoid having "pushy" salespeople who manipulate customers into buying products that they do not necessary want as soon as they step in the store. A consequence of forceful sales approach is that customers will grow dissatisfied with their purchase and fear of returning to the store. Instead, stores should create a friendly environment where customers enjoy the freedom of choosing or deferring from choosing.

---

The thesis experiment also found that the mitigation strategies are more effective when being in combination with each other than being stand-alone. To managers, it means that Categorization and Provision of Default Option strategies are not to be neglected. Given a product assortment, managers cannot stay idle and expect customers to construct their preferences by themselves. By putting products into categories, customers can better differentiate the options and better recognize their preferences. By providing a default option, consumers can enjoy a low-effort way of making a decision or have a reference point for evaluating other options. Altogether, Categorization, Provision of Default Option and Unconscious Information Processing help choosing easier, increase chance of satisfaction and decrease chance of remorse.

Moreover, the differences among groups of respondents in experienced choice overload suggest managers to understand their target customers and cater their services accordingly. Since women and young people are more susceptible to choice overload, stores should put efforts into assortment design and organization or think of cutting assortment size. On the other hand, since men, older people and highly educated people are less susceptible to choice overload, stores can offer them a wider range of choices.

### **5.3 Limitations**

First, the sample of respondents is not sufficiently large and diverse. The majority of respondents was university students from the age 18-34 and from Asia or Europe. Unfortunately, we did not obtain many respondents from other age groups, education backgrounds and geographical backgrounds. This drawback of the sampling led to the incomplete understanding about the change in choice overload among different age groups, education backgrounds and geographical backgrounds, as well as the lack of statistical difference in many group pairs.

Second, the form of the experiment presents further drawbacks. As the experiment takes the form of an online survey, participants are vulnerable to background distractions. The presence of background distractions might have resulted in more choice overload than without as background distractions make respondents grow impatient at the choice tasks. Or the distraction might have interrupted some respondents during the choice tasks in a similar condition as Unconscious Information Processing, leading to lower choice overload than without. On another hand, participants didn't actually make out-of-pocket purchases nor use



---

the product in the experiment; while in real life, Satisfaction and Remorse of a certain product is subject to the cost and the usage experience. As a result, the evaluation of Satisfaction and Remorse would be inaccurate compared to real-life situations.

Third, the design of multi-item scale was faulty. The Perception of Variety and Remorse scale have low reliability, resulting in our inability to accurately measure respondents' perception of variety and remorse. As for the statements within the Perception of Variety scale, they generate different understanding and sentiments to the respondents. As for the Remorse, it is not very suitable to ask about it within the same survey as typically remorse occurs after customers have used the product for a period of time.

Fourth, due to the limitation of resources in this research, we were unable to examine the mitigation effect on choice overload by other assortment strategies, such as adjusting the number of product categories (Yan, et al., 2015), adding options differentiated by non-complementary features (Chernev, 2005), and shelf management and space elasticity (Dreze, et al., 1994). Therefore, comparing the effects of those additional strategies and their combinations on mitigating choice overload would be a valuable direction for future research.

---

## Works Cited

- Alba, J., Hutchinson, W. & Lynch, J., 1991. Memory and Decision Making. *Handbook of Consumer Theory Research*, pp. 1-49.
- Beneke, J., 2015. Are Consumers Really Bewildered by Overchoice?. *Journal of Food Products Marketing*, pp. 90-100.
- Beneke, J., Cumming, A. & Jolly, L., 2013. The effect of item reduction on assortment satisfaction - A consideration of the category of red wine in a controlled retail setting. *Journal of Retailing and Consumer Services*, Volume 20, pp. 282-291.
- Besedes, T., Deck, C., Sarangi, S. & Shor, M., 2012. Decision-making strategies and performance among seniors. *Journal of Economic Behavior & Organization*, Volume 81, pp. 524-533.
- Bettman, J., 1979. *An Information Processing Theory of Consumer Choice*. MA: Addison Wesley.
- Boatwright, P. & Nunes, J. C., 2001. Reducing Assortment: An Attribute-Based Approach. *Journal of Marketing*, 65(3), pp. 50-63.
- Boniwell, I., 2006. *Positive Psychology in a Nutshell: A Balanced Introduction to The Science of Optimal Function*, London, UK: PWBC.
- Bos, M. W., Dijksterhuis, A. & Baaren, R. B. v., 2011. The benefits of "sleeping on things": Unconscious thought leads to automatic weighting. *Journal of Consumer Psychology*, Issue 21, pp. 4-8.
- Botti, S., Orfali, K. & Iyengar, S. S., 2009. Tragic Choices: Autonomy and Emotional Responses to Medical Decisions. *Journal of Consumer Research*, Volume 36, pp. 337-352.
- Broniarczyk, S. M., Hoyer, W. D. & McAlister, L., 1998. Consumers' Perceptions of the Assortment Offered in a Grocery Category: The Impact of Item Reduction. *Journal of Marketing Research*, Volume 35, pp. 166-176.
- Chernev, A., 2003. When More Is Less and Less Is More: The Role of Ideal Point Availability and Assortment in Consumer Choice. *Journal of Consumer Research*, Volume 30, pp. 170-183.
- Chernev, A., 2005. Feature Complementarity and Assortment in Choice. *Journal of Consumer Research*, Volume 31, pp. 748-759.
- Chernev, A., 2011. *The Psychology of Choice Overload: Implications for Retail Financial Services*, s.l.: Filene Research Institute.

- 
- Chernev, A., Böckerholt, U. & Goodman, J., 2014. Choice overload: A conceptual review and meta-analysis. *Journal of Consumer Psychology*, pp. 333-358.
- Crawford, J. D. & Stankov, L., 1996. Age differences in the realism of confidence judgements: A calibration study using tests of fluid and crystallized intelligence. *Learning and Individual Differences*, 8(2), pp. 83-103.
- Diehl, K., Kornish, L. J. & Lynch, J. G., 2003. Smart Agents: When Lower Search Costs for Quality Information Increase Price Sensitivity. *Journal of Consumer Research*, 30(1), pp. 56-71.
- Dijksterhuis, A., Bos, M. W., Nordgren, L. F. & Baaren, R. B. v., 2006. On Making the Right Choice: The Deliberation-Without-Attention Effect. *Science*, 311(5763), pp. 1005-1007.
- Dijksterhuis, A. & Nordgren, L. F., 2006. A Theory of Unconscious Thought. *Perspectives on Psychological Science*, pp. 95-109.
- Dreze, X., Hoch, S. J. & Purk, M. E., 1994. Shelf Management and Space Elasticity. *Journal of Retailing*, 70(4), pp. 301-326.
- Gourville, J. T. & Soman, D., 2005. Overchoice and Assortment Type: When and Why Variety Backfires. *Marketing Science*, pp. 382-395.
- Halpern, S. D., Ubel, P. A. & Asch, D. A., 2007. Harnessing the power of default options to improve healthcare. *The New England Journal of Medicine*, Issue 357, pp. 1340-1344.
- Howard, J. & Sheth, J., 1969. *The Theory of Buyer Behavior*. NY: Wiley.
- Huber, J. & Kline, N., 1991. Adapting Cutoffs to the Choice Environment: The Effects of Attribute Correlation and Reliability. *Journal of Consumer Research*, Issue 18, pp. 346-357.
- Iyengar, S. S., Jiang, W. & Huberman, G., 2003. *How Much Choice is Too Much?: Contributions to 401(k) Retirement Plans*, Philadelphia, PA: Pension Research Council.
- Iyengar, S. S. & Lepper, M. R., 2000. When Choice is Demotivating: Can One Desire Too Much of a Good Thing?. *Journal of Personality and Social Psychology*, 79(6), pp. 995-1006.
- Jacoby, J., 1978. Consumer research: a state of the art review. *Journal of Marketing*, pp. 87-96.
- Johnson, E. F. & Goldstein, D., 2003. Do defaults save lives?. *Science*, Issue 302, pp. 1338-1339.
- Johnson, E. J., Bellman, S. & Lohse, G. L., 2002. Defaults, framing and privacy: why opting in-opting out. *Marketing Letters*, Issue 13, pp. 5-15.
- Johnson, E. J., Hershey, J., Meszaros, J. & Kunreuther, H., 1993. Framing, Probability Distortions, and Insurance Decisions. *Journal of Risk and Uncertainty*, Issue 7, pp. 35-51.

- Johnson, E. & Payne, J., 1985. Effort and Accuracy in Choice. *Management Science*, Issue 31, pp. 395-414.
- Kahn, B. E., 1995. Consumer Variety-Seeking Among Goods & Services: An Integrative Review. *Journal of Retailing and Consumer Services*, Issue 2, pp. 139-148.
- Kahn, B. E. & Lehmann, D. R., 1991. Modeling Choice Among Assortments. *Journal of Retailing*, 67(3), pp. 274-299.
- Kahn, B. E. & Wansink, B., 2004. The Influence of Assortment Structure on Perceived Variety and Consumption Quantities. *Journal of Consumer Research*, 30(4), pp. 519-533.
- Kahneman, D. & Tversky, A., 1979. Prospect Theory: An analysis of decision under risk. *Econometrica*, 47(2), pp. 263-292.
- Karni, E. & Schwartz, A., 1977. Search Theory: The Case of Search with Unsure Recall. *Journal of Economic Theory*, 16(1), pp. 38-52.
- Lane, R. E., 2001. *The Loss of Happiness in Market Democracies*. s.l.:Yale University Press.
- Madrian, B. C. & Shea, D. F., 2001. The power of suggestion: inertia in 401(k) participation and savings behavior. *The Quarterly Journal of Economics*, Issue 116, pp. 1149-1187.
- Mather, M. & Carstensen, L. L., 2005. Aging and motivated cognition: the positivity effect in attention and memory. *Trends in Cognitive Sciences*, 9(10), pp. 496-502.
- Messner, C. & Wanke, M., 2010. Unconscious information processing reduces information overload and increases product satisfaction. *Journal of Consumer Psychology*, Issue 21, pp. 9-13.
- Misuraca, R., Teuscher, U. & Faraci, P., 2015. Is more choice always worse? Age differences in the overchoice effect. *Journal of Cognitive Psychology*, 28(2), pp. 242-255.
- Mittal, B., 2016. The maximizing consumer wants even more choices: How consumers cope with the marketplace of overchoice. *Journal of Retailing and Consumer Services*, Volume 31, pp. 361-370.
- Mogilner, C., Rudnick, T. & Iyengar, S. S., 2008. The Mere Categorization Effect: How the Presence of Categories Increases Choosers' Perceptions of Assortment Variety and Outcome Satisfaction. *Journal of Consumer Research*, 2(35), pp. 202-215.
- Murphy, T. & Cotteleur, M. J., 2015. *Behavioral strategy to combat choice overload: A framework for managers*, s.l.: Deloitte University Press.
- Myers, D. G., 2001. *The American Paradox: Spiritual Hunger in an Age of Plenty*. s.l.:Yale University Press.
- Nedungadi, P., 1990. Recall and Consumer Consideration Sets: Influencing Choice without Altering Brand Evaluation. *Journal of Consumer Research*, Issue 17, pp. 263-276.

- 
- Payne, J. W., Johnson, E. J. & Bettman, J. R., 1993. *The adaptive decision maker*. Cambridge, UK: Cambridge University Press.
- Roberts, J. H. & Lattin, J. M., 1991. Development and Testing of a Model of Consideration Set Composition. *Journal of Marketing Research*, Issue 28, pp. 429-440.
- Rooij, M. v. & Teppa, F., 2008. *Choice or no choice: what explains the attractiveness of default options*, s.l.: Network for Studies on Pensions, Aging and Retirement.
- Schwartz, B., 2000. Self-Determination: The Tyranny of Freedom. *American Psychologist*, Volume 55, pp. 79-88.
- Schwartz, B., 2005. *The Paradox of Choice: Why More is Less*. New York: Harper Perennial.
- Schwartz, B. et al., 2002. Maximizing Versus Satisficing: Happiness Is a Matter of Choice. *Journal of Personality and Social Psychology*, 83(5), pp. 1178-1197.
- Simon, H., 1956. Rational Choice and the Structure of The Environment. *Psychological Review*, pp. 129-138.
- Skelton, A. C. & Allwood, J. M., 2017. Question demand: A study of regretted purchases in Great Britain. *Ecological Economics*, Volume 131, pp. 499-509.
- Syam, S. S. & Bhatnagar, A., 2015. A decision support model for determining the level of product variety with marketing and supply chain considerations. *Journal of Retailing and Consumer Services*, Volume 25, pp. 12-21.
- Tanius, B. E., Wood, S. & Hanoach, Y., 2009. Aging and choice: applications to Medicare Part D. *Judgment and Decision Making*, 4(1), pp. 92-101.
- Toffler, A., 1970. *Future Shock*. s.l.:Random House.
- Vigna, S. D. & Malmendier, U., 2006. Paying not to go to the gym. *American Economic Review*, Issue 96, pp. 694-719.
- Wilson, T. D. et al., 1993. Introspections about reasons can reduce post-choice satisfaction. *Personality and Social Psychology Bullentin*, 3(19), pp. 331-339.
- Wilson, T. D. & Schooler, J. W., 1991. Thinking too much: Instropection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology*, 2(60), pp. 181-192.
- Yan, H., Chang, E.-C., Chou, T.-J. & Tang, X., 2015. The over-categorization effect: How the number of categorizations influences shoppers' perceptions of variety and satisfaction. *Journal of Business Research*, pp. 631-638.
- Yun, J. T. & Duff, B. R., 2017. Is utilizing themes and effective scheme? Choice overload and categorization effects within an extensive online choice environment. *Computers in Human Behavior*, Volume 74, pp. 205-214.

Zhang, S. & Schmitt, B. H., 1998. Language Structure and Categorization: A Study of Classifiers in Consumer Cognition, Judgment and Choice. *Journal of Consumer Research*, 25(2), pp. 108-122.

Zwarun, L. & Hall, A., 2014. What's going on? Age, distraction, and multitasking during online survey taking. *Computers in Human Behavior*, Volume 41, pp. 236-244.

## Appendices

### Appendix A: Screenshots of pilot study survey

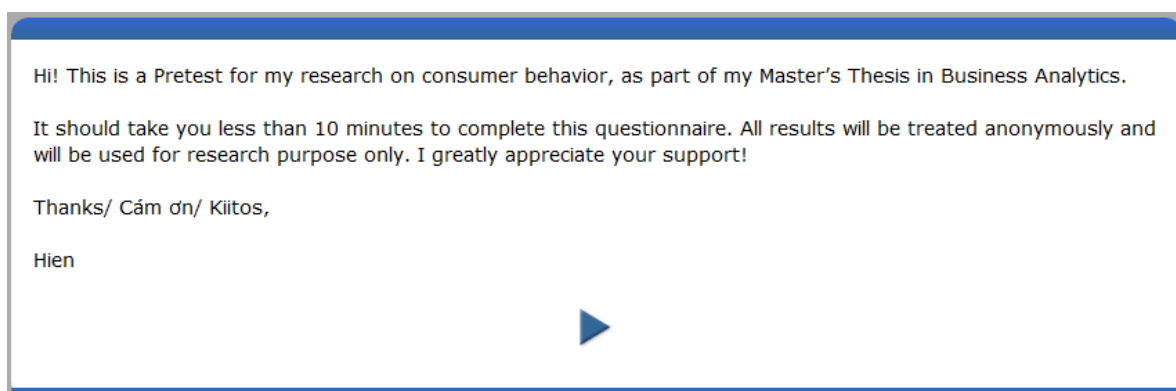


Figure 23: Introduction to the pilot study survey



Figure 24: Background questions in the pilot study survey

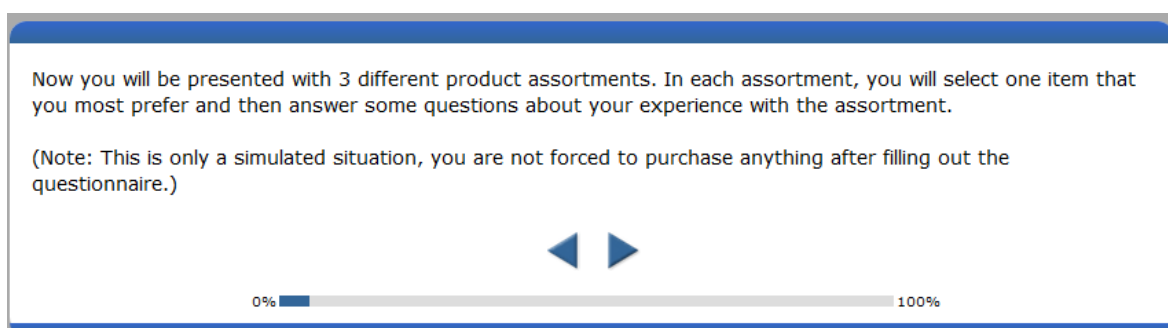


Figure 25: Instruction about choice tasks in the pilot study survey

Please choose the item you would like to purchase.

#### Brow Line

Price: 119€



Price: 119€



Price: 129€



Price: 189€



Price: 189€



#### Cat Eye

Price: 129€



Price: 129€



Price: 139€



Price: 189€



#### Rectangle

Price: 119€



Price: 129€



Price: 119€



Price: 129€



Price: 119€



Price: 119€



#### Round

Price: 139€



Price: 129€



Price: 119€



Price: 189€



#### Rimless

Price: 119€



Price: 189€



Price: 199€



Price: 119€



#### Square

Price: 119€



Price: 119€



Price: 129€



Price: 129€



Price: 129€



Price: 129€



Price: 129€



Figure 26: Illustration of a choice task scenario in the pilot study survey (in the picture is the Eye Glasses - Categorization scenario)



Please respond to the following statements on a scale of 1-7.

The choice well matches my style.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

I feel overwhelmed when reviewing the choices.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

If I had to pay 25% extra for a returnable product, I would choose to do so.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

There are too many options to choose from.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

There are enough options for me to choose from.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

There is a wide variety of products to choose from.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

I regret my choice.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

Choosing the right one is difficult.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

The lamps are different from each other.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

I am satisfied with my choice.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

I feel frustrated when making the decision.

	1	2	3	4	5	6	7	
Strongly disagree								Strongly agree

Figure 27: A set of statements for measuring choice overload that is presented after each choice task scenario in the pilot study survey

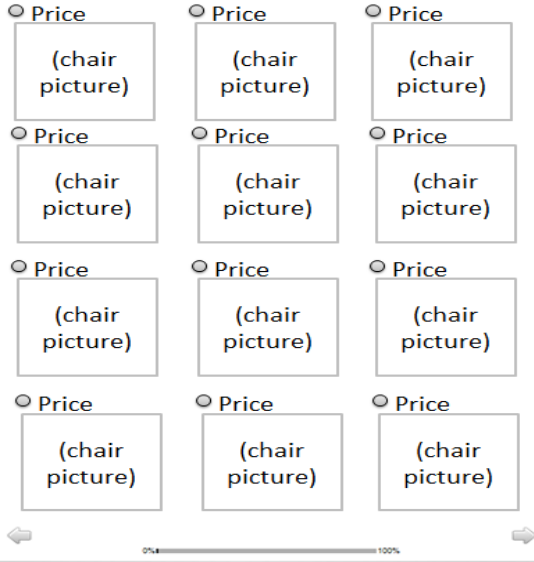
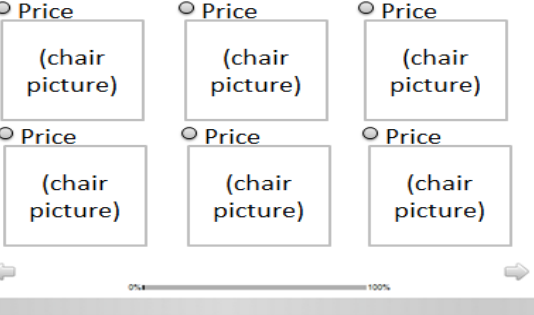
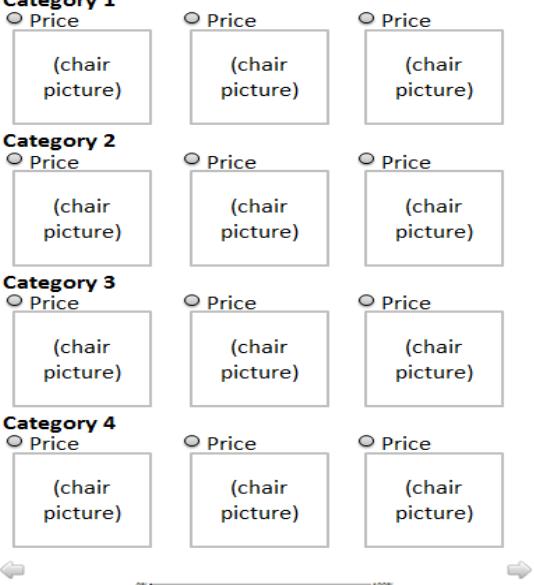
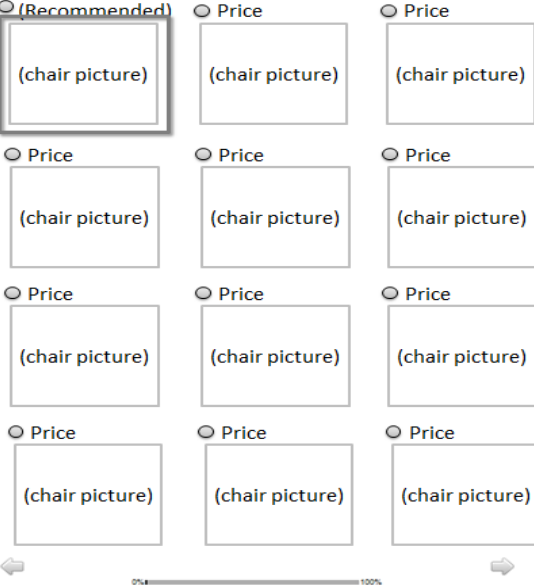
All answers have been recorded, thank you very much for your time!

Powered by Sawtooth Software, Inc.

0%  100%

Figure 28: Closure of the pilot study survey

## Appendix B: Demonstration of 9 assortment scenarios

<p>Select ONE item that you would like to purchase</p>  <p><b>Scenario 1 (coded “big”):</b></p> <p>A large assortment of 30 options. This was a simulation of the control condition without any mitigation strategy.</p>	<p>Select ONE item that you would like to purchase</p>  <p><b>Scenario 2 (coded “small”):</b></p> <p>A small assortment of 6 options. This was a simulation of <b>Reduction of Assortment Size</b> strategy.</p>
<p>Select ONE item that you would like to purchase</p> <p><b>Category 1</b></p>  <p><b>Scenario 3 (coded “cat”):</b></p> <p>A large assortment of 30 options organized into 4 different categories, with 7-8 options in each category. This was a simulation of <b>Categorization</b> strategy.</p>	<p>Select ONE item that you would like to purchase</p>  <p><b>Scenario 4 (coded “de”):</b></p> <p>A large assortment of 30 options with 1 recommended option emphasized in bolded frame. This was a simulation of <b>Provision of a Default Option</b> strategy.</p>

**Select up to FIVE options that you most prefer**


Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

Rearrange the letters to find the correct words about Animals. You can find hints in the pictures and capitalized letters.



hoLDpin \_\_\_\_\_  
 adPAn \_\_\_\_\_  
 iivK \_\_\_\_\_  
 thiNg IOw \_\_\_\_\_  
 laoKa \_\_\_\_\_  
 dogHegeg \_\_\_\_\_  
 seoMo \_\_\_\_\_  
 nawS \_\_\_\_\_  
 keynoD \_\_\_\_\_  
 kmuSk \_\_\_\_\_  
 pipoH \_\_\_\_\_  
 baroC \_\_\_\_\_

**Select ONE item that you would like to purchase**

Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

Price (chair picture)     Price (chair picture)     Price (chair picture)

**Scenario 5 (coded “*uncon*”):**

Participants were first presented with a large assortment of 30 options, in which they selected up to 5 options that they most preferred. Then they were assigned to complete an anagram game, in which they had to find 12 correct words about Animal. After having completed the anagram game, they were presented with the assortment again and asked to make a decision. This was a simulation of the **Unconscious Information Processing** strategy.

**Select ONE item that you would like to purchase**

**Category 1**  
 (Recommended)     Price     Price

(chair picture)

(chair picture)

(chair picture)

**Category 2**  
 (Recommended)     Price     Price

(chair picture)

(chair picture)

(chair picture)

**Category 3**  
 (Recommended)     Price     Price

(chair picture)

(chair picture)

(chair picture)

**Category 4**  
 (Recommended)     Price     Price

(chair picture)

(chair picture)

(chair picture)

← 0% | 100% →

**Scenario 6 (coded “catde”):**

A large assortment of 30 options organized into 4 different categories, with 7-8 options in each category. In each category, there was a recommended option emphasized in bolded frame. This was a simulation of the **Categorization** and **Provision of a Default Option** combination.

**Select up to FIVE options that you most prefer**

(Recommended)     Price     Price

(chair picture)

Price     Price     Price

(chair picture)

Price     Price     Price


(chair picture)

Price     Price     Price

(chair picture)

(chair picture)

Rearrange the letters to find the correct words about Food. You can find hints in the pictures and capitalized letters.



- Dunto \_\_\_\_\_
- coaT \_\_\_\_\_
- ushIS \_\_\_\_\_
- dotHgo \_\_\_\_\_
- ruCry \_\_\_\_\_
- Sighttape \_\_\_\_\_
- balMleta \_\_\_\_\_
- kiCooe \_\_\_\_\_
- fnfuM \_\_\_\_\_
- cheFm serFi \_\_\_\_\_
- Peakcan \_\_\_\_\_
- humsMoor \_\_\_\_\_

← 0% | 100% →

**Select ONE item that you would like to purchase**


<input checked="" type="radio"/> (Recommended)	<input type="radio"/> Price	<input type="radio"/> Price
<div style="border: 2px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>
<input type="radio"/> Price	<input type="radio"/> Price	<input type="radio"/> Price
<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>
<input type="radio"/> Price	<input type="radio"/> Price	<input type="radio"/> Price
<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>
<input type="radio"/> Price	<input type="radio"/> Price	<input type="radio"/> Price
<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>	<div style="border: 1px solid black; padding: 5px;">(chair picture)</div>

◀ 0% 100% ▶

**Scenario 7 (coded “deuncon”):**

Participants were first presented with a large assortment of 30 options with 1 recommended option emphasized in bolded frame, in which they could select up to 5 options that they most preferred. Then they were assigned to complete an anagram game, in which they had to find 12 correct words about Food. After completing the anagram game, they were presented with the assortment again and asked to make a decision. This was a simulation of **Provision of a Default Option and Unconscious Information Processing** combination.

**Select up to FIVE options that you most prefer**

<p><b>Category 1</b></p> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><b>Category 2</b></p> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><b>Category 3</b></p> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><b>Category 4</b></p> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div> <p><input type="checkbox"/> Price</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">(chair picture)</div>	<p style="font-size: small;">Rearrange the letters to find the correct words about Summer. You can find hints in the pictures and capitalized letters.</p>  <p>gunSaeless _____</p> <p>cel maCer _____</p> <p>lyceBic _____</p> <p>maCping _____</p> <p>aiSgn _____</p> <p>hellSeas _____</p> <p>cutCoon uiceJ _____</p> <p>cuBebear _____</p> <p>lorleR Cotsare _____</p> <p>lanP eTie _____</p> <p>Weart karP _____</p> <p>andS Cleats _____</p>
---	--

◀ 0% 100% ▶

Select ONE item that you would like to purchase

**Category 1**

Price  Price  Price

(chair picture) (chair picture) (chair picture)

**Category 2**

Price  Price  Price

(chair picture) (chair picture) (chair picture)

**Category 3**

Price  Price  Price

(chair picture) (chair picture) (chair picture)

**Category 4**

Price  Price  Price

(chair picture) (chair picture) (chair picture)

0% 100%

### Scenario 8 (coded “catuncon”):

Participants were presented with a large assortment of 30 options in which they could select up to 5 options that they most preferred. The assortment was organized into 4 different categories, with 7-8 options in each category. Then they were assigned to complete an anagram game, in which they had to find 12 correct words about Summer. After having completed the anagram game, they were presented with the assortment again and asked to make a decision. This was a simulation of the **Categorization and Unconscious Information Processing** combination.

Select ONE item that you would like to purchase

**Category 1**

(Recommended)  Price  Price

(chair picture) (chair picture) (chair picture)

**Category 2**

(Recommended)  Price  Price

(chair picture) (chair picture) (chair picture)

**Category 3**

(Recommended)  Price  Price

(chair picture) (chair picture) (chair picture)


**Category 4**

(Recommended)  Price  Price

(chair picture) (chair picture) (chair picture)

0% 100%

Rearrange the letters to find the correct words about Celebrations. You can find hints in the pictures and capitalized letters.



haBkdy  
hvingTskna  
Halonewel  
sCrimhats  
ewN rYea  
tEeas  
iriAp losdF  
audtGroan yaD  
Mono valetsrIF  
Camvral  
dingdeW  
narul ewN rYea

0% 100%

**Select ONE item that you would like to purchase**

**Category 1**  
 (Recommended)    Price    Price

(chair picture)	(chair picture)	(chair picture)
-----------------	-----------------	-----------------

**Category 2**  
 (Recommended)    Price    Price

(chair picture)	(chair picture)	(chair picture)
-----------------	-----------------	-----------------

**Category 3**  
 (Recommended)    Price    Price

(chair picture)	(chair picture)	(chair picture)
-----------------	-----------------	-----------------

**Category 4**  
 (Recommended)    Price    Price

(chair picture)	(chair picture)	(chair picture)
-----------------	-----------------	-----------------

← 0% 100% →

**Scenario 9 (coded “catdeuncon”):**

Participants were presented with a large assortment of 30 options in which they can select up to 5 options that they most prefer. The assortment was organized into 4 different categories, with 7-8 options in each category. In each category, there was a recommended option emphasized in bolded frame. Then they were assigned to complete an anagram game, in which they had to find 12 correct words about Celebration. After having completed the anagram game, they were presented with the assortment again and asked to make a decision. This was a simulation of **Categorization, Provision of a Default Option and Unconscious Information Processing** combination.

*Table 41: Demonstrations of 9 assortment scenarios<sup>6</sup>*

<sup>6</sup> The pictures in Table 43 are only demonstrations, not actual screenshots of the online experiment. The screenshots are not featured as the pictures are too big to facilitate quick understanding.

## Appendix C: Screenshots of actual experiment survey

Hi! This is an experiment for my research on consumer behavior, as part of my Master's Thesis in Business Analytics. By participating in the experiment, you will get the chance to win 1 out of 10 Amazon gift cards, each is worth \$20.

It should take you about 10 minutes to complete this experiment. To ensure the reliability of the results, please sit through the whole experiment without pause.

All results will be treated anonymously and will be used for research purpose only. I am truly grateful for your support!

Hien Vu  
hien.vu@aalto.fi  
Aalto University School of Business, Finland




Figure 29: Introduction to the actual experiment survey

**What is your gender?**

male

female

other

**What is your age?**

Under 13

13-17

18-25

26-34

35-54

55-64

65 or over

**What is the highest level of education you have completed?**

High School

Bachelor's Degree



Master's Degree

Doctorate Degree

Professional Degree (JD, MD, DDS, DVM, LLB)

Other

**What country are you from?**


0%  100%

Figure 30: Background questions in the actual experiment survey



---

Assuming that you need a chair for personal use at home, next you will be presented with 2 different assortments of office chairs.

In each assortment, you will select one or more item(s) that you most prefer. Then, you will answer some questions about your experience with the assortment.

You might come across a wordplay game in between the tasks.

(Note: These are only simulated situations; you are not forced to purchase anything after the experiment.)



0%  100%



*Figure 31: Instruction about choice tasks in the actual experiment survey*

**Out of all categories, select ONE item that you would like to purchase.**

**Ergonomic**

(Recommended) Price: 180€  


Price: 250€  


Price: 289€  


Price: 220€  


Price: 245€  


Price: 280€  


Price: 299€  


Price: 249€  


**Executive-styled**

(Recommended) Price: 270€  


Price: 219€  


Price: 275€  


Price: 250€  


Price: 199€  


Price: 268€  


Price: 230€  


**Mesh**

(Recommended) Price: 110€  


Price: 89€  


Price: 150€  


Price: 129€  


Price: 145€  


Price: 150€  


Price: 130€  


Price: 149€  


**Task**

(Recommended) Price: 115€  


Price: 89€  


Price: 168€  


Price: 180€  


Price: 165€  


Price: 120€  


Price: 175€  


←

0%
100%

→

Figure 32: Illustration of a choice task scenario in the actual experiment survey (in the picture is the “catde” Categorization - Provision of Default Option condition)

Please respond to the following statements about your experience with the assortment.

**I felt frustrated when making the decision.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**I am satisfied with my choice.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**The chosen chair is a good purchase.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**Choosing the right one is difficult.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**I was overwhelmed when reviewing the choices.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**There is a wide variety of chairs to choose from.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**The chairs are different from each other.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**I am uncertain if I made the best choice.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**During the decision-making process, I changed my mind a few times.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**If I had to make the decision again, I would choose the same thing.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**There are too many options.**

1 2 3 4 5 6 7

Strongly disagree  Strongly agree

**The choice is close to my ideal.**

1 2 3 4 5 6 7


Strongly disagree  Strongly agree

← 0%  100% →

Figure 33: A set of statements for measuring choice overload that is presented after each choice task scenario in the actual experiment survey

---


**Price: 165C**



You previously chose . How strongly do you regret this decision?

	1	2	3	4	5	6	7	
Not at all	<input style="width: 100%; height: 20px;" type="text"/>							Strongly regret

**Price: 140C**



You previously chose . How strongly do you regret this decision?

	1	2	3	4	5	6	7	
Not at all	<input style="width: 100%; height: 20px;" type="text"/>							Strongly regret

←

0%100%

→

---

Figure 34: Statements for measuring "regret" that are presented after the participants completes all 2 choice task scenarios in the actual experiment survey

(Optional) Enter your email and get the chance to win 1 out of 10 available Amazon gift cards, each is worth \$20.

(Optional) Other comments/ feedbacks. If you need additional information concerning the research purpose or would like a short copy of the research results, you can also contact me at [hien.vu@aalto.fi](mailto:hien.vu@aalto.fi)

**THANK YOU FOR YOUR PARTICIPATION!**

Click the next arrow to submit your responses.



0%  100%



**End of experiment. All responses have been recorded.**

Powered by Sawtooth Software, Inc.

0%  100%

*Figure 35: Closure of actual experiment survey*