



**Shifting to renewal energy - Consumer perception on large household purchases**

Lappeenranta–Lahti University of Technology LUT

Degree Programme in International Business and Entrepreneurship

Master's Thesis

2021

Vishaal Sood

Examiners: Professor Mikko Pynnönen

Professor Mika Immonen

## **ABSTRACT**

Lappeenranta-Lahti University of Technology LUT  
School of Business and Management  
Degree Programme in International Business and Entrepreneurship

Vishaal Sood

### **Shifting to renewal energy - Consumer perception on large household purchases**

Master's Thesis

2021

43 pages, 8 figures, 8 tables and 4 appendices

Examiners: Professor Mikko Pynnönen and Professor Mika Immonen

Keywords: TAM, large household purchases, consumers, energy

The research studies the energy consumption of consumers by examining large household purchases. The research on consumer attitudes towards energy consumption and thus on large household purchases are relevant in modern days. Perceived ease of use and perceived behaviour influence is examined in consumer behaviour.

The research methodology was a qualitative study, and the result was analysed using SPSS statistical method. The data was collected in April -June 2020 in the Northern Periphery and the Arctic area. The results indicate that consumer perceived behaviour and ease of use play an important role in purchasing large household purchases. Consumers attitudes and habits refine intentions to implementation. This thesis suggests that risks and total costs are the main factors influencing large household purchases. However, governmental incentives have been shown to influence household consumption.

The result tells that large household purchases are positively influenced behavioural intentions. Consumer's perception of ease of use and usefulness using large household products positively impacts behavioural intention for ongoing use of that product.

## **TIIVISTELMÄ**

Lappeenrannan–Lahden teknillinen yliopisto LUT

LUT-kauppakorkeakoulu

Kauppätieteet

Vishaal Sood

### **Siirtyminen uusiutuvaan energiaan - Kuluttajien näkemys suurista kotitaloushankinnoista**

Kansainvälinen Liiketoiminta ja yrittäjyys / Kauppätieteiden pro gradu -tutkielma

43 sivua, 8 kuvaa, 8 taulukkoa ja 4 liitettä

Tarkastajat: Professori Mikko Pynnönen ja Professori Mika Immonen

Hakusanat: TAM, suuret kotitaloushankinnat, kuluttajat, energia

Tutkimus tutkii kuluttajien energiankulutusta tutkimalla suuria kotitaloushankintoja. Tutkimus kuluttajien asenteista energiankulutukseen ja siten kotitalouksien suuriin ostoihin on ajankohtainen. Kuluttajien käyttäytymisessä tarkastellaan helppokäyttöisyyttä ja käyttäytymisen vaikutusta.

Tutkimusmenetelmä oli laadullinen tutkimus, ja tulos analysoitiin SPSS-tilastollisella menetelmällä. Tiedot kerättiin huhtikuusta kesäkuuhun 2020 pohjoisella periferiällä ja arktisella alueella. Tulokset osoittavat, että kuluttajien havaitsemalla käytöksellä ja helppokäyttöisyydellä on tärkeä rooli suurten kotitalousostojen ostamisessa. Kuluttajien asenteet ja tavat tarkentavat aikeita toteuttaa. Tämä opinnäytetyö viittaa siihen, että riskit ja kokonaiskustannukset ovat tärkeimmät tekijät, jotka vaikuttavat suuriin kotitalouksien ostoihin. Valtion kannustimien on kuitenkin osoitettu vaikuttavan kotitalouksien kulutukseen.

Tulos kertoo, että suuret kotitalouksien ostot vaikuttavat positiivisesti käyttäytymisaikeisiin. Kuluttajan käsitys helppokäyttöisyydestä ja hyödyllisyydestä suurten kotitaloustuotteiden avulla vaikuttaa myönteisesti käyttäytymisaikeeseen jatkaa tuotteen käyttöä.

## ACKNOWLEDGEMENTS

I remember back in the days when I finished my Bachelor Thesis. I thought I would not want to do a Master's Thesis. It has been a true journey and a great learning experience. Now, student life has come to an end. I am grateful for the wonderful LUT and the memories I have had in Lappeenranta. I will cherish those memories.

I want to thank my supervisors Mikko Pynnönen and Mika Immonen, for giving me the support and independence to write this thesis. It has been a unique and exciting approach. I would also like to show my gratitude to professors, teachers, and other staff members in LUT. I want to thank my fellow students and friends who have made my university experience joyful.

I would also like to thank my family for giving me the support. Mom & Dad, I finally made it. Thanks to my little sister's. Also, thanks to my relatives in Sweden.

*Vishaal Sood*

*1<sup>st</sup> November 2021, Helsinki*

## Table of Contents

INTRODUCTION .....	1
1.1 Background .....	2
1.2 Research questions .....	5
1.3 Theoretical framework .....	5
1.4 Definitions and delimitations .....	6
1.5 Research methodology .....	8
1.6 Structure of the research .....	9
LITERATURE REVIEW .....	10
2.1 Theory of Planned Behaviour .....	10
2.1.1 Beliefs .....	11
2.1.2 Attitudes .....	11
2.1.3 Subjective norm .....	12
2.1.4 A perceived sense of control and intention to perform the function.....	13
2.1.5 Criticism and observations on the TPB-model mentioned in the studies .....	14
2.2 Technology Acceptance Model .....	16
2.2.1 Establishment of TAM.....	16
2.2.2 The Technology of Acceptance (TAM2).....	18
2.2.3 Criticism of TAM.....	21
2.3 The Unified of Acceptance and Use of Technology (UTAUT).....	22
2.4 Extending TAM in Household Purchases .....	24
DATA AND METHODOLOGY .....	25
3.1 Case project.....	25
3.2 Data collection methods.....	26
3.3 Data analysis and methods.....	30
3.4 Measure and methods.....	34
3.5 Reliability and validity .....	35

3.6 Measure development .....	36
FINDINGS .....	37
4.1 Descriptive statistics of the model variables .....	37
4.2 Discussion of the findings .....	39
CONCLUSIONS .....	42
5.1 Limitation and future research .....	43
LIST OF REFERENCES .....	44
APPENDICES .....	50
Appendix 1 – Explanatory Variables .....	50
Appendix 2 – Variable Descriptive Statistic .....	51
Appendix 3 – Annual Income - Country Wise .....	52
Appendix 4 – Education Difference by Gender .....	54

## **LIST OF SYMBOLS AND ABBREVIATIONS**

NPA – Northern Periphery and the Arctic

TAM – Theory of Acceptance Model

TPB – Theory of Planned Behaviour

UTAUT – Unified Theory of Acceptance and Use of Technology

TRA – Theory of Reasoned Behavior

## INTRODUCTION

*“Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

*Gro Harlem Brundtland 1987*

Consumers are getting more aware of their environmental habitat. Environmental awareness is increasingly driving our daily choices. Limited resources on Earth increasingly drive the sustainable development of our choices. What kind of footprint do we leave for future generations to raise questions? Earth’s limited resources are causing humanity to think of alternative solutions for consumers. Consumer attitudes and habits refine, guide, and change this behaviour. (Bartel & Hoogendam (2011)

According to Nikolaos (2016), consumer buying behaviour is something that the consumer does not often deliberate. Some may make their purchases at random, while others may have clear motives when buying a particular product or service. Consumers can influence sustainability preferences according to their beliefs. Implementing consumer sustainability purchases starts with examining their motives and attitudes.

The thesis examines how consumers consider sustainable incentives in purchasing decisions by the given incentives. In the thesis, the pre-gathered questionnaire was examined and understood based on which the answers were compiled. The study reveals what determines the choice of the purchasing decision. The study also sought to find out how consumers demographic affects purchasing development.

The introduction of this thesis presents the framework by giving comprehension on the topic, defining the research gap and the aspiration of this thesis, and presenting the research questions used to answer the query based on the research gap about the consumer’s environmentally friendly attitude is in consumption patterns originating from a questionnaire that was collected in Northern Periphery and Arctic (NPA) area. Also, interpretation and delimitations are conferred, as well as the design of this thesis.



The thesis originated when consumers' consumption habits were sought to explore hydrogen energy supply opportunities. Hydrogen-related research questions were challenging for the respondents, so the questionnaire focused on large household purchases. This thesis's idea arose from the hydrogen Utilisation & Green Energy (HUGE) project. The project is part of the Northern Periphery and Arctic (NPA) program, under priority Axis 3 - Energy Effectiveness & Renewable Energy. The HUGE project aims to recognise the potential of green hydrogen energy in remote rural areas in different home orders, transportation, and industries (HUGE Project). In a later chapter, we will explain more about the HUGE project.

## **1.1 Background**

Hydrogen cannot be considered an actual energy source, as it is not found as such on Earth naturally; it must always be produced. Therefore, it is better to talk about hydrogen as an energy carrier.

Renewable hydrogen is one answer to the challenges of combating climate change. It is produced by electrolysis with renewable electricity. Its versatility can be used directly to reduce emissions in many industries where it is not easy to reduce carbon emissions, such as the iron and steel industry and long-distance transport. It can also be combined with recovered carbon dioxide to produce biofuels and chemicals in place of fossil-based materials. (Butcher 2020; Turner 2014)

Although renewable hydrogen has much potential, its commercialisation has been challenging. Its production technology requires much capital, and the production process consumes much electricity. Sufficiently low-carbon electricity has not been available, and the regulatory framework to support development is not yet complete. However, recent developments have moved in a more promising direction. (Turner 2014)

Significant progress was made when the European Union (EU) announced its strategy to expand hydrogen as part of its commitment to carbon neutrality by 2050. Renewable energy is expected to reduce the carbon footprint of EU energy consumption significantly, and hydrogen can reduce the most complex emissions. Attitudes towards hydrogen have changed significantly in the world since 2010. The EU has become more proactive; legislation is moving forward, and, above all, the availability of renewable energy is increasing, and costs are falling. (FCH Europa 2019)

Rogner (1998) cited that hydrogen could produce in various processes, but the greatest desire is to produce renewable hydrogen by electrolysis using electricity from carbon-free energy sources. Basic energy technology has been around for a long time, but affordable renewable energy development lacks behind. Also, the fight against climate change has lacked solid political support. The decline in wind power costs to a competitive level took more than ten years, and the same trend will be seen with hydrogen if investment in green hydrogen does not increase significantly. A lot of renewable or zero-emission energy is still needed to increase the use of technology. However, a clean hydrogen economy is starting to evolve because there are many different operators worldwide. (McDowall & Eames 2007)

Interest in hydrogen has been growing in Europe in recent years, and companies and governments have explored the possibility of joining the hydrogen economy. It takes time to build infrastructure, draft legislation, develop companies in the sector, and provide a solution for users, who will ultimately have to invest in hydrogen as a raw material or process medium. (Butcher 2020)

There is a growing interest in energy-intensive sectors such as refining and steel production and shipping and aviation, as they need to aim for low carbon and consider hydrogen as one possible solution. Hydrogen is also attractive because it can be produced anywhere if cost-effective carbon-free energy and possibly suitable infrastructure are available. Also, as costs and infrastructure allow, hydrogen can be transported from one destination to another, eventually becoming a globally tradable commodity. (Mulder et al., 2007)

Margeta & Glasnovic (2010) research says that Europe has an important role to play here. It has the necessary projects, such as a green development program, going much further in environmental matters. It is creating a desirable market that makes hydrogen a good, investment-friendly business. Europe now could take the lead in this economy and technology.

Sustainable development is a continuous and controlled process of societal change globally, regionally, and locally to secure good opportunities for the present and the future, which means that the environment, man, and economy represent the republic's leader in arrangement-making and operation.

Sustainable advancement, for example, was discussed at the UN Brundtland Commission in 1987. The Commission's work conceives awareness to a process that has progressed interactively with states, municipalities, and the international community. Sustainable development policy has

gradually emerged and become more extensive.

*Sustainable development is...*

*... The environment, man, and the economy are considered on an equal footing in decision-making and action.*

*... Thinking over generations.*

*... Adapting our operations to the limits of nature's ability to regenerate and carry capacity.*

*... Addressing the challenges of population growth, poverty, food, and health.*

*... Promoting gender equality and education.*

*... Global activities that be influenced by all.*

*... Divided into ecological, social, and economic sustainability.*

(Brundtland Report 1987)

There has been a growing debate about ecology and green values in recent decades, and especially in the 21st century, ecological values have grown in importance for both individuals and businesses in the world of values. However, researchers have found that people may not function effectively both ecologically and inevitably. (Eagan et al., 2001)

The conclusion of the consumer's purchasing process is based on the purchasing attitudes and beliefs, and many different factors influence the final purchase decision. Factors influencing consumer behaviour have been extensively studied around the world since the last century. A person's consumption behaviour is altered by the culture and people around their characteristics, life situations, and various psychological factors. The purchase process is also changed by the importance of the commodity to the consumer and purchasing situation. Besides, in the current mature market, the importance of product availability has been emphasized. (Shwu-Ing & Chen-Lien 2009)

A commodity that is a good or service can be divided into categories. A good is a merchandise that consumers use to fulfil their own needs, such as cars, food, and clothes. Service is intangible such as dining at a restaurant. Needs can be long-term or short-term, in which case the consumption benefit can be divided according to duration or one-off consumption. Large household consumption commodities include cars and household appliances, the acquisition costs of which are high and have longer-lasting properties than food, a disposable commodity. (Nerlove 1960)

## **1.2 Research questions**

This research aspiration is to understand consumers' perception of large household purchases based on given research data. We want to understand how the consumers evaluate themselves as a decision-maker when purchasing large household commodities. The main research question of this study is:

*“What are the consumer's perceptions on large household purchases?”*

The main research question has the following sub-question:

*How social economic status influence on large household purchases?*

## **1.3 Theoretical framework**

The theoretical framework (Figure 1) is built by understanding that numbers of factors influence behavioural intention. Understand consumer purchasing attitudes, perceived usefulness and perceived ease of use are examined in the Technology Acceptance Model (TAM). The approach to understanding consumer behaviour is also examined with the Theory of Planned Behaviour (TPB) which provides insights into three core components of the model: attitude, subjective norm, and perceived behaviour control. The newer model, The Unified Theory of Acceptance and Use of Technology (UTAUT), is a more unified approach to define user intentions. With the theoretical literature, the objective is to understand the data and insights into consumers' purchasing behaviour.

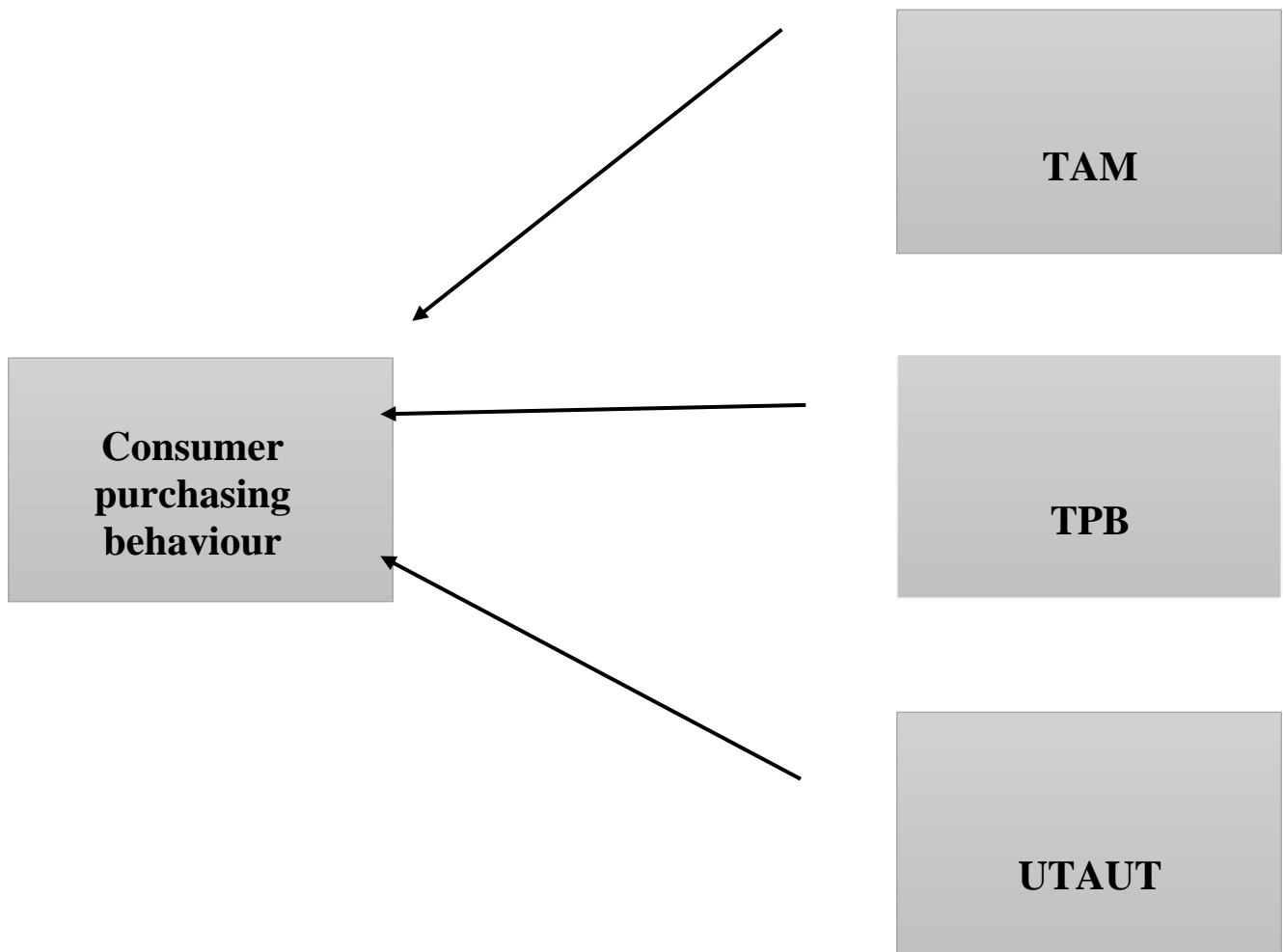


Figure 1: Theoretical Framework

#### 1.4 Definitions and delimitations

The thesis aims to examine consumers’ perceptions of large household purchases and map the consumers’ attitudes. We will study whether the perception influences alternative purchasing preferences on large household consumption. The data is collected in the NPA region. In NPA, the following countries are Finland, Ireland, Iceland, Sweden, and Norway and Northern Scotland. A comparison between countries is not done and is excluded out. Consumer perception is limited to households—household forms from family members who manage their economy. We have left out corporate and public sectors in consumer perception, and the examination is done within the private sector. Large household purchases have been limited to durable materialistic goods. Intangible goods are left out of the study. Also, the environmental perspective is delimited out.

The theories that are used in the study are to help understand consumer purchasing perception and their sensitives to large households’ goods. Large household goods are durable goods that can be used

repeatedly or continuously over significantly more than one year. Consumer durable goods such as cars, refrigerators, washing machines, and televisions often have a comparatively high purchase cost. Semi-durable goods are defined out of this research. The study background and data compilation are further interpreted in Chapter 3.

The outlook of this research comprises consumer perception of large household goods. An overview of consumer perception is presented. The research aims to understand the effects of consumer perception on large household purchases and the implementation. Consumer perception is influenced by different variables that are examined in the thesis. The topic covered in the study field is Theory of Planned Behaviour, Technology Acceptance Model, the Unified of Acceptance and Use of Technology. These key terms are comprehended according to their definitions below:

#### Theory of Planned Behaviour (TPB)

*“Intentions to perform the behaviour of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour” (Ajzen 1991, 179).*

#### Technology Acceptance Model (TAM)

*“Theory that explains how users come to accept the use of technology determined. The model suggests that when users are presented with new technology, several factors influence their decision about how and when they will use it” (Silva 2015, 205).*

#### The Unified of Acceptance and Use of Technology (UTAUT)

*“According to UTAUT, performance expectancy, effort expectancy, and social influence were theorized and found to influence behavioral intention to use a technology, while behavioral intention and facilitating conditions determine technology use” (Venkatesh et al., 2011, 528).*

## Large household goods

*“A large household goods are based on whether the goods can be used only once or can be used repeatedly or continuously over significantly more than one year. Consumer durables, such as cars, refrigerators, washing machines and televisions, often also have a relatively high purchase price and are long-lasting.”* (Grewal et al., 2014, 101)

### **1.5 Research methodology**

The nature of the data and the statistic, we will use a quantitative research method. It is the most convenient method to study the research inquiry. This study’s empirical section was performed using a one-way analysis of variance analysis (ANOVA) test. The data is analysed by using SPSS. It is a commonly used method for comparing data from distinct populations. There are two requirements for using the one-way ANOVA approach: the test data is gathered self-sufficiently from the populations, and all populations have the same variances. The data is gathered from different sources, and unusual variations may exist. (Liang & William 2007, 205) In the ANOVA analysis, the variables regarding consumer perception have five variables that we will examine. We will examine consumer perception of large household purchases by understanding the statistical data. The characteristic of data One-Way ANOVA is applicable for this.

## 1.6 Structure of the research

This study has five main chapters that will accordingly be presented. The introduction chapter presents the background and research gap, which follows the research questions. After this, a prospectus of the literature review follows the theoretical framework of this thesis. The crucial definitions have also presented the custody and methodology of the thesis. The second chapter of the thesis focuses on different theories, which helps us understand consumer perception. The third chapter presents the empirical part, where research background, data collection methods, analysis, and development are presented. The fourth chapter presents the findings of the thesis, comprising findings. The fifth chapter, which is the last, presents conclusions and a summary. The design of this thesis is presented below in figure 2.

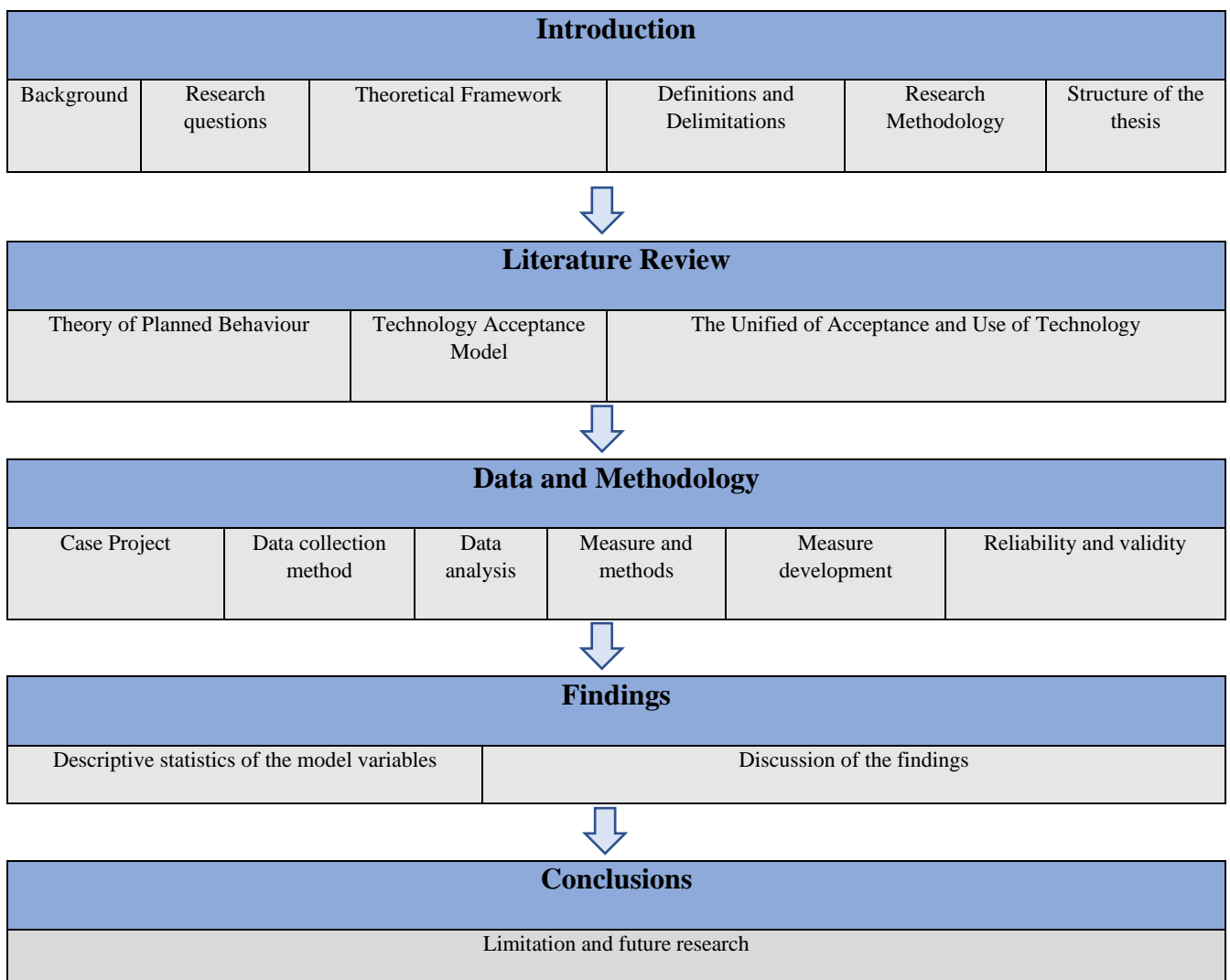


Figure 2: Structure of the thesis



## **LITERATURE REVIEW**

This chapter examines consumer perception adaptation with the benefit of different theories. The literature review covers three main theories: Theory of Planned Behaviour, Technology Acceptance Model and The Unified of Acceptance and Use of Technology.

### **2.1 Theory of Planned Behaviour**

The Theory of Planned Behaviour, which we will use the abbreviation TPB (Ajzen 1991), extends the Theory of Reasoned Action (TRA). TRA was required to develop because the theory did not consider behaviour that is not self-dependent. The TRA model is often used to predict behaviour in situations where human behaviour is completely dependent on one's will. The TPB anticipate better behaviour when personal feelings are not completely under his or her control. (Madden, Ellen & Ajzen 1992)

TBA-model has been successfully used in examining consumer adaptation, and the theory elements are well explained in the purchasing model. However, self-regulation is an essential part of human behaviour and forms and a crucial part of the TPB model. Self-regulation is knowledge-based (cognitive); the TPB is also the basis for a rational thought process. A consumer must intend to perform a designated function before it can be realised as a proper implementation. (Ajzen 1991)

The TPB model comprises three independent aspects that explain the intention to execute functions: attitudes, subjective norm, and perceived sense of control. The main rule is that the more conclusive the person's attitude is towards behaviour and more favourable, the person believes they can transform a particular function into an act. The relative importance of the three variables varies depending on the situation. (Ajzen 1991) Tarkiainen & Sundqvist (2005) noticed that consumer behaviour could be predicted based on intent, leading to attitudes, subjective norms, and perceived behaviour control.

The TPB model can only interpret consumers' beliefs on relevant life events or other background factors. Interest is how the intention is converted to behaviour.

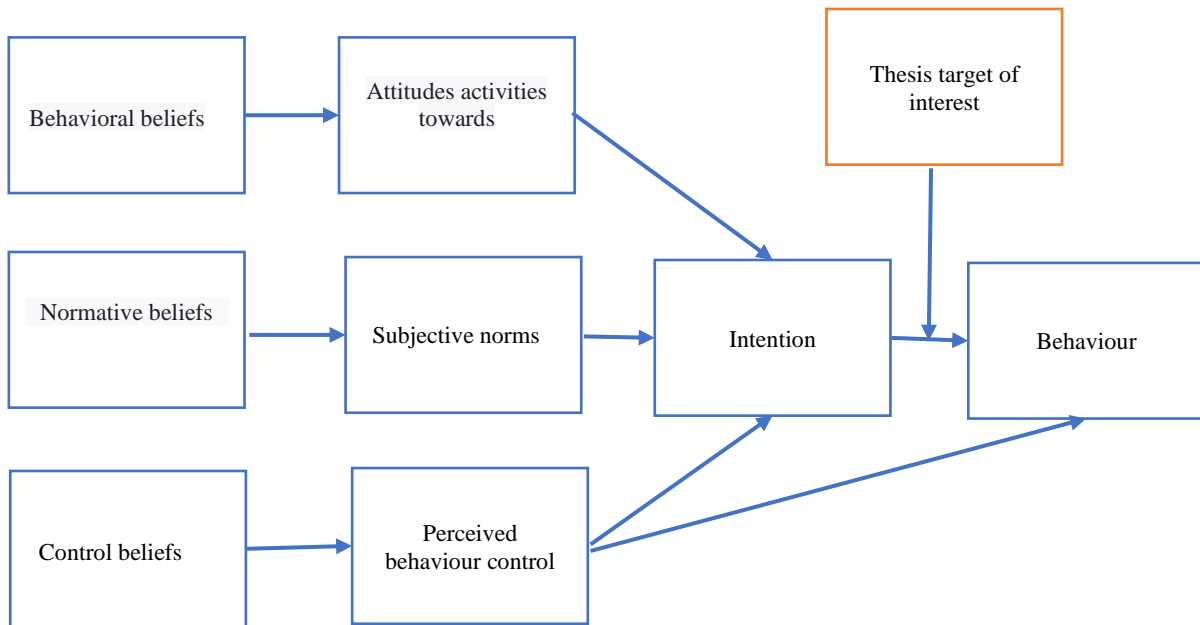


Figure 3: Theory of Planned Behaviour (Urban 2012)

### 2.1.1 Beliefs

Attitudes consist of the beliefs that people have about a particular subject. Humans tend to favour behaviours that have favourable consequences and form attitudes that are not desirable, which we associate with unfavourable outcomes. Beliefs are often salient, of which only a few are affected by current behaviour. (Ajzen 1991)

After performing a specific function or decision, a person can expect to experience pain, pleasure, remorse, fear, or other emotions are linked to those attitudes. Behaviour outcomes can be expected to be positive, negative, or neutral. According to the theory, human behaviour can be predicted by examining other variables of manner, others' expectations, and beliefs attached to a sense of control. Admittedly, the theory does not take a position on what these beliefs consist of. However, background factors include demographics such as age, education, income level, and social media exposure. (Ajzen 2011)

### 2.1.2 Attitudes

Attitudes towards a particular feature can take many forms. One of the most common models to illustrate the formation of attitudes is a three-tier model brought by Rosenberg and Hovland in their

scientific research in 1960. A model in which attitudes are seen to consist of the cognitive, affective, and conative parts. The cognitive part, the informational part, develops when the consumer is exposed to marketing material. This emotion (affection) towards a particular thing is formed, ultimately manifesting itself as a function (conative part). (Bagozzi, Tybout, Craig & Sternthal 1979; Breckler 1984) This function appears in consumer behaviour with the intention of the consumer to purchase a particular commodity. Studies have found that a persuasive message that seeks to influence a person's beliefs on a particular object is affected by attitudes about that object. (Ajzen 1991) However, attitudes have been found to be weakly predictive of the actual consumer behaviour in the purchasing situation (Vermeir & Verbeke 2006).

The deeper values of the person are developed from attitudes. Value is an individual's organised understanding of how a person wants to act, used as a decision-making standard in different situations. Values can be, for example, a sense of belonging, security, appreciation of others, the joy of life and self-respect. Studies have shown that people whose values include the common good rather than those who only pursue their interests do not participate in environmental and social responsibility choices. Environmental decisions generally are attached to well-being—both humans, animals, and the environment. Generally, examining people's attitudes can predict their purchasing behaviour. Attitudes do not tell how often the consumer is going to purchase. (Tarkiainen & Sundqvist 2009; Chrysohoidis & Krystallis 2005) It has been discovered that attitudes implement the ex-ante evaluation. The assessment has a direct role in purchasing decisions. In other words, the assessment may have a restorative effect on the purchasing decision. (Hsu & Chen 2014)

### **2.1.3 Subjective norm**

It is assumed that an individual's behaviour is affected by their morals and normative factors, which are transmitted by social influence and attitudes. Persons compose social influence own beliefs on what is right and what is wrong in a particular group. It can be referred to as a *subjective norm*. Studies have found that subjective norms strongly link attitudes, which refers to the social environment influencing individuals' attitudes. (Arvola et al. 2008; Tarkiainen & Sundqvist 2005)

Tarkiainen & Sundqvist (2005) have established the relation between subjective norms and attitudes. They examined that the more positive person relates to something that matters to them, it has a more significant influence on individuals inner circle (family & friends). The concept of the subjective

norm has been perceived as too restrictive; for example, Urban, Zverinová & Scasny (2012) suggest that descriptive norms, which means individuals understand what others are doing, should be included in the model because they can influence the intention to perform. Subjective norms and descriptive norms may contradict each other. An example of this is a parent who denies their child from smoking tobacco and drinking alcohol, even if they are doing it. Subjective standards are crucial explanatory factors when it comes to anticipating consumer behaviour and especially on durable goods. (Olsen 2007; Dean et al. 2012; Lodorfos & Dennis 2008) For example, in China, the pressure of facial loss (embarrassment) is the single most significant factor that influences a particular branded product. (Chen et al. 2014) As mentioned, others' opinions play an essential role in formatting consumer habits in Finland. (Arvola et al. 2008)

#### **2.1.4 A perceived sense of control and intention to perform the function**

According to Ajzen (2002), the intention to perform and perform an activity has a notable difference with a perceived sense of control. The feeling of control can be split into two components: 1) *perceived self-efficacy* (internal manner), which refers to ease or difficulty in operating a particular action and 2) *perceived controllability* (external factors), which refers to how much the person feels the result independent on his or her actions. A perceived sense of control may also be affected by previous experience behaviour, which influences subsequent behaviour. Past behaviour has no causal relationship with later behaviour, and therefore past behaviour cannot reliably measure habit. (Ajzen 1991)

The sense of control experienced in the model comprises the factors that enable desired activity, such as skills and collaboration. The perceived sense of control plays a significant role in the TPB model. A person needs to know the activity and confidence in their abilities to perform the desired function. If the resources required to perform a function have changed or the behaviour pattern includes new functions, the perceived sense of control no longer anticipates the behaviour. (Ajzen 1991)

Perceived self-efficacy refers to individuals' inner experience, such as their abilities or willpower to buy the commodity. Many studies have shown that too difficult purchasing decisions may cause consumers to postpone or reject their decision. Performing a specific decision is an opportunity to perform it, i.e., they have a synergy effect. (Tarkiainen & Sundqvist 2005; Olsen 2007)

Descriptive norms impact attitudes, subjective norms, and intention, so it is justified to include them in the extended TPB model. Researchers were unable to deduce how the descriptive norm affects the perceived sense of control. (Urban et al. 2012)

From a purchasing perspective, it is essential to know if a person is experiencing a particular activity voluntarily or influenced by other factors. Madden et al. (1992) conclude their research by following: “*if a person is feeling low perceived control, it can be affected and thus change the ultimate behaviour.*” Therefore, for example, a particular product can be placed at the discretion of a consumer through marketing means.

The relative impact of each independent factor on intent is always case-specific. If the behaviour is not very resource-intensive (i.e., it is easily feasible), the behaviour can be predicted accurately based on intentions (Ajzen 1991). If the behaviour is experienced to be self-reliant, the intention to perform that function plays a crucial role. There is no intention to perform a particular activity if they do not feel that they have sufficient resources for the activity, i.e., money. Here, in this case, it is more beneficial to provide the person with the proper means to increase absolute control over a particular activity. (Madden et al. 1992)

### **2.1.5 Criticism and observations on the TPB-model mentioned in the studies**

The Theory of Planned Behaviour has received criticism for not considering the influence of a person's emotions and moral choices. In theory, one of the most controversial assumptions is that attitudes are based on beliefs or thoughts that the person has toward the object. The theory has also critiqued not considering a person's morality when making decisions, i.e., whether a person's emotions are right or wrong. However, it examines the anticipation of the behaviour mainly through social norms. What kind of external pressure does a person have? (Arvola et al. 2008)

For example, the concept of *moral licensing* has attracted the researcher's interest. It is generally assumed that a person has a certain level of moral ideal to which an individual strives. After a lousy activity, a person wants to compensate it with something considered good activity. In moral licensing, a person can justify an act against its morals after good deeds because individual has risen above its moral base. (Klotz & Bolino 2013)

Attitudes are more likely to predict behaviour when a person has previous experience of the subject at hand, but only up to a certain point. Therefore, an individual's feelings, morals and reviews of a product should be considered when are seeking to predict an individual's motive to purchase durable goods. (Arvola et al. 2008) Urban et al. (2012) mention in their research that perception of what others are doing is a significant factor in anticipation and should implement the accordingly TPB-model. The consumer is more likely to perform a specific function if it appears as a natural act in their eyes. The consumer chooses durable goods accordingly to how their incentives promote. Sometimes, people may form their perceptions of other actions (imaginary norm) based on what others say about their actions (subjective norm).

According to Ajzen (2011), emotions and assessments of a behaviour's outcome affect the object in two manners. First, they act as background circumstances shaping behaviour, others' expectations, and control beliefs attached to emotions. For example, people in a positive state of mind estimate that certain behaviours are more likely to result in positive results. Second, emotions associated with an object can highlight behaviour patterns that a person already has in their memory.

The theory is a comprehensive approach to justified action that considers environmental factors influencing skills and abilities. Disapproval of Theory has focused chiefly on its usability in health psychology research, and there are no barriers to using it in the study of entrepreneurial intentions presented in the research.

## **2.2 Technology Acceptance Model**

The Theory of Technology Acceptance Model, which we will use the abbreviation TAM, seeks to predict people's readiness to adopt the technology. The introduction of the new theory can be considered published by Davis's in 1985. (Venkatesh et al., 2003) TAM is a theory that can estimate how well users accept new technology usage and predict actual usage. Initially, the TAM was matured to study the acceptance of information systems. (Davis 1989)

More research on technology acceptance and development has since been published. In this chapter, the combined theory of technology acceptance and usage is examined.

### **2.2.1 Establishment of TAM**

The need to comprehend the acceptance of technology arose as technology became part of people's daily lives. The forerunners of the TAM can be considered the theory of reasoned action in psychology (Ajzen & Fishbein 1980) and the extension of planned behaviour theory (Ajzen 1985), which seek to explain and predict human decision-making. (Marangunić & Granić 2015)

The Theory of Reasoned Action (TRA) is implemented to anticipate how individuals behave based on past attitudes and intentions. TRA assumes that individuals are rational in decision-making and utilise systematically available information to assist the decision-making process. According to the Theory, the behaviour's most significant predictors can be considered behaviour intentions instead of attitude. (Ajzen & Fishbein 1980)

However, TRA limitations had seen, especially among people with little control over their behaviour and attitudes. Ajzen expanded the theory to include perceived behaviour control when creating the theory of planned behaviour (TPB). This theory extension explains how people have a behavioural intention, but the actual action is inhibited. In theory, attitude, subjective norm, and behaviour control all have significant albeit different effects on human behavioural intention. (Ajzen 1985) However, since even this theory concludes that people are rational and decide based on the knowledge available, it does not consider situations where a person's motives are unconscious. (Marangunić & Granić 2015)

Although the TRA and TPB are helpful in many cases, studies were found that these theories cannot implement extensively. Therefore, Fred David started to create a new theory called the Theory of Acceptance Model (TAM). (Marangunić & Granić 2015)

TAM has two significant changes over previous TRA and TPB models; the subjective norm has not been considered in predicting actual behaviour, but only in the person’s attitudes towards it. Second, Davis (1985) identified two main factors in predicting the attitude towards using the system a) *perceived usefulness* and b) *perceived ease of use*. The original TAM model is shown in figure 4.

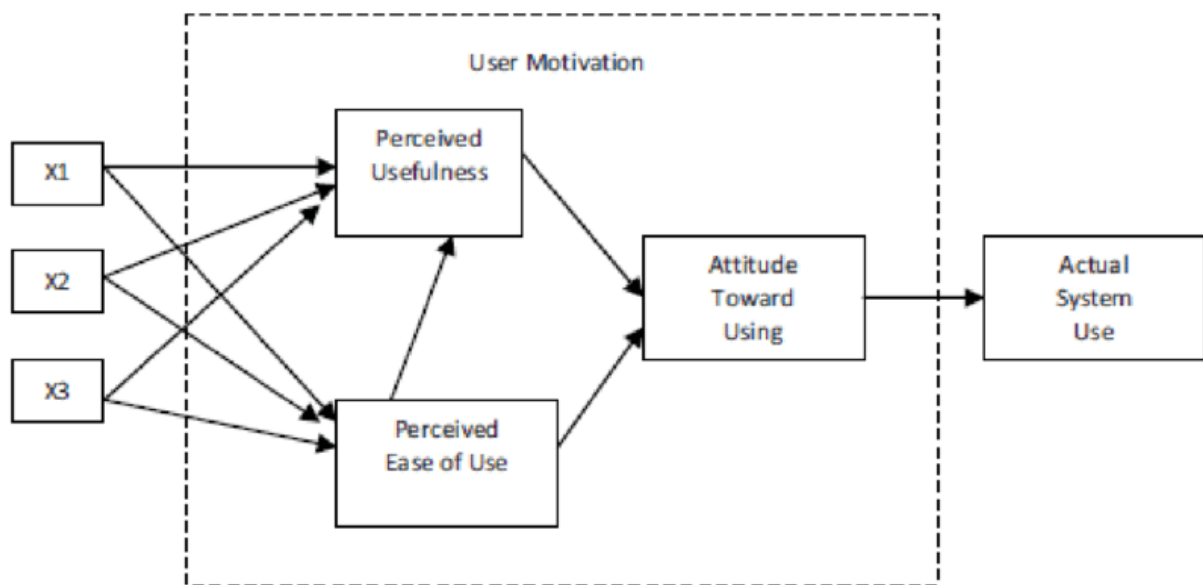


Figure 4: Original Technology Acceptance Model (Davis, 1986).

According to TAM, several different factors influence when and how the system is used. The attitudes towards technology are formed based on the perceived usefulness and perceived ease of use experienced on the model. External factors influence these. The perceived ease of use means the individual’s lack of effort in using the system. Perceived usefulness means the individual’s experience of the application’s benefits in connection with the work. The perceived ease of use is related to the perceived usefulness so that the ease of use increases the actual system usage. The system’s perceived ease of use does not increase its attitude if it is not valuable. (Davis 1989)

In the original TAM, attitudes toward behaviour were crucial in explaining the intent of the technology. Researchers found in their studies that perceived usefulness and perceived ease of use



alone do not clarify the attitudes against manner, but perceived usefulness has been seen influencing the intended use, which predicts actual behaviour. Later Davis created a model in which attitudes toward use are entirely excluded from the model. (Davis 1989) This redesigned TAM is shown in figure 5.

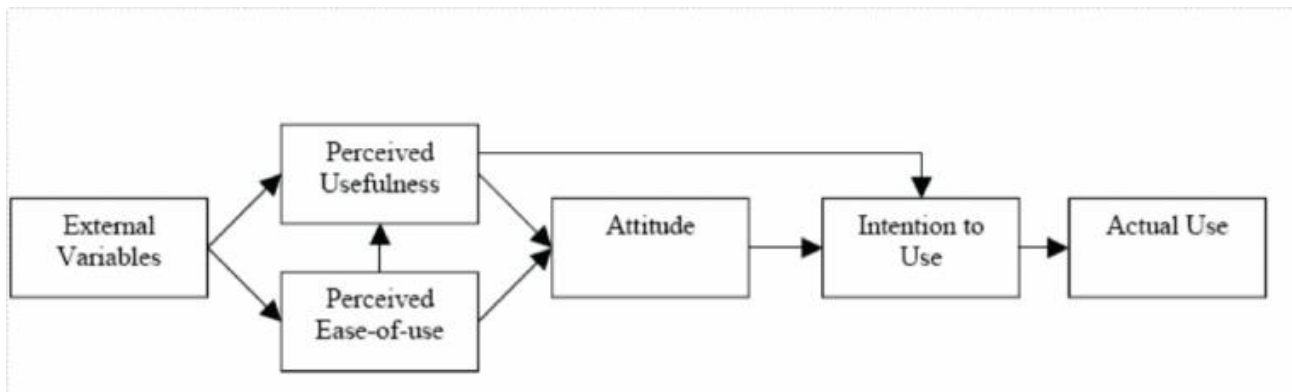


Figure 5: Updated version of TAM (Davis 1989)

User beliefs about the behaviour can be determined by external factors such as advertisements or sensitives. Perceived ease of use and usefulness affect an individual’s willingness to choose environmentally friendly, durable goods. This attitude and perceived utility influence behavioural intent, which in turn predicts actual decisions. (Davis 1989)

### 2.2.2 The Technology of Acceptance (TAM2)

Later researchers have been specified the theory as TAM2. In figure 6, we can see how the refined model, social impact actions, and cognitive instrumental processes have significantly influenced users’ acceptance of technology. Subjective norm, image, the significance of the task and demonstrability of results affect the experience of the technology’s usefulness. Voluntary use has impacted the intention to use technology, both directly and through a subjective norm. (Venkatesh & Davis 2000)

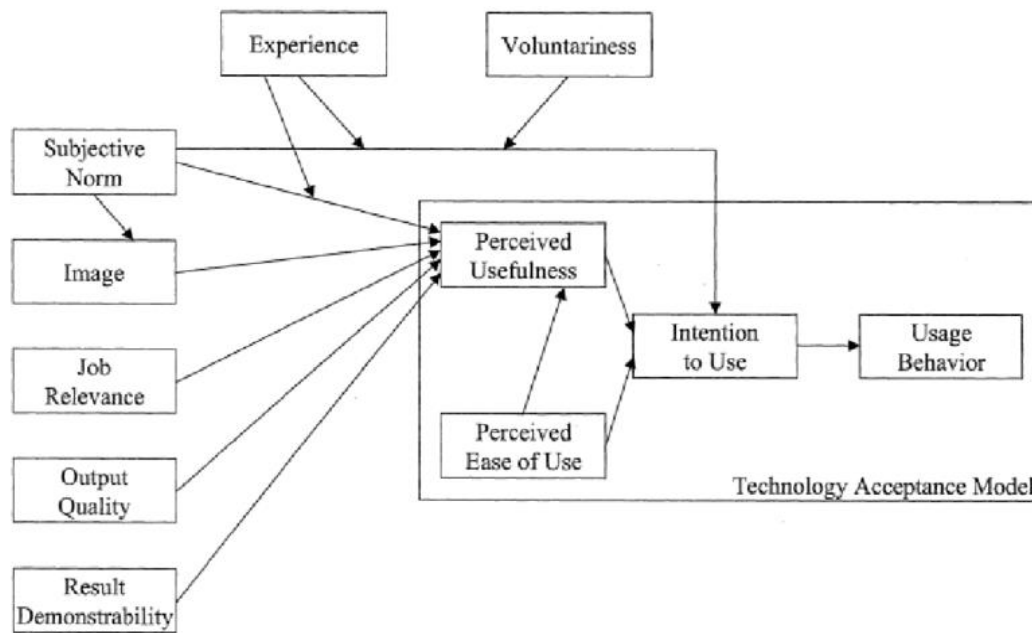


Figure 6: Technology Acceptance Model (TAM 2) (Venkatesh and Davis, 2000).

Subjective norm, image and job relevance is recognized as a group of a social influence process. *Subjective norm* refers to an individual’s perception of what most people think they should or should not perform the behaviour in question. *Image* is the degree to which someone thinks that using a particular system will affect their social status. *Job relevance* is the user’s perception of the extent to which a user benefits from technology usage. The *output quality* is the increase that technology gives to the quality of the work result. *Result demonstrability* means that a person can describe the system’s advantage to their job performance. *Voluntariness* is expanded to make the change between obligatory and voluntary usage of a technological invention. *Experience* approaches after implementation of the system through direct experience of exploiting the system. (Venkatesh & Davis 2000)

Figure 7 TAM3 was developed because previous literature on TAM did not address the importance of measures that assist the organization’s management in decision-making in a technology deployment situation. There was a need for knowledge about what different measures can influence previously known factors related to the acceptance and use of technology, such as the perceived ease of using the technology and its usefulness. (Venkatesh & Bala 2008)

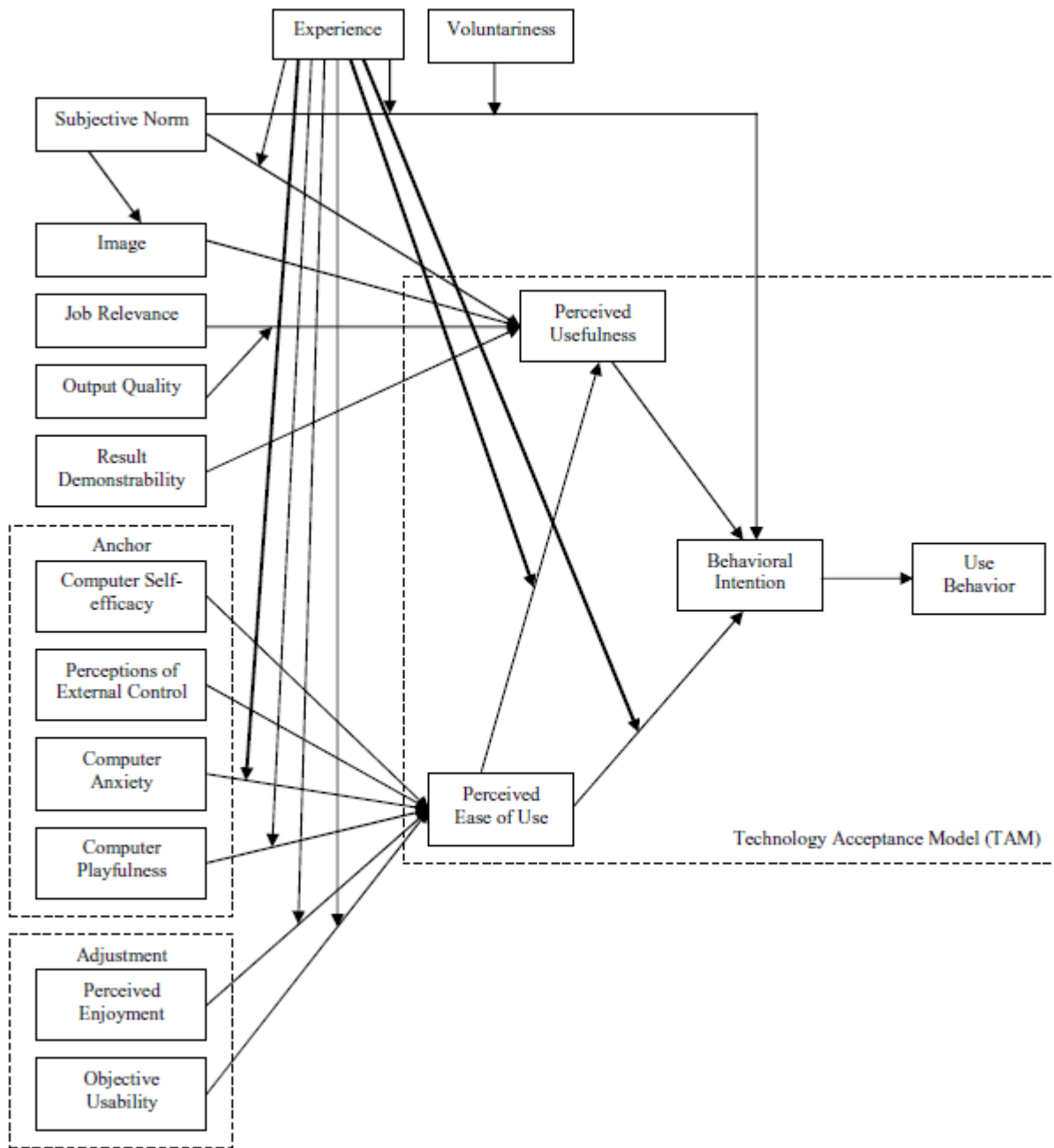


Figure 7: Technology Acceptance Model (TAM 3) (Venkatesh and Bala, 2008).

According to TAM3, perceived usefulness factors do not affect the perceived ease of use or vice versa. TAM3 presents new connections, such as the effects of involvement on critical relationships. Experience is an essential variable in technology acceptance because individuals’ reactions to information can change over time. These developing perceptions can play an extensive part when an individual decides to continue acting on that behaviour using the system. While initial approval has been crucial, using the system is critical when measuring its real success. Therefore, it is significant

to recognize the impact of experience in technology acceptance. As the experience increases, ease of use in the intention decreases and the influence on perceived utility increases. However, ease of use still significantly impacts the user's reaction to the technology, even if they have much practical experience. (Venkatesh & Bala 2008)

### **2.2.3 Criticism of TAM**

Although the technology acceptance model has been adopted in several studies, it is associated with it. However, there are also challenges to using it. Tiainen et al. (2013) and others have found that there is not necessarily a relationship between perceived ease of use and actual use. In addition, they state that in the case of technological innovations in the communities, a person's decisions to use or not to use technology are ease of use and usability and social factors. (Tiainen et al., 2013)

In addition, the TAM model has been criticized, among other things, for the fact that in its studies, technology users have often reported the amounts of users themselves, and this does not necessarily give an accurate picture of the actual use of the technology (Legris et al., 2003; Lee, Kozar & Larsen, 2003). One of the weaknesses of the TAM model is that the results obtained can be generalized. In addition, the lack of long-term studies is a limitation of the TAM model, as user perceptions and purposes may change over time, in which case no occasional conclusions can be drawn from the results. (Lee et al., 2003)

The technology acceptance model has been criticized (e.g., Legris et al., 2003; Bagozzi, 2007). The effect of perceived utility and ease of use on use intentions has varied across studies (Chan & Teo 2007), and the model has been considered too general and contains too few factors influencing the intention to use (Bagozzi 2007). However, only one study (Bagozzi, 2007) has concluded that the whole TAM model should be forgotten, and technology adoption should be approached from a new perspective. According to Bagozzi (2007), for example, the assumption of intention and action the relationship between the two is not justified, there is no moral theory for identifying the precursors of perceived ease of use and usefulness, and the effect of psychological factors has been weakly or incorrectly considered in the model. Bagozzi (2007), further studies supporting the results were not found, and several researchers have regularly applied and extended the TAM model.

However, Salovaara & Tamminen (2009) point out that despite their limitations, The TAM model can still be helpful to use when the technology understudy does not provide opportunities to use this technology in different ways.

### **2.3 The Unified of Acceptance and Use of Technology (UTAUT)**

The development of the theory TAM continues as researchers have defined a new theory, Unified Theory of Acceptance and Use of Technology (UTAUT). In this model, UTAUT is structured from eight different theories combined, which are the technology of acceptance model (TAM), the theory of reasoned action (TRA), theory of planned behaviour (TPB), integration of technology acceptance model and Planned behaviour (combined TAM and TPB), Motivational model (MM), Model of PC Utilization (MPCU), Innovation diffusion theory (IDT) and Social-Cognitive Theory (SCT). (Tan 2013)

The model of UTAUT is constructed on the following elements: Behaviour, intentional and behaviour factors. The first group includes individual-level moderate factors such as age, gender, experience, and technology's voluntary use. The second group includes factors directly influencing the behavior's intention or conduct, such as performance, expectations, social drivers, and conditions that may support technology use. (Venkatesh et al. 2003) A summary of the critical factors, areas affected, and individual variables are given in table 1.

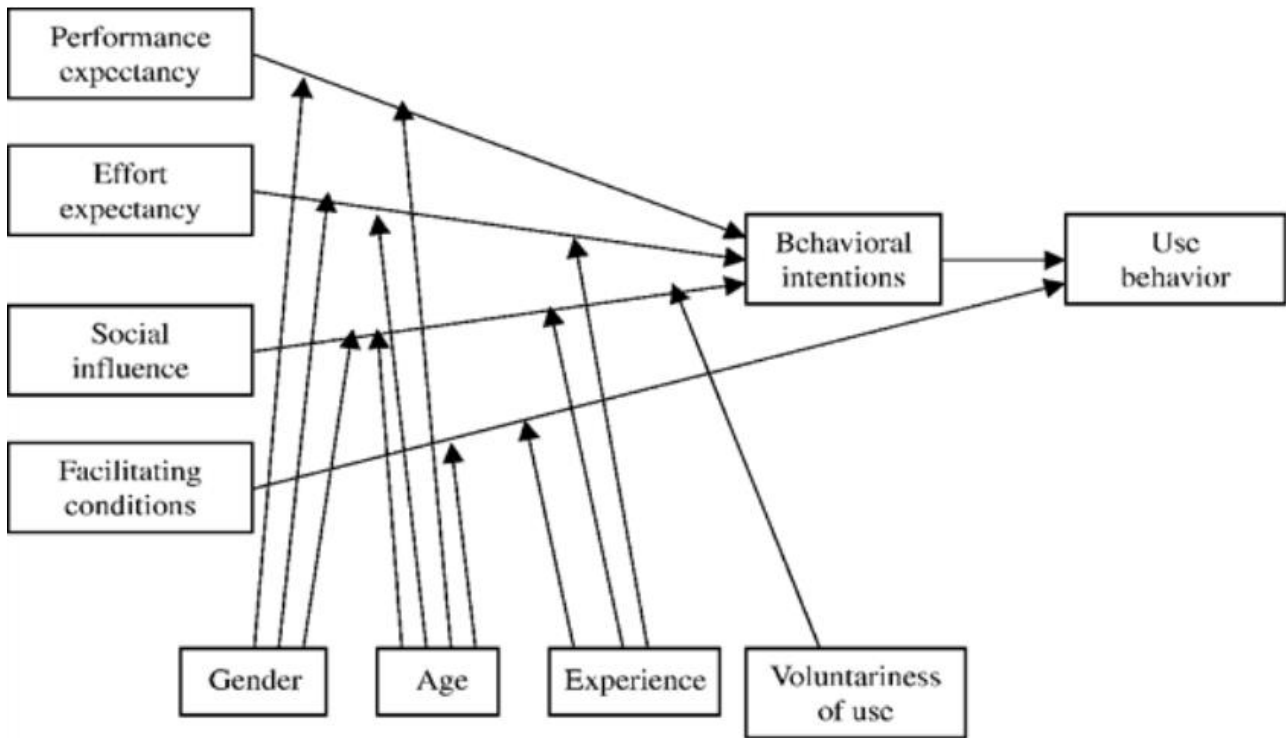


Figure 8: UTAUT model (Venkatesh et al., 2003)

Main factor	Affected areas	Affecting factor
Performance	Perceived usefulness, external motivation, connection to the job, relative benefit, and observable results	Gender, age
Effort	Ease of use, accessibility, not complicated	Gender, age, experience, voluntariness
Social influence	Own and other's beliefs on technology	Gender, age, experience
Conditions	Resources, organization, support, need, experience	Age, experience

Table 1: Factors influencing behaviour (Venkatesh et al. 2003)

The UTAUT model has proven through empirical research that there are three direction factors to behaviour (performance anticipation, the anticipation of effort and social drives). There are two factors for both behaviour (condition and intent). It also affects factors that are experience, age, voluntary and gender into the model. The model indicates that age and gender strongly influence performance expectations behaviour. It is at its most vital for men and young employees. Age and

gender also influence the anticipatory behaviour of the effort. These impacts are more substantial on women and older employees, but these factors decrease as the experience increases. The contribution of social impact is not significant in any area of influence without affecting factors. The role of condition as a factor is only relevant when age and experience act as an operator. In this case, it affects older people at a later stage in their lifecycle. (Venkatesh et al. 2003)

## **2.4 Extending TAM in Household Purchases**

Ofori, Appiah-Nimo and Wright (2019) studied online shopping determinants by extending TAM in their research. They proposed that TAM unified perceived cost and perceived risk, which resolute online shopping intentions and absolute use. The discovery exhibited that ease of use on usefulness had a compelling impact as the model TAM has anticipated the same. Encompassed by independent variables, the perceived cost did not enact on purchase intention. Perceived risk had no clear implications on actual use. However, it had a crucial impact on purchasing intention.

Consumer experience of value perception has been studied from a TAM perspective by Song-Yi and Kyu-Hye (2019). They examined a value-based TAM, developing from classic TAM variables concerning relevant consumer value perception. The positive and negative experience of value perception on consumer's belief was studied. The findings indicated that consumers' positive background had a positive correlation with the commodity they use. On the other hand, consumers' negative experience impedes the commodity they use if they already have opposing beliefs. Consumer's perception of ease of use and usefulness using large household products positively impacts behavioural intention for continuous use of that product.

Household life cycle examined to explain household technology adaption in different household life cycle stages such as marital status, age, and presence of children in the household, differences in purchase patterns across stages and complex interactions. In the household life cycle, purchasing pattern has been identified to be distinct. Younger singles or older couples have different leisure activities. Younger singles could spend more leisure activities such as eating at a restaurant or going to movies. Families and couples could spend more on major appliances such as automobiles for their family's convenience. Income is the crucial variable of household expenditures and household life cycle, reflecting income changes over time. Income level is an influential variable on large household purchases. (Brown & Venkatesh 2005)

Al-Nahdi, Habib, & Albdour. (2015) examined purchasing factors effecting on real estate markets. The subject of the review was effect on attitudes, subjective norm, perceived behaviour control and demographics on the intention to purchasing real estate. Their findings showed that there is a positive significant correlation between attitudes and subjective norms. Perceived behaviour control didn't had that significant meaning.

## **DATA AND METHODOLOGY**

In this chapter, the research context is examined. The data analysis and collection, measurables and methods, measure development and reliability and validity are covered.

### **3.1 Case project**

The Huge project started to raise knowledge of green hydrogen as a feasible energy vector for distant and rural communities in housing, transport, and industry. Many communities in the NPA programme area face difficulties by low economic diversity, peripheral locations, discrete demography, and lack of critical mass, and they have abundant amounts of renewable energy resources accessible locally. (HUGE Project)

The HUGE project aim:

- To provide communities with energy security and independence through a growing awareness and easing hydrogen utilisation from excess renewable energy.
- To increase hydrogen awareness as a feasible energy choice for various end uses in the public infrastructure domain – housing, transport, and industry.
- To facilitate the decision-making and application of public infrastructure and energy storage hydrogen possibilities, suitable for cold atmosphere and dispersed resolutions. (HUGE Project)

The HUGE project will achieve this thought:

- Providing the crucial tools to measure the hydrogen renewable energy chain possibilities in the NPA area and beyond.



- It is increasing willingness to capitalise on the hydrogen possibilities appropriate for constructing, upholding, and running housing and public infrastructure.
- Facilitating decision-making by structuring volume in infrastructure suppliers to feat the profusion of natural resources to their full ability though raising knowledge about the aids delivered by employing a hydrogen economy. (HUGE Project)

The Hydrogen Utilization & Green Energy (HUGE) project is a 1.4 million € three-year project. Northern Periphery and Arctic (NPA) program is funding the project and is led by the Environmental Research Institute, North Highland College UHI. The duration of the program is from mid-2019 to mid-2022. (HUGE Project)

In this chapter research context, the data collection and its analysis are presented. Measures and their development are put forward, and lastly, the reliability and validity of the measures are covered.

This thesis is done with a quantitative study approach. A sample of data was collected from different households in countries (NPA) by questionnaire. The idea was to examine relations between the countries and gain a more comprehensive view focusing on people's attitudes in the northern periphery of Europe towards sustainable development and new energy sources. The data is pre-collected by LUT professors, and the survey is international. The thesis data is related to The Hydrogen Utilization & Green Energy (HUGE) project, led by the Environmental Research Institute, North Highland College UHI.

### **3.2 Data collection methods**

The empirical data of the survey is structured. A structured interview (form interview) is the most traditional form of an interview that corresponds to filling in a questionnaire in a guided manner. The interview uses a form with ready-made questions with ready-made answer options. The questions are asked in the same order to all interviewees, and the interviewee should choose the answer option that suits him / her best. (Saaranen-Kauppinen & Puusniekka, 2006)

The survey's implementation has been done through paper form, electronic platform, phone interview or a combination of previous methods. The survey was translated to each country's language; for example, a survey conducted in Finland was done in Finnish. The target number of respondents is

approx. is n=1500 – 2000 (net amount). The tender must include an estimation of the implementation of the sample. The sample’s target population is random sampling with the age group of 25-65 years old. Weighting according to the age distribution of the population. Country %-share is 15% each country, Finland (15%), Sweden (15%), Norway (15%), Scotland (15%), Northern Ireland and Ireland (15%). Capitals or large metropolises are excluded from the sample. The claimed amount is a maximum of 100 (approx. 70 % Likert scale, 30%, yes or no.) Response time estimated at less than 20 minutes per participant. The provider obtains a sample. The compiled material is submitted to LUT in SPSS, .xlsx or .csv file format. In addition to the material, a summary of the demographic distribution of non-respondents is provided. Data collection was done April-June 2020.

The survey and the factors were derived from the literature below in table 2. Each factor has its relevance to the study and is categorised.

Table 2 Derived research questions

<i><b>Factor</b></i>	<i><b>Descriptive</b></i>	<i><b>Literature</b></i>
<i>ECON_GSUB</i>	<i>The importance of environmentally friendly sensitives</i>	Bertrandias, L. and Elgaaied-Gambier, L. (2014)
<i>ECON_LEASE</i>	<i>Significance of leasing</i>	Lang, C., Seo, S. and Liu, C. (2019)
<i>ECON_RELATIVE_ADVANTAGE</i>	<i>Relevance of technical features</i>	Su, Dejin; Zhou, Wenli; Gu, Yuandong; Wu, Bei (2019).
<i>ECON_RISKS</i>	<i>Significance of overall risks</i>	Schaefers, T., Lawson, S. J. and Kukar-Kinney, M. (2016)
<i>ECON_TOTAL_COSTS</i>	<i>Significance of finance and total costs</i>	Su, Dejin; Zhou, Wenli; Gu, Yuandong; Wu, Bei (2019).

As shown in Appendix 1, this research data has five factors, and each factor has 2-4 variables according to their relevance. Variables are grouped according to their labels. ECON\_GSUB is related to environmentally friendly sensitives, especially governmental incentives. ECON\_LEASE is related to the significance of the leasing option. ECON\_RELATIVE\_ADVANTAGE has relevance to better functionality. ECON\_RISKS is associated with alternative risks. ECON\_TOTAL\_COSTS is relative to exposure of expenses.

Area	Count	Percent
Sweden	323	16,20
Scotland	322	16,10
Finland	320	16,00
Ireland	320	16,00
Northern Ireland	319	16,00
Norway	301	15,10
Iceland	94	4,70
Gender	Count	Percent
Female	1025	51,3
Male	965	48,3
Undisclosed	9	0,5
Age binned (10yrs)	Count	Percent
<=30	260	13
31 - 40	576	28,8
41 - 50	554	27,7
51 - 60	390	19,5
61 - 70	208	10,4
71+	5	0,3
Undisclosed	6	0,3
Management of housing	Count	Percent
Owned apartment	1126	56,3
Rental or part-ownership apartment	788	39,4
Undisclosed	85	4,3

Table 3 Participant demographic outlook

We can see from table 3 that the range of participants is homogeneous. There are seven areas evenly distributed except Iceland. Gender is evenly distributed. The responder's age is well scattered, except the older age group has minor representation.

### 3.3 Data analysis and methods

The data modelling was conducted thought statistically using the ANOVA method. Analysis of Variance (ANOVA) is used to examine whether the means of two or more groups differ statistically. For example, an analysis of variance can be used to examine whether the average wages of women and men differ in a company or whether school children's grades differ from other schools. Analysis of Variance has traditionally been considered the primary experimental analysis method and has been commonly used in medicine. However, it also has several application possibilities in social science. (St»hle 1989)

An ANOVA test is a method to discover if a questionnaire or test results are significant. It can help to conclude out if needed to reject the null findings or accept the alternative findings. In said testing groups to see if there is a difference between them. A few examples are given to demonstrate the difference between groups:

- A group of consumers are trying two different cars: sports cars or sedans, to see which car is better.
- A manufacturer has two different processes to make pencils. They want to know if one process is better than another.
- Student from different school takes the same test if they want to know if one school outperformed the other.

There are several expansions possibilities associated with the use of analysis of variance. There is one-way analysis, two-way analysis of variance, covariance analysis and multivariate analysis (MANOVA). This thesis focuses on the so-called one-way analysis of variance, the simplest of the alternatives. (St»hle 1989)

One-way analysis of variance is the simplest form of analysis; therefore, the analysis looks at group means of the variables to be explained. The variable to be explained must be such that it makes sense to calculate an arithmetic mean (i.e., in practice, a distance or ratio scale variable, measurement level and means of variables). There is only one explanatory variable in a one-way analysis of variance. As this variable divide's observation units into categories, its measurement level must be either a classification or a ranking scale. (St»hle 1989)

The variance analysis is used to examine whether the explanatory variable's means are statistically significantly different in different explanatory variables. The starting assumption of the analysis, i.e., the null hypothesis, is that the means of the categories of interest are equal. If the null hypothesis can be rejected because of the variance analysis, there are differences between the explanatory variable's means in the explanatory variable's different categories. (Stahle 1989)

The variance analysis is based on that explained variance (dispersion number) divided into two sections. The first part measures the intra-class variance within-group, and the second part measures the variance between class means. If the two variances do not differ very much, the means obtained for the different groups are likely derived from a similar description. In this case, there is not a statistically significant difference between them. On the other hand, if the two variances differ enough, the null hypothesis can be rejected. As a statistical test in the variance analysis, the so-called F-test tells the probability that the null hypothesis about group means' similarity can be rejected. (Stahle 1989)

For the coding and inputs of the data, SPSS software was used to conduct variance analysis. This result is getting aggregated variability inside a data set. The independent variables on the dependent variable in a regression study are used in the ANOVA test. The analysis reveals if the data set is inconsistent. Comparing two groups or more at the same time gives insights if there is any relationship between them. The F statistic (F-ratio), the ANOVA test result, examines multiple data groups' analysis to determine the variability between and within samples. The null hypothesis is stated when no actual difference exists between the tested groups. The F-ratio statistic will be close to 1. The allocation of overall possible values of the F-ratio is the F-distribution. (Cuevas et al., 2004)

		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
<b>ECON_GSUB</b>	Between Groups	329,467	6	54,911	25,394	,000
<b>ECON_LEASE</b>	Between Groups	223,287	6	37,215	11,373	,000
<b>ECON_RELATIVE_ADVANTAGE</b>	Between Groups	61,004	6	10,167	5,299	,000
<b>ECON_RISKS</b>	Between Groups	93,735	6	15,622	10,113	,000
<b>ECON_TOTAL_COSTS</b>	Between Groups	84,088	6	14,015	9,193	,000

Table 4 One-way ANOVA test

From Appendix 2, we can see the questionnaire and the relating questions. The questionnaire has 13 questions divided into sections according to their relevance, such as total cost, relative advantage, risk, governmental subsidy, and leasing. In the survey, respondents are asked if they agree or disagree with the question that is presented. Respondents will answer from 1 to 7, of which one is highly disagreeing, and seven is highly agreeing. Respondents have the option to answer anywhere in the range of 1 to 7. We can see that in every question, the target number of respondents is achieved. The goal of the target responder was 1500 – 2000. Std. Deviation explains how focused the observations are. Giving insights into how far the observations are from the average. The larger the mean distance, the less concentrated the distribution. The standard deviation can be slight even if the distribution range is extensive. As we can see from table 5, the standard deviation does not vary much from the mean. The low standard deviation has a low spread. Standard deviation < Mean the preponderance of high value. A closer standard deviation to the mean indicates the sample spread is more diminutive and tend to cluster around the mean. The standard deviation of sample data distribution has a dominant tendency. (Levy 1974) In table 5, we have delimited out the excluded cases and will not examine them.

Variance is an important parameter describing statistical variance and is obtained as the second moment of the distribution. The variance indicates how large the squared deviations from the mean are on average. It can be approached through the concept of standard deviation; Variance is the square of the standard deviation. A smaller variance indicates that the data set value is closer to the mean and closer to each other. A more considerable variance explains that the value is far from the mean and each other. This helps us assess group differences. (Kruskal & Wallis 1953) We can see that only two variables from among other variables have differences. Econ\_A\_lease1 and Econ\_B\_lease2 have higher variance levels to mean, which is higher variability than other variables.

Table 5 Case Processing Summary

<b>Factor</b>	<b>Cases</b>	<b>N</b>	<b>%</b>
<i>ECON_GSUB</i>	Valid	1765	88,3
<i>ECON_LEASE</i>	Valid	1671	83,6
<i>ECON_RELATIVE_ADVANTAGE</i>	Valid	1803	90,2
<i>ECON_RISKS</i>	Valid	1658	82,9
<i>ECON_TOTAL_COSTS</i>	Valid	1812	90,6

In Appendix 2, we can see that each variable individualizes descriptive statistics. The N sample varies from lowest value 1737 to highest value 1903. The minimum value to choose is 1, and the maximum value to choose is 7. This method is used in the Likert scale, which is commonly used in research questionnaires. We can see from Appendix 2 that the lowest mean stands at 3.39 for econ\_B\_lease2 and the highest mean econ\_A\_tc1. Std. deviation explains to us how dispersed the data is. It is a measure of how long each observed value is from the mean. Low std. deviation tells the data is clustered around the means and high std. deviation express that data is more spread out. An std. deviation close to zero indicates that data points are close to the mean, whereas a high or low std. deviation illustrates data points are commonly above or below the means. A low std. deviation has been said to be high precision. We can see that econ\_A\_lease1 and econ\_A\_lease2 have the highest std. deviation, which indicates variables are more spread out than others. Variance measures variability. Typically, variance is not used as an index of spread because it is in squared units. Therefore, we use std. deviation.

Table 7 below presents descriptive statistics for the sample and all factors used in the analysis. The statistics reveal that the factors are typically distributed. Factors have positive value. None of the factors has reason to be rejected, so all of them are kept. We can see all the N for each factor. The sampling requirement was met, which was 1500 – 2000 (N) samples. Responders had the option to choose from 1 to 7 if they agreed or not on each variable. For each factor, mean, standard deviation and variance are calculated. The highest mean has factor ECON\_TOTAL\_COST, then ECON\_RISKS, ECON\_GSUB, ECON\_RELATIVE\_ADVANTAGE and the least ECON\_LEASE. Standard deviation is lowest with ECON\_TOTAL\_COSTS, then ECON\_RISKS, then ECON\_RELATIVE\_ADVANTAGE, then ECON\_GSUB and the least ECON\_LEASE. Variance for the factors ECON\_TOTAL\_COSTS and ECON\_RISKS has the lowest variance value. The highest variance has ECON\_Lease.



Table 6 Summary of descriptive statistic

<i>Factor</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>ECON_GSUB</i>	1913	4,6487	1,54381
<i>ECON_LEASE</i>	1876	3,4224	1,85695
<i>ECON_RELATIVE_ADVANTAGE</i>	1929	4,3940	1,40429
<i>ECON_RISKS</i>	1947	4,9624	1,27947
<i>ECON_TOTAL_COSTS</i>	1954	5,1311	1,27535
<i>Valid N (listwise)</i>	1773		

### 3.4 Measure and methods

The questionnaire of data has five variable sections. ECON\_GSUB, ECON\_LEASE, ECON\_RELATIVE\_ADVANTAGE, ECON\_RISKS, AND ECON\_TOTAL\_COSTS. ECON\_GSUB means governmental subsidies. It the relevant to the consumer when the government has sensitive support. ECON\_LEASE means using the leasing purchasing method. ECON\_RELATIVE\_ADVANTAGE means the advantage of sustainable, durable goods over non-sustainable durable goods. ECON\_RISK means the risk that is associated with it is sustainable, durable goods. ECON\_TOTAL\_COSTS means the relevance of the overall cost of sustainable, durable goods. The sample size (N) is the total number of observations in each group. We can see from above (table 6) that N varies among the question. It remains to be interpreted why this is the case. In table 6 are calculated mean, standard deviation, and variance. This will help us understand the data much better.

### 3.5 Reliability and validity

Validity refers to the validity of research: the ability to study what is intended to be investigated. It is ensured by careful planning and cares with deliberate data collection. Research questions should examine the right things and cover the whole research problem. Precise definition and representation of the population obtaining a sample will facilitate the realization of a valid study. Validity is split into internal and external validity. Internal validity means the inherent reliability of the study. External validity means the generalizability of that study. (Metsämuuronen 2008)

Reliability as a concept refers to the reproducibility of a study. It is divided into internal and external reliability. The research results must not be random, i.e., they must be reproducible similar. The internal reliability of the study can be established by measuring the same statistical unit several times. The measurement is reliable if repeated the measurement results are the same. The external reliability of the study means that the measurements are also reproducible in other studies and situations. Mistakes in research data collections input should be avoided so that the study's reliability is not compromised. Low reliability calculates the study's reliability and the meter's validity, although reliability is independent of validity. (Metsämuuronen 2008)

Cronbach's alpha was used to inspect the reliability of all the factors. The summary of ECON\_GSUB, ECON\_LEASE, ECON\_RELATIVE\_ADVANTAGE, ECON\_RISKS, and ECON\_TOTAL\_COSTS is presented in table 7. The alpha coefficient value for the two items is .720, suggesting that the items have relatively high internal consistency. For the ECON\_LEASE, the alpha coefficient value for the two items is .817, suggesting that items have high internal consistency. ECON\_RELATIVE\_ADVANTAGE, the alpha coefficient value for two items is .670, which indicates moderate internal consistency. ECON\_RISKS, the alpha coefficient value for the four items is .867, which point to high internal consistency. ECON\_TOTAL\_COSTS, the alpha coefficient value for the three items is .085, which indicates solid internal consistency. The summary of the result of the factors is represented in table 7. Factors have proven to have excellent or high reliability. Cronbach's alpha does have some limitations. For instance, scores with a low number of affiliated items tend to go lower reliability, and sample size could also affect overall appearance for better or worse. However, it is still an extensively used measure. Thus, all the factors are kept from further analysis.

Table 7 Cronbach's Alpha Matrix

<i>Factor</i>	<i>Cronbach's Alpha</i>	<i>Cronbach's Alpha Based on Standardized</i>	<i>N of Items</i>
<i>ECON_GSUB</i>	.720	.720	2
<i>ECON_LEASE</i>	.817	.817	2
<i>ECON_RELATIVE_ADVANTAGE</i>	.670	.670	2
<i>ECON_RISKS</i>	.867	.867	4
<i>ECON_TOTAL_COSTS</i>	.805	.805	3

The general rule Cronbach's Alpha .70 > good

Factor ECON\_RISKS has four items and the highest Cronbach's alpha score, which can be a considerate most reliable factor. ECON\_TOTAL\_COSTS has three items, and Cronbach's alpha value is relatively high and can be considered the second strongest reliability. Within these factors, internal consistency is high. A high value for alpha does not designate that the measure is unidimensional. Other factors have two items that can influence Cronbach's alpha reliability.

### 3.6 Measure development

ANOVA analysis provides intellectual indicators: group sample sizes (N), Mean, Standard Deviation (Std. Deviation), variance, and minimum and maximum value. The ANOVA (table 4) shows that the F-test is a statistical test indicating whether the regression analysis variables explain the variation. Significant (Sig) = .xxx explains statistical significance. If the number is less than 0.05, then it has statistical significance. SPSS explains the data's significance level, which is essential to consider when interpreting the test. Because of this, significance levels are defined. Statistically, the significance level indicates the probability that zero abnormal dependence is statistically significant or a coincidence. Sig values are used to corresponding symbols that are used for reporting the results in connection within.

# FINDINGS

## 4.1 Descriptive statistics of the model variables

In the previous chapter, we discussed the data and methodology of the study. Analysis of variance (ANOVA) is used to analyse data between explanatory backgrounds of variables. Information was collected, how descriptive variables measure any component of the explanatory attitude. Differences between groups were compared among themselves.

In this chapter, findings are presented, and findings are interpreted. Descriptive statistics of the area can be found in table 8 below. It presents area, valid sample size, std. Deviation, std. Error, 95% confidence interval for mean, minimum and maximum.

Table 8 Descriptive statistics of the area

<i>Factor</i>	<i>Area</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>
<i>ECON_GSUB</i>	Finland	290	4,3966	1,49497
	Ireland	293	5,2611	1,29247
	Northern Ireland	282	5,0071	1,32252
	Scotland	287	4,7979	1,34617
	Sweden	270	4,2704	1,58965
	Iceland	83	3,5602	1,83695
	Norway	268	4,3638	1,64075
	Total	1773	4,6382	1,53001
	<i>ECON_LEASE</i>	Finland	290	3,2431
Ireland		293	3,7935	1,84433
Northern Ireland		282	3,844	1,78331
Scotland		287	3,7979	1,78649
Sweden		270	3,2796	1,79491
Iceland		83	2,5422	1,6045
Norway		268	3,1567	1,95446
Total		1773	3,4791	1,84037
<i>ECON_RELATIVE_ADVANTAGE</i>		Finland	290	4,3966

*ECON\_RISKS*

Ireland	293	4,6604	1,35164
Northern Ireland	282	4,5408	1,28678
Scotland	287	4,4564	1,32776
Sweden	270	4,2556	1,4147
Iceland	83	4,0602	1,43857
Norway	268	4,1306	1,53417
Total	1773	4,3954	1,3952
Finland	290	4,9382	1,27842
Ireland	293	5,1962	1,07614
Northern Ireland	282	5,0511	1,22207
Scotland	287	5,1118	1,18644
Sweden	270	4,6898	1,24991
Iceland	83	4,6205	1,52715
Norway	268	4,5631	1,34637
Total	1773	4,9175	1,26195
Finland	290	5,2253	1,22412
Ireland	293	5,2901	1,10409
Northern Ireland	282	5,2116	1,20528
Scotland	287	5,2044	1,1753
Sweden	270	5,008	1,29165
Iceland	83	5,0522	1,32695
Norway	268	4,6275	1,3777
Total	1773	5,0989	1,25171

*ECON\_TOTAL\_COSTS*

The descriptive statistic of responders is below listed. Responders are from seven different regions. Ireland has been divided into Ireland and Northern Ireland by researchers. As we can see, sampling is homogeneous between countries. Presumably, Iceland's sampling is smaller due to the smaller population. Gender is divided between men and females, which is relatively constant, but female responders with higher weight. There is a small group of non-undisclosed gender. Education has been divided into lower and higher, where higher education has greater dominance. Undisclosed education is small portion less than 2%. Management of housing is grouped by people who own their apartment or people living in rental or part-owned apartments. A more specific criterion is limited out.

## 4.2 Discussion of the findings

*“What are the consumer’s perceptions on large household purchases?”*

Consumers are more often aware of their consuming habitat. As we can see from Chapter 2 academics, have described consumer perception to be adaptable. To format purchasing decisions, each consumer has their perception about the purchases. So, what is the consumer’s perception of large household purchases?

Consumers more tend to consider the total costs of large household purchases. It can be reflected in their buying power, or total cost is directly affecting consumers life. Total costs have the highest significance when evaluating purchases. It is reflected in annual income or education standards.

The main research question is the following sub-questions:

### *1. How social economic status influence on large household purchases?*

As we can see from Appendix 2, the factor ECON\_TOTAL\_COSTS mean it is higher than ECON\_RISK. Questionnaire responders have answered financial variables to be a more significant impact over large household purchases. Std. deviation and variance of the factors are close to each other, almost identical. In Appendix 1, we have labelled each factor and expressed what each label means.

From Appendix 3, we can see annual income comparison in each country area. Low annual income means responders with less than 29 000€, and high annual income means over 30 000€. Mean risks are almost the same for both low and high. Regarding annual income, the economic risk is comparatively normally distributed. Financial factors tend to influence more people with high annual income. It is out of our scope to investigate why so? People with higher income levels are impacted by total costs more than people with lower income. Total risks have more impact on people with low-income levels than people with high income-level. In table 8, Cronbach Alpha is slightly for the total risk factor than total costs. Financial factors and total risks have equal importance on large household purchases. Therefore, this finding is rejected as we cannot prove whether financial factors have

greater importance over total risks. Financial factors are equally crucial to total risks, but they do not have greater importance over total risks.

In chapter two, we covered a theoretical review on different behavioural intentions. As per se financial factors has great importance. The annual income level influences it. We can see from Appendix 3 that each country has greater significance in total cost over relative advantage. This assertion is supported by table 7, which shows Cronbach's alpha values. From appendix 3, countries with high annual income have a more outstanding mean and standard deviation than low annual income. As per relative advantage, the mean is smaller among responders, and the standard deviation is more dispersed, indicating it has no significant importance over total costs. From Appendix 4, we can see education differences by gender. People with lower education are aggregated with the education level of primary school and high school. People with higher education levels are formed by polytechnic and university. In the relative advantage, females have a lower mean and more spread out the data than men. Men with higher education are impacted by relative advantage factors over lower education levels, the same as females. Total costs have more weight than a relative advantage. A commodity price has a vast role when deciding to purchase. This finding we can accept because total costs have greater importance over relative advantage.

Better education level has more tendency for improved annual income. With higher education, labourers tend to have skilled qualifications and, therefore, have a better salary. Researchers have been found that education and wage level correlates. People with higher education tend to achieve high paid jobs, and this tends to increase purchasing power. (Morgan & David 1963) People with strong purchasing power can afford to buy large household purchases.

As shown in Appendix 4, it is slightly lower in low education level than high education level. Also, standard deviation tends to be slightly lower in high education levels. There is no significant divergence between low and high education by gender, but a slight difference can be seen. Corresponding to education, ECON\_TOTAL\_COSTS is comparatively normally distributed in higher female and male cases. In low female and male cases, the distribution is positively skewed, meaning that more values are concentrated on the left side of the mean. Therefore, education has causation to total costs.

In their research, Srinivasan, Srivastava & Bhanot (2014) studied the influence of education on the frequency of buying luxury products. They found that there is a relationship between education and luxury brands. They discovered a significant difference in perception of financial value among people

with different education levels. There was also a significant difference in perception of self-identity among people with different education levels. It is also valid in this study. We can make two observations from Appendix 4. First education level with low and higher level and secondary education level between men and females. People with higher education level has a slightly bigger mean. Standard deviation is constant with people with lower education. For example, Total costs and risks are distributed righter than leasing in low and high education levels. They are giving risks and total cost more emphasis. The leasing factor has the most negligible effect on large household purchases. The importance lags from other variables. From our view of the study, leasing does not have a significant impact. We can interpret the variable as the least effective among others. The examined data advocate this. We need to consider that the interview questions were only two in the leasing variable than the total cost variable, which had four questions. Also, the characteristics of leasing sub-questions can affect the values.

There are many causes for consumer spending. There is real disposable annual income for annual income, which we are not further discussed as we can see from Appendix 3 that ECON\_TOTAL\_COSTS has a more significant difference on high annual income over low annual income. Mean total costs is comparably more significant in high annual income. In low annual income, the distribution is positively skewed, meaning that more values are concentrated on the left side of the mean. High annual income is comparatively customarily distributed but slightly right-side emphasised. People with high annual income tend to be more influenced by costs and financial factors than people with low annual income.

Perceived risk of awareness is consumers' uncertainty when buying costly goods. Consumers' perceptions of risk are variable and partly unclear. Risk perception may, on the one hand, be fragmented or narrow. There are no risks at all or on their own; only a few risks are identified in life. On the other hand, life is seen to be included different levels of risk. Typical would also seem available so that the risks are not compared to every day just ponder. A typical way for consumers to deal with risks and how there is no control is the best possible company where different risks are sought to be identified and done systematically.



## CONCLUSIONS

This thesis aims to examine household consumption on large household purchases with statistical analysis. The sample data consist of pre-gathered data from the questionnaire. Perceived ease of use and perceived behaviour is influence consumer behaviour. This study examined issues affecting consumer large household purchases. Respondents in the study were from seven different areas. The gender distribution was almost even. The average age of the respondents was divided into 30-50 years. The focus of the study was on the issues and factors influencing consumer purchasing behaviour in terms of consumer durables. It is discovered based on the data provided. The main research question is stated as “*What are the consumer’s perceptions on large household purchases?*”. A variety of factors influences consumer behaviour. Some influence heavily, other factors do not. The research found that the significant influence was financial factors such as total cost and risks. Risks and financial influence vary, depending objectively. It was to expect, as these are the most crucial things when starting purchasing. Risk and total cost are significant, as we can find in Cronbach Alpha.

This thesis suggests that risks and total costs are the main factors influencing large household purchases. However, governmental incentives have been shown to influence household consumption. Although the results did not give much certainty to the consumer behaviour on household goods, the findings did not ‘show any negative correlation either. The factors that are discovered in the study does not decrease consumer perceived behaviour. Consumer perceived behaviour and perceived ease of use play an important role in purchasing large household purchases. Consumers attitudes and habits refine intentions to implementation. Although Econ\_Risks and Econ\_Total\_Costs were high among responders, there is still room for improvements. That is why consumers should consider implementing a perceived sense of control in their purchasing decision even with small increments to create sustainable procurement.

There is a possibility of getting perceived usefulness from commodities; exemplary implementation on large household purchases regarding consumers should be considered. Consumer habits, attitudes and norms also create a structure for purchasing decisions which should also be examined. The decision to purchase large household goods is affected by consumer’s demographics such as age, level of education and wage level. The consumer has perceived behaviour control can be affected by advertisement, incentives, product features and price.

Large household purchases have been influenced by annual income level and with education differences by gender. Household’s with higher annual income levels tend to influence more with

absolute risk and total costs. These variables have a significant impact on the product buying decision itself. People with higher annual income levels tend to have better purchasing power and buy more long-lasting products at a higher price. Also, the higher-income level could create opportunities to choose better alternative products. People with low-income levels could focus more on the total costs to have income left for alternative consumption. Higher education level tends to lead people to better jobs. Therefore, it influences salaries. People with higher education levels could be more environmentally and socially aware about consumption to choose products that are produced sustainably.

### **5.1 Limitation and future research**

This study encountered limitations during its progression. The first limitation is the data analysis which has more space for improvement. The geography of data is fragmented. The sample size of Iceland is much smaller than from other countries, which could be increased by giving more effort. Future research can be undertaken to incorporate cultural dimensions, which would give a better understanding of country divergence. The consumer behaviour practises in this study were not divided into practice and reactive practices. Consumer habits and attitudes are not investigated and could be a future research plan. Also, the sustainability aspect could implement for further studies. Do sustainable factors have an impact on consumers' decisions?

In addition, the cultural dimension was left out of this study but could have an exciting approach. The cultural differences on large household goods or cultural differences in sustainability procurement could open future possibilities for further investigation.

The research data was too fragmented and could have been narrowed. Exciting topics such as driver's and barriers for sustainable procurement could be examined. Are there specific factors affecting sustainable consumer behaviour? How could sustainable procurement be improved among consumers? Also, the comparison between a commodity produced in a sustainable and non-sustainable way could be interesting to investigate.

## LIST OF REFERENCES

- Arvola, A. – Vassallo, M. – Dean, M. – Lampila, P. – Saba, A. – Lähteenmäki, L. – Shepherd, R. (2008) Predicting intentions to purchase organic food: The role of affective and moral attitudes in the Theory of Planned Behaviour. *Appetite*. Vol. 50 (2–3), 443–454.
- Anita Saaranen-Kauppinen & Anna Puusniekka. 2006. KvaliMOTV - Menetelmäopetuksen tietovaranto [www-document]. Tampere: Yhteiskuntatieteellinen tietoarkisto [Accessed:24.03.2021]. Available at: <https://www.fsd.tuni.fi/menetelmaopetus/>
- Ajzen, I. (1985). From intentions to actions: a theory of planned behaviour. In: Kuhl, J. and Beckmann, J. (eds.) *Action Control: From Cognition to Behavior*. New York. Springer.
- Ajzen, I. (1991) The Theory of planned behaviour. *Organisational behaviour and human decision process*. Vol. 50 (2), 179–211.
- Ajzen, I. (2002) Perceived behavioural control, self-efficacy, locus of control, and the theory of planned behaviour. *Journal of Applied Social Psychology*. Vol. 34 (4), 665–683.
- Ajzen, I. (2011) The Theory of planned behaviour: Reactions and reflections, *Psychology & Health*. Vol. 26 (9), 1113–1127.
- Ajzen, I & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall, Englewood Cliffs.
- Al-Nahdi, T. S., Habib, S. A., & Albdour, A. A. (2015). Factors Influencing the Intention to Purchase Real Estate in Saudi Arabia: Moderating Effect of Demographic Citizenship. *International Journal of Business and Management*, 10(4).
- Bartels, Jos; Hoogendam, Karen (2011). The role of social identity and attitudes toward sustainability brands in buying behaviours for organic products. *Journal of Brand Management*, 18(9), 697–708.
- Bagozzi, R. 2007. The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems*, 8(4), 244-254
- Bagozzi, R. P. – Tybout, A. M. – Craig, C. – Sternthal, B. (1979) The construct validity of the tripartite classification of attitudes. *Journal Of Marketing Research*. Vol. 16 (1), 88–95.
- Butcher, A. (2020). Mikä hidastaa vetyä? -UPM. [www-document] [Accessed 22.03.2020] Available at: <https://www.upm.com/fi/artikkelit/energia/20/mika-hidastaa-vetya/>

- Breckler, S. J. (1984) Empirical validation of effect, behaviour, and cognition as distinct components of attitude. *Journal of Personality and Social Psychology*. Vol. 47 (6), 1191–1205.
- Brown, S. A., & Venkatesh, V. (2005). Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle. *MIS Quarterly*, 29(3), 399–426.
- Chrysosoidis, G. M., & Krystallis, A. (2005). Organic consumers' personal values research: Testing and validating the list of values (LOV) scale and implementing a value-based segmentation task. *Food Quality and Preference*. Vol. 16, 585–599.
- Chen, J. – Lobo, A. – Rajendran, N. (2014) Drivers of organic food purchase intentions in mainland China – evaluating potential customers' attitudes, demographics, and segmentation. *International Journal of Consumer Studies*. Vol. 38, 346–356.
- Antonio Cuevas; Manuel Febrero; Ricardo Fraiman (2004). An anova test for functional data., 47(1), 111–122.
- Dean, M. – Raats, M. M. – Shepherd, R. (2012) The Role of Self-Identity, Past Behavior, and Their Interaction in Predicting Intention to Purchase Fresh and Processed Organic Food. *Journal of Applied Social Psychology*. Vol. 42 (3), 669–688.
- Eagan, P.; Finster, M.; Hussey, D. (2001). [IEEE Comput. Soc Second International Symposium on Environmentally Conscious Design and Inverse Manufacturing - Tokyo, Japan (11-15 Dec. 2001)] Proceedings Second International Symposium on Environmentally Conscious Design and Inverse Manufacturing - Creating business value by linking industrial ecology with business strategy and product design., (), 842–847.
- Grietus Mulder; Jens Hetland; Guido Lenaers (2007). Towards a sustainable hydrogen economy: Hydrogen pathways and infrastructure., 32(10-11), 1324–1331.
- Grewal, Rajdeep; Mehta, Raj; Kardes, Frank R. (2004). The Timing of Repeat Purchases of Consumer Durable Goods: The Role of Functional Bases of Consumer Attitudes. *Journal of Marketing Research*, 41(1), 101–115.
- FCH Europa. (2019). Hydrogen Roadmap Europe: A sustainable pathway for the European energy transition. [online-document] [Accessed: 22.03.2021] Available at: [https://fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe\\_Report.pdf](https://fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf)
- Fred D. Davis. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13(3), 313-340.

- James Morgan and Martin David (1963). Education and Income. *The Quarterly Journal of Economics*, 77(3), 423–437
- Jure Margeta; Zvonimir Glasnovic (2010). *Feasibility of the green energy production by hybrid solar+hydropower system in Europe and similar climate areas.*, 14(6), 1580–1590.
- Halm Levy (1974). The Rationale of the Mean-Standard Deviation Analysis: Comment. *The American Economic Review*, 64(3), 434–441.
- Harold Gulliksen (1945). *The relation of item difficulty and inter-item correlation to test variance and reliability.*, 10(2), 79–91.
- H.-H. Rogner (1998). Hydrogen technologies and the technology learning curve., 23(9), 833–840.
- HUGE Project. (2019). Project – Summary. [Accessed: 23.03.2021] [www-document] Available at: <https://huge-project.eu/project/summary/>
- HUGE Project, (2019). HUGE Output Tool (HOT) Service. [Accessed: 19.03.2021] [www-document] Available at: <https://huge-project.eu/project/summary/>
- Hsu, C-L. – Chen, M-C. (2014) Explaining consumer attitudes and purchase intentions toward organic food: Contributions from regulatory fit and consumer characteristics. *Food Quality and Preference*. Vol. 35, 6–13.
- Klotz, A. C. – Bolino, M. C. (2013) Citizenship and counterproductive work behavior: a moral licensing view. *Academy of Management Review*. Vol. 38 (2), 292–306.
- Lars Støhle; Svante Wold (1989). *Analysis of Variance (ANOVA)*., 6(4), 259–272.
- Lodorfos, G. N. – Dennis, J. (2008) Consumers' intent: in the organic food market. *Journal of Food Products Marketing*. Vol. 14 (2), 17–38.
- Legris, P., Ingham, J. & Colletette, P. 2003. Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40, 191-204.
- Liang, J. – William S, P. (2007). ANOVA for business data: What can you do if the statistic conditions are not satisfied? *Journal of Global Business Issues*. Summer 2007, Vol. 1 Issue 2, p2005-2015. 11p. 3. Charts, 4 Graphs.
- Nikola Marangunić and Andrina Granić. 2015. Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society* 14(1), 81-9.

- Marc Nerlove (1960). The Market Demand for Durable Goods: A Comment. *Econometrica*, 28(1), 132–142.
- Madden, T. J. – Ellen, P. S. – Ajzen, I. (1992) A comparison of the theory of planned behavior and the theory of reasoned action. *PSBP*. Vol. 18 (1), 3–9.
- Metsämuuronen, Jari. *Laadullisen tutkimuksen perusteet*. 3. uud. p. Helsinki: International Methelp, 2008. Print.
- Salovaara, A and Tamminen, S. (2009) Accept or appropriate? A design-oriented critique of technology acceptance models. In: Pertti Saariluoma and Hanna Isomäki (eds.) *Future Interaction Design II*, 157–173. Lontoo: Springer.
- Silva, P. (2015). Davis' Technology Acceptance Model (TAM) (1989), 205-206.
- Ofori, Daniel; Appiah-Nimo, Christina; Wright, Len Tiu (2019). Determinants of online shopping among tertiary students in Ghana: An extended technology acceptance model. *Cogent Business & Management*, 6(1)
- Olsen, S. V. (2007) Repurchase loyalty: The role of involvement and satisfaction. *Psychology & Marketing*. Vol. 24 (4), 315–341.
- Pappas, Nikolaos (2016). Marketing strategies, perceived risks, and consumer trust in online buying behaviour. *Journal of Retailing and Consumer Services*, 29(), 92–103.
- United Nations. (1987) Report of the World Commission on Environment and Development. 1987: Brundtland Report. [Assessed 19.03.2021]
- Urban, J. – Zverinová, I. – Scasný, M. (2012) What Motivates Czech Consumers to Buy Organic Food? *Sociologicky časopis/Czech Sociological Review*. Vol. 48 (3), 709–736.
- Tiainen, T., Kaapu. T., and Ellman. A. (2013) Evidence against a correlation between ease of use and actual use of a device in a walk-in virtual environment. *An Interdisciplinary Journal on Humans in ICT Environments* 9(1), 56-71
- Tan, P. (2013). Applying the UTAUT to Understand Factors Affecting the Use of English E-Learning Websites in Taiwan. *SAGE Open* October-December 2013: 1–12.
- Tarkiainen, A. – Sundqvist, S. (2005) Subjective norms, attitudes, and intentions of Finnish consumers in buying organic food. *British Food Journal*. Vol. 107 (11), 808–822.

- Tarkiainen, A. – Sundqvist, S. (2009) Product Involvement in Organic Food Consumption: Does Ideology Meet Practice? *Psychology & Marketing*. Vol. 26 (9), 844–863.
- Turner, J. A. (2004). Sustainable Hydrogen Production. *Science*, 305(5686), 972–974.
- Vermeir, I. – Verbeke, W. (2006) Sustainable food consumption: exploring the consumer “attitude – behavioral intention” gap. *Journal of Agricultural and Environmental Ethics*. Vol. 19, 169–194
- Venkatesh, V., Morris, M.G., Davis, G.B., Davis, F.D., 2003. User acceptance of information technology: toward a unified view. *MIS Q.* 27 (3), 425–478.
- Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, and Fred D. Davis. 2003. User acceptance of information technology: Toward a unified view. *MIS Quarterly* 3(27), 425-478.
- Viswanath Venkatesh and Hillol Bala. 2008. Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences* 39(2), 273-315.
- Viswanath Venkatesh and Fred D. Davis. 2000. A theoretical extension of the technology acceptance model: four longitudinal field studies. *INFORMS* 46(2), 186-204.
- Venkatesh, V., Thong, J. Y. L., Chan, F. K. Y., Hu, P. J.-H., & Brown, S. A. (2011). Extending the two-stage information systems continuance model: incorporating UTAUT predictors and the role of context. *Information Systems Journal*, 21(6), 527–555.
- Youghwa Lee, Kenneth A. Kozar and Kai R.T. Larsen. 2003. The technology acceptance model: past, present, and future. *The Communications of the Associations for Information Systems*, 12(50), 752–780.
- Youn, Song-Yi; Lee, Kyu-Hye (2019). Proposing value-based technology acceptance model: testing on paid mobile media service. *Fashion and Textiles*, 6(1), 13
- William McDowall; Malcolm Eames (2007). Towards a sustainable hydrogen economy: A multi-criteria sustainability appraisal of competing hydrogen futures., 32(18), 4611–4626.
- William H. Kruskal and W. Allen Wallis (1953). Errata: Use of Ranks in One-Criterion Variance Analysis. *Journal of the American Statistical Association*, 48(264), 907–911.
- Wu, Shwu-Ing; Lo, Chen-Lien (2009). The influence of core-brand attitude and consumer perception on purchase intention towards extended product. *Asia Pacific Journal of Marketing and Logistics*, 21(1), 174–194.





## APPENDICES

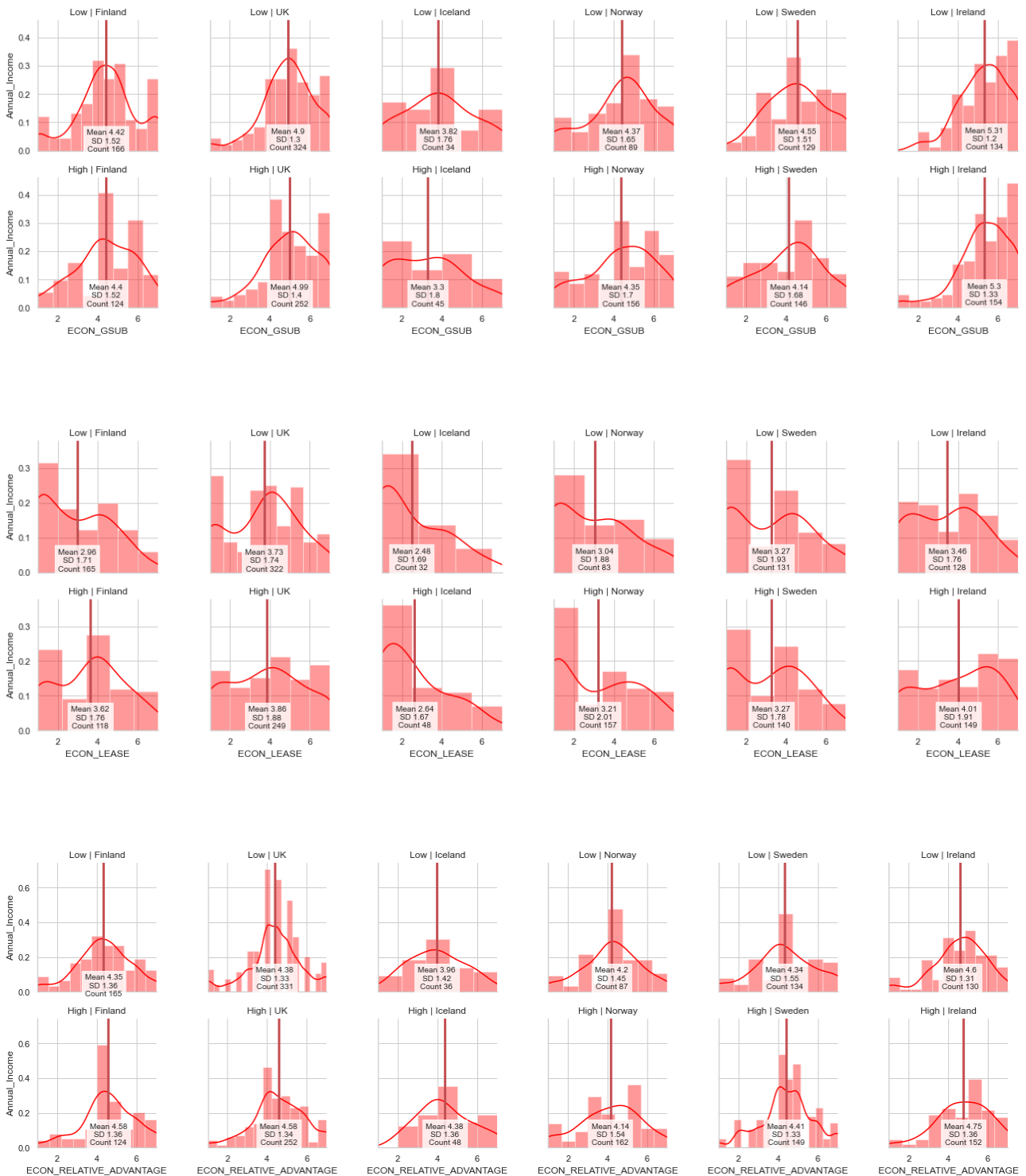
### Appendix 1 – Explanatory Variables

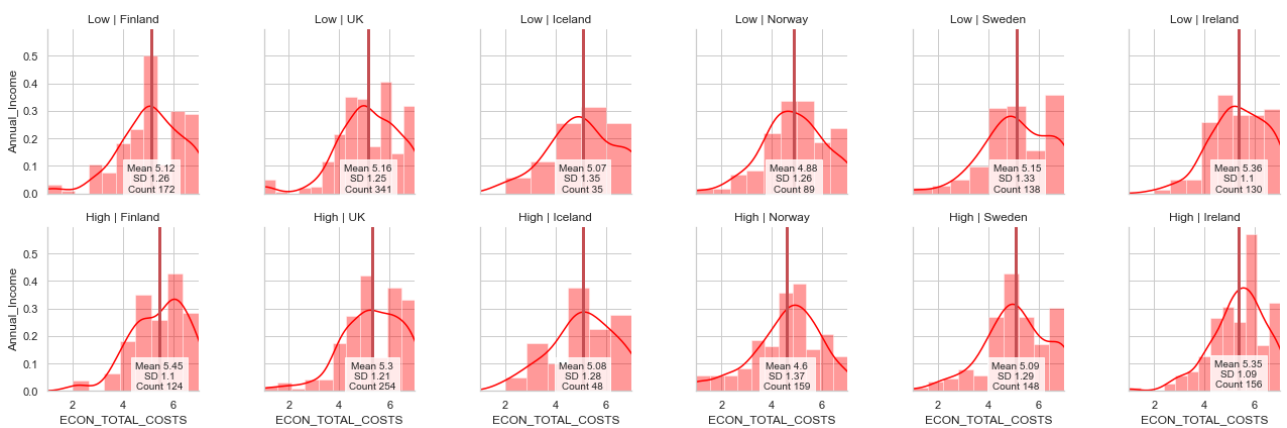
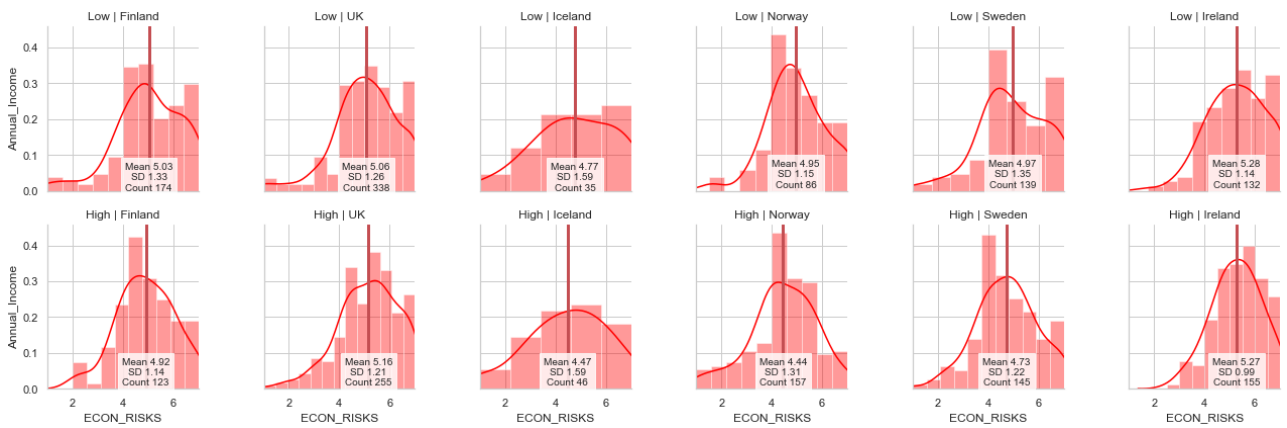
Factor	Variable	Label
ECON_GSUB	econ_A_gsub1	<i>The government should provide financial support before considering environmentally friendly options for large home purchases.</i>
	econ_B_gsub2	<i>The state should establish clear guidelines and regulations before considering environmentally friendly options for large home purchases.</i>
ECON_LEASE	econ_A_lease1	<i>In the future, I will consider the option of leasing the purchase of a car or other means of transport.</i>
	econ_B_lease2	<i>In the future, I will consider leasing an option for home repairs or renovations.</i>
ECON_RELATIVE_ADVANTAGE	econ_A_ra1	<i>I will only consider environmentally friendly options for large home purchases if they work better in use than traditional options.</i>
	econ_B_ra2	<i>I will only consider eco-friendly options for large home purchases if they are easier to use than traditional options.</i>
ECON_RISKS	econ_A_risk1	<i>The risk associated with financing is significant in large home purchases.</i>
	econ_B_risk2	<i>The risk associated with unexpected repair costs is significant for large home purchases.</i>
	econ_C_risk3	<i>The risk associated with financial dependence is significant in large home purchases.</i>
	econ_D_risk4	<i>The risk of making the wrong choice is significant in large home purchases.</i>
ECON_TOTAL_COSTS	econ_A_tc1	<i>In large home purchases, acquisition and installation costs affect my decisions.</i>
	econ_B_tc2	<i>In large home purchases, operating costs (e.g., fuels) influence my decisions.</i>
	econ_C_tc3	<i>For large home purchases, repair and maintenance costs affect my decisions.</i>

## Appendix 2 – Variable Descriptive Statistic

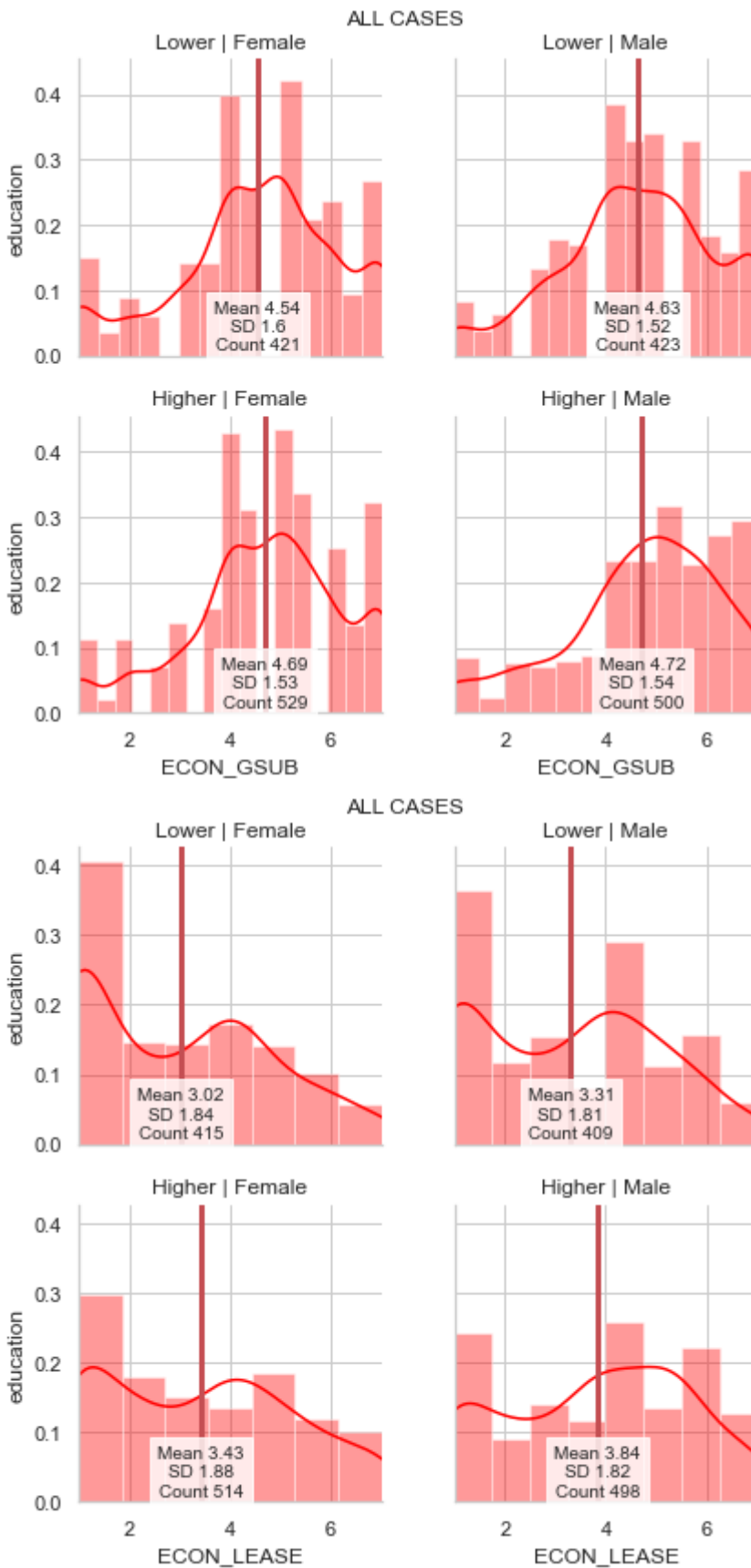
<i>Variable</i>	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>
<i>econ_A_gsub1</i>	1857	1	7	4,56	1,762	3,104
<i>econ_A_lease1</i>	1810	1	7	3,49	2,036	4,144
<i>econ_A_ra1</i>	1873	1	7	4,47	1,612	2,599
<i>econ_A_risk1</i>	1858	1	7	4,98	1,507	2,271
<i>econ_A_tc1</i>	1888	1	7	5,18	1,473	2,169
<i>econ_B_gsub2</i>	1821	1	7	4,77	1,668	2,781
<i>econ_B_lease2</i>	1737	1	7	3,39	1,929	3,720
<i>econ_B_ra2</i>	1859	1	7	4,33	1,584	2,509
<i>econ_B_risk2</i>	1821	1	7	4,93	1,518	2,304
<i>econ_B_tc2</i>	1903	1	7	5,10	1,503	2,259
<i>econ_C_risk3</i>	1778	1	7	4,96	1,495	2,234
<i>econ_C_tc3</i>	1891	1	7	5,16	1,439	2,070
<i>econ_D_risk4</i>	1839	1	7	4,98	1,446	2,090
<i>Valid N (listwise)</i>	1433					

## Appendix 3 – Annual Income - Country Wise

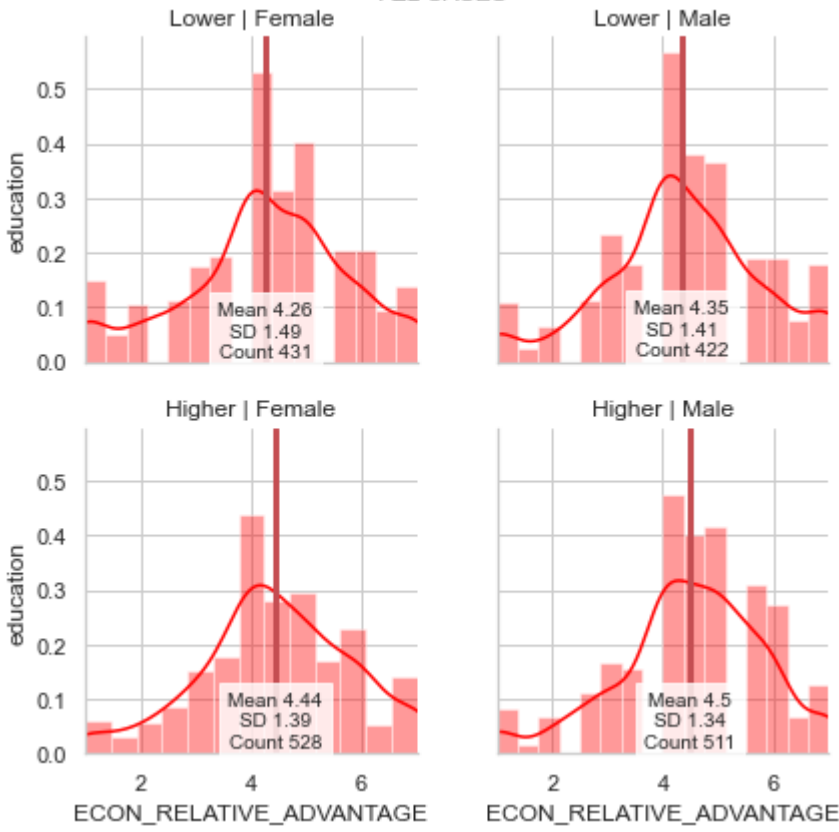




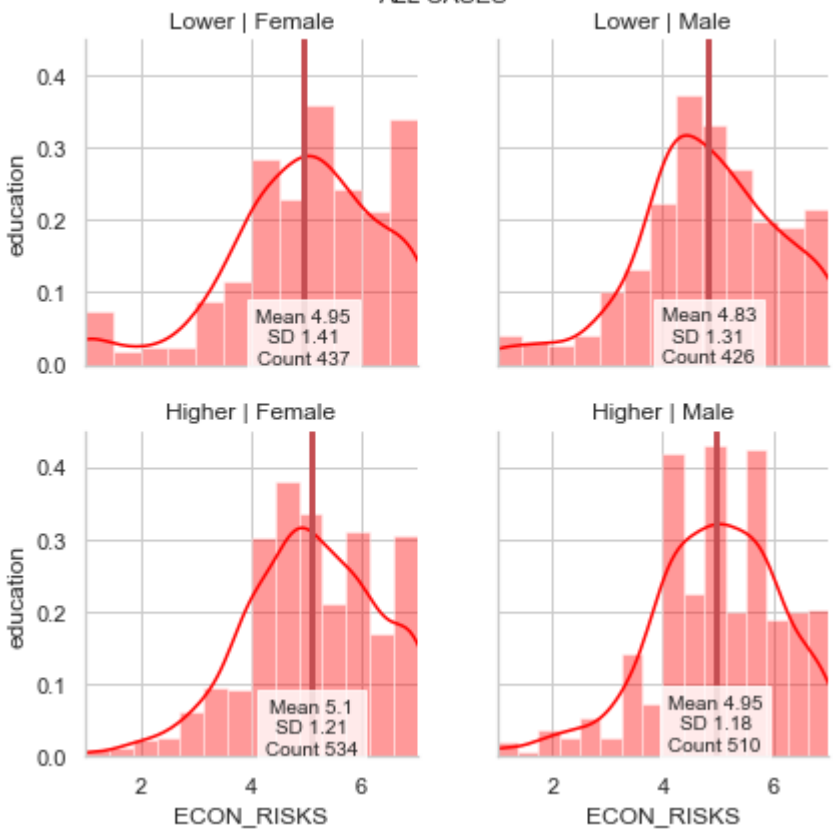
## Appendix 4 – Education Difference by Gender



ALL CASES



ALL CASES



ALL CASES

