Apple's iPhones in the customers' eyes: Which features are the most important and what will the future bring?

Bachelor Thesis for Obtaining the Degree

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Affidavit

I hereby affirm that this Bachelor's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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Abstract

Today's digital world entails a lot of possibilities which businesses can utilize in order to increase their sales numbers, revenues or improve their relationship to their customers. On the other hand, electronic commerce carries a lot of challenges. One of these difficulties to overcome is the huge inflow of product reviews. This encounters enormous efforts for businesses to be able to summarize their customers' opinions and utilize this input for further purposes. The study introduces various forms of feature extraction for customer reviews. Beside the various methods describing an approach for the above mentioned problem, the literature review also gives an insight how the obtained information from reviews can be used by managers. The empirical part of the research presents a similar process, as the ones described in the literature review. The final results, which reveal the most important features of iPhones, were achieved with the help of SPSS Statistics by analysing 200 reviews from Amazon about iPhone 6S and 7. Descriptive statistics, group comparison tests, and linear regression were applied to deliver the desired outcome. Aspects, such as general features and options, camera quality, battery life or design currently seem to be the most important for the users. How this attitude will change in the future, and how smartphones will look like after all, is speculated in the final part of the paper.

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List of Abbreviations

AR – Augmented reality

B2C – Business to consumer

CEO – Chief executive officer

DP – Double propagation

EC or E-commerce – Electronic commerce

eSIM – Embedded SIM

GUI – Graphical user interface

ID – Identification

LTE – Long-term evolution

OS – Operating system

PC – Personal computer

PoS – Part-of-speech

WOM – Word-of-mouth

1 Introduction

1.1 Aim of the research

Nowadays companies have the opportunity to collect data on their products from their customers through online platforms, analyse them, and use them for making decisions for the future in product development or improvement processes. (Decker & Trusov, 2017) There is an innumerable amount of reviews online. (Cui et al., 2012) The biggest question for organizations is how they can manage to use them in an efficient way and summarize them in order to understand what customers' preferences are towards the product. This study seeks to give an insight how product feature extraction can be done and how it can be used to make decisions and predictions about the future through a research on iPhones.

This paper is going to give an overview of the most important features of Apple's iPhone 6S and 7 using product reviews written by customers on Amazon. The research will provide an answer on how the importance of features changed from one version to the other and seeks to find out whether these characteristics were taken into consideration or developed in designing the newest iPhone.
The study's main aim is to explore the opinion of customers on iPhones through a ranking method using IBM SPSS Statistics software. Another aim of the thesis is to get to know the customers of Apple in order to understand why they prefer specific features. Finally, the research will answer the question how customer reviews can be used by managers and how important these are for Apple by comparing old and new products.

1.2 Methodology

The study will be built on reviews taken from Amazon. In order to have accurate results, a preferably large number of reviews has to be collected. The reviews analysed should be written in English, and each type of rating (1-5 stars) should be considered. Since even one version of iPhone differs in several aspects such as colour or internal storage memory, reviews from each type will be taken into consideration. Also, it is a crucial aspect that only reviews mentioning a feature will be used for the research. After collecting the data, a manual coding will transform them into numerical values.

To familiarize with the data different descriptive statistics will be applied. Various types of tests will help in delivering results, setting up a ranking and answering the research question.

2 Literature review

This part of the paper will describe customer reviews in detail, their pros and cons, as well as their use for companies. It will introduce methods for product feature extraction other than the one which will be used for this research. Furthermore, the literature review will give information on the companies that are concerned in this study. Last but not least, some information will be provided about the customers of Apple, which is important to later understand the findings in the research.

2.1 Product reviews – in general, characteristics & use, pros & cons

2.1.1 Product reviews definition and characteristics

Today, thanks to the Internet and the various review websites, there is a huge amount of information about different products available for consumers. The content is created by the users themselves and it appears mostly in the form of online product reviews. (Cui et al., 2012) Customer reviews can be defined as:

- "A customer review is a review of a product or service made by a customer who has purchased the product or service. Customer reviews are a form of customer feedback on electronic commerce and online shopping sites." (Wikipedia, 2017)
- "A report about a product written by a customer on a commercial website to help people decide if they want to buy it." (Cambridge Dictionary, 2017)

Cui et al. (2012) found that customers' decisions whether to purchase a product or not is often based on reviews. Review websites are not only a channel for customers to exchange their experiences and opinions, but they also serve as a source of information "…for firms that seek to understand consumers' perceptions and preferences." (Xiao et al., 2015) A recent study of BrightLocal (2017) uncovered that 85% of people trust product reviews as much as personal recommendations. This

number implies that when it comes to reviews it is crucial in companies' decision making process. It has an influence on different activities which businesses are carrying out, such as "…product improvement, new product development, pricing, market segmentation, positioning and advertising." (Xiao et al., 2015) The use of consumer reviews will be described in more detail in the subchapter: 2.1.3 Use of product reviews for companies.

Muralidharan et al. (2014) proposed a way which can classify consumer reviews. Reviews can be categorized upon their direction or as Muralidharan et al. (2014) defined: "review valence", where three different types are determined:

- "Positive (one-sided)" (Muralidharan et al.,2014)
- "Neutral (two-sided)" (Muralidharan et al.,2014)
- "Negative (one-sided)" (Muralidharan et al.,2014)

Feedbacks from users generally influence other customers' purchase intentions either by assisting them or preventing them from buying a product. Positive opinions encourage online shoppers to finalize their decision and settle for the selected good. While positive reviews normally increase the sales numbers of businesses, negative reviews do the opposite. Firms have to handle negative reviews just as much as the positive and neutral ones. It gives them the opportunity to see what could have been or what can be done better, and by doing so, they also have the possibility to communicate with customers. In the consumers' eyes however, neutral feedbacks are the most credible ones, including arguments for and against the product. (Muralidharan et al., 2014)

Another feature of reviews is the quality. High quality reviews are "product reviews that are informational and objective..." (Muralidharan et al., 2014) and focus mostly on the product's attributes. Low quality reviews are, on the contrary, subjective and include emotional opinions. Disregarding the valence, high quality reviews have always more power against low quality reviews thus having a higher influence on purchase decisions. (Muralidharan et al., 2014)

The third way to categorize reviews is to extract "consumption emotions". (Muralidharan et al., 2014) The emotions can be positive, neutral and negative. Before

buying a product, consumers have an expectation how it will be, and after buying it, they form their satisfaction or dissatisfaction about it. Emotions come from the stage where the expectations meet the experience. In the case of satisfaction these will be positive emotions and accordingly, the outcome will be a negative feeling if the user is dissatisfied. (Muralidharan et al., 2014)

2.1.2 Advantages and disadvantages of product reviews

This paragraph analyses product reviews in terms of their advantages and disadvantages in two dimensions. Firstly, product reviews will be evaluated in the consumers' eyes. Since this study considers reviews in a rather scientific way, more emphasis will be put on the pros and cons of reviews from the managerial and researcher perspective.

For customers the main advantage is the possibility to "…make better purchase decisions." (Muralidharan et al., 2014) Regardless the location of the consumers, one can find various reviews and recommendations about a product, everything about its features and background information on the different stages of the purchasing process. (Muralidharan et al., 2014) All these provide help to focus on the most important attributes of a product and choose the most suitable product one could find. (Zha et al., 2014)

Since e-commerce is booming, there is a steady increase in performing more and more reviews online. This action of users can be seen as a disadvantage for the others who are seeking for help in a purchase decision. Too much information confuses prospective customers and sometimes it even causes the refusal of buying a product. Another negative factor lies in the difference of people. Some people prefer a feature over another one, but for others these features are not even important. When reading reviews, it might be difficult to find the relevant ones which represent the same interests and contain all the information one needs. (Yan, et al., 2015)

According to Xiao et al. (2015), there are a lot of advantages of consumer reviews for companies. If one is willing to conduct a study about users' opinions, a high amount of information has to be collected and a traditional approach, such as surveys can cause high costs as well as it takes a lot of time to accomplish. However, using online reviews makes researchers' life easier due to the fact that there is a great quantity of

data available online for everyone. The process of data collection therefore is fast and easy. Consumer reviews usually describe a product or service based on their various features, which helps "…to construct more comprehensive preference measurement models than preference datasets collected through surveys or experiments." (Xiao et al., 2015) Another benefit is that consumer reviews are written on a voluntary basis, hence it gives more accuracy and credibility when creating overall opinions about a product and its features rather than using surveys where respondents are 'forced' to answer questions. (Decker & Trusov, 2010)

On the contrary, Muralidharan et al. (2014) found some disadvantageous characteristics of reviews. Destructive opinions about a product can negatively influence the decision of customers and the brand's reputation as well. (Muralidharan et al., 2014) Even though there is a huge amount of information available, sometimes it is difficult to organise it and come to conclusions about a product's perceived values by the customers. (Zha et al., 2014)

2.1.3 Use of product reviews for companies

Valence of the reviews helps decision makers to understand how their customers perceive a product, and by this, they can improve both the product and the relation with the consumers. (Muralidharan et al., 2014) Improving the product can happen on two dimensions, such as its design can be enhanced as well as its quality. (Yan et al., 2015) Additionally, product reviews serve as a tool for companies to raise the brand's awareness in a B2C relationship through an extension and complementation of the traditional "offline word-of-mouth communication". (Chevalier & Mayzlin, 2006) Summarised reviews are also helpful to managers in making "personalized product recommendations" for the firms' customers. (Kang & Zhou, 2016; Scaffidi et. al., 2007) Finally, the success, growth and level of customers' loyalty of the business can also be measured, as Reichheld defined, by the "referral patterns" which is the likelihood of customers endorsing others in their reviews to purchase a product. (Reichheld, 2003)

To summarize, "…many firms use online reviews as important feedbacks in their product development, marketing, and consumer relationship management." (Zha et al., 2014)

2.2 Methods for product feature extraction

This part of the study will describe different methods, which are useful to collect, summarize, analyse and evaluate online reviews in order to find out which product features are the most important in the users' eyes.

2.2.1 Product aspect ranking

The product aspect ranking method was developed by Zha et al. (2014) to use reviews in a more efficient way. To come quickly to the final results, the framework contains an automatic identification of the most important attributes. Figure 1 exhibits the ranking which is set up in three steps. (Zha et al., 2014)

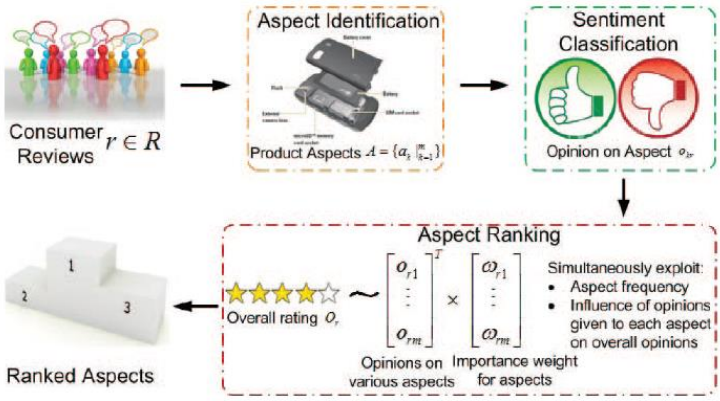

Figure 1 Steps of the product aspect ranking method (Zha et al., 2014)

The first step identifies the features of a product. Reviews carry two characteristics in the research, which are opinions formed by the customers mentioning one or more product aspects and the overall rating ranging on a different scale depending on the review site. It is also assumed that the overall rating is influenced by the features mentioned. The level of influence is weighted in the method, so the aspects can be ranked by their importance. Also due to the fact, that review sites work differently, the aspect identification might follow in different processes. (Zha et al., 2014) In the study there are reviews where the positive and negative opinions are separated and reviews which are in the form of "…free text…". (Zha et al., 2014) That is to say, nouns are collected and a vocabulary list is made from the words which appear the most often. (Zha et al., 2014) Synonyms are handled by the "…ISODATA (Iterative Self-Organizing Data Analysis Technique) clustering algorithm." (Zha et al., 2014) The next

stage is to classify the extracted product aspects based on their sentiment. (Zha et al., 2014) In the case of the so-called "…Pros and Cons…" reviews the direction is obviously clear, so the only work with them is creating a lexicon of positive and negative terms respectively. (Zha et al., 2014) To determine the direction of the simply written reviews, a classifier is used to separate the aspects which are meant in a positive or negative way. The final step includes the application of an algorithm which ranks the features. As already mentioned above, aspects are considered important if they are mentioned regularly in reviews and if they have an influence on the overall rating. (Zha et al., 2014) The algorithm calculates "aspect importance scores" after which the most important features are visible and can already be used by firms to improve their reputation by increasing product quality. (Zha et al., 2014)

2.2.2 EXPRS: An extended pagerank method for product feature extraction

The EXPRS method by Yan et al. (2015) was established to improve the quality and accuracy of the outcome of the feature extraction process. Yan et al. (2015) criticized several limitations from previous studies such as the ignorance of "implicit features", meaning that some characteristics are mentioned in a review in an unspoken way. Moreover, this study also tries to solve the problem of sentiments appearing in reviews and considers synonyms of product attributes. (Yan et al., 2015)

The main concept of Yan et al. (2015) is, that a so-called "lexical analysis" manages to find the most important features of a product by pairing attributes with sentiments while taking synonyms as well as implicit aspects into consideration. The final outcome will be generated by an "extended PageRank" algorithm called "NodeRank", which ranks the features upon their importance. (Yan et al., 2015)

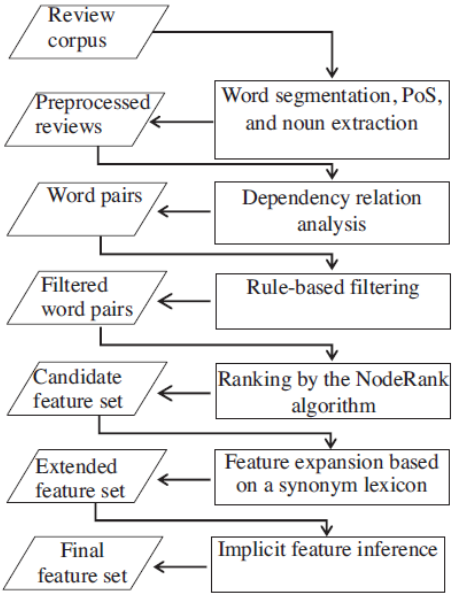

Figure 2 The process of the EXPRS method (Yan et al., 2015)

Figure 2 represents the process of the above mentioned EXPRS method. EXPRS stands for "Extended PageRank algorithm enhanced by a Synonym Lexicon." (Yan et al., 2015) The process happens as follows: in the first stage, from a review, text will be converted into "preprocessed reviews". (Yan et al., 2015) This action involves removing pointless symbols and characters, separation of words (which is only needed in some languages, such as Chinese) and collection of nouns which possibly represent a product feature. The next step is to find the connections in the sentence between nouns and adjectives and the ones who belong together will be paired, for instance 'nice design', or 'good camera'. After building the pairs, some data cleaning has to be done. Nouns and collocations, which do not refer to a feature, will be taken off the list of word pairs. These could be brand names, user name or the date when the review was written. (Yan et al., 2015) In stage four, the "NodeRank" algorithm is applied. (Yan et al., 2015) The algorithm is responsible for the ranking and it is based on a "node network" and "node-line graph". (Yan et al., 2015) Pairs with a high enough "NodeRank" will be processed in the final stages of the process. (Yan et al., 2015) The closing stage consists of two steps: one of them is expanding the existing list of pairs by adding synonyms and the other one is including implicit aspects. After these actions, the final outcome is delivered and the ranked list can be used for various purposes.

This method benefits both the online shoppers and the firms. With the help of the EXPRS method customers can optimize their search for reviews with their own interest, while manufacturers receive an evaluation by their users. (Yan et al., 2015)

2.2.3 Feature based summarization

Bafna and Toshniwal (2013) proposed another method to extract features from product reviews. The uniqueness of this method is that the outcome is more organised and the extraction happens more regularly and not only once as it is done in other methods. (Bafna & Toshniwal, 2013) The following figure illustrates the process of "feature based summarization". (Bafna & Toshniwal, 2013)

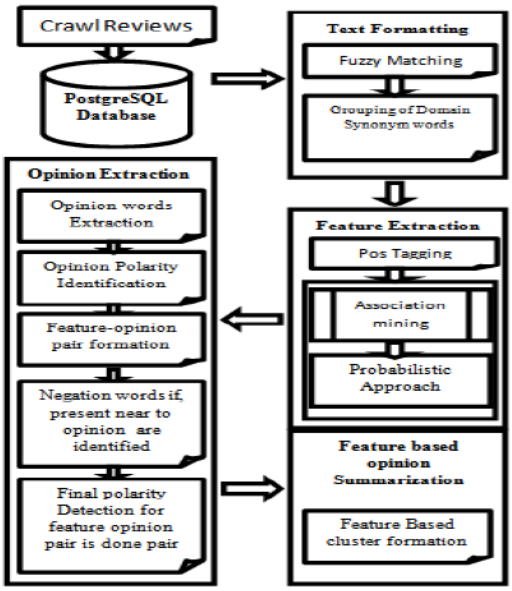

Figure 3 Bafna & Toshniwal's framework for feature extraction (Bafna & Toshniwal, 2013)

Similarly, to the approach of Zha et al. (2014) the collected reviews have to be cleaned first. All words misspelled will be either corrected or taken out from the data set. The next step in the data preparation is to find all nouns describing a product attribute and make groups of words with equivalent meaning. An important point to take into consideration is that for different products synonyms may vary in describing an aspect of the product. After pre-processing the reviews, the extraction phase follows in two steps. Firstly, POS tags will be created. (Bafna & Toshniwal, 2013) POS tagging is also often used in various frameworks. Wikipedia defines POS as follows:

"In corpus linguistics, part-of-speech tagging (POS tagging or PoS tagging or POST), also called grammatical tagging or word-category disambiguation, is the process of marking up a word in a text (corpus) as corresponding to a particular part of speech, based on both its definition and its context—i.e., its relationship with adjacent and related words in a phrase, sentence, or paragraph." (Wikipedia, 2018)

After this grammatical analysis, almost all nouns will be gathered together and only those will be selected for further assessment which stand for the examined product's attributes. (Bafna & Toshniwal, 2013) This elimination is done by using the sequence of two approaches called "association rule mining" and "probabilistic approach". (Bafna & Toshniwal, 2013) "Rule mining" filters nouns appearing the most often. (Bafna & Toshniwal, 2013) Since this idea cannot deal with nouns and collocations which do not fit as a feature, the "probabilistic model" is applied to solve the problem. (Bafna & Toshniwal, 2013) It eliminates all the nouns referring to something else than a character of the product. After the features are extracted, the sentiment is the next element to be analysed. As it is seen also on Figure 3, it consists of five steps. First, personal comments, both negative and positive are collected. Most frequently the polarity is expressed in the form of adjectives. The extracted opinions' direction is evaluated in the next step. After detecting the polarity, again, similarly to other methods, the adjectives which refer to a specific feature will be matched. Positive sentiments will stay positively meant as long as there is no word like for instance 'no', 'not' or 'neither' close to the adjective. (Bafna & Toshniwal, 2013) On the contrary, if a "negation word" is found close to a positive adjective it will convert the polarity into negative and vice versa. (Bafna & Toshniwal, 2013) To deliver the final results, the sentiments of each feature are summarized either possessing positive or negative polarity. (Bafna & Toshniwal, 2013)

2.2.4 RubE: Rule-based methods for extracting product features

The outlying quality the "rule-based method" towards other ways of feature extraction lies in considering all types of product aspects, such as objective and subjective, and obtaining the desired information by an unsupervised process of "rule based extraction". (Kang & Zhou, 2016) This method can be applied not only for reviews of regular, physical products, called "search goods", but also for comments on "experience goods". (Kang & Zhou, 2016)

"Experience goods" are defined by Nelson (1970) as commodities or services whose quality is evaluated by trying out different brands until ending up with the most preferred one. "Search goods" are for instance clothing items or furniture, while cars, music or different types of food are classified as "experience goods". (Nelson, 1970)

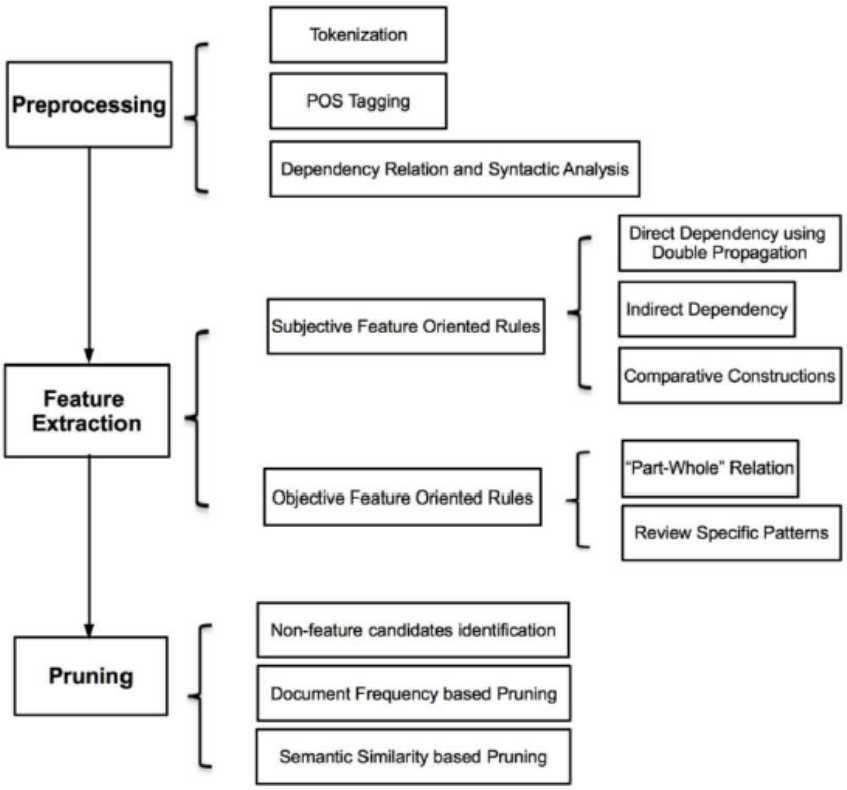

Figure 4 The RubE process (Kang & Zhou, 2016)

As it can be seen on Figure 4, the process of the "rule-based method" consists of three main steps: "preprocessing" followed by "feature extraction" and "pruning". (Kang & Zhou, 2016)

The starting stage is very similar to other methods, as it performs almost the same analyses: "tokenization, POS tagging, named entity recognition, and dependency grammar analysis." (Kang & Zhou, 2016) The second main step is divided into two sections due to the separation of subjective and objective features. (Kang & Zhou, 2016) For extracting subjective features three semantic designs exist:

- "Direct dependency" implies that there is a dependent relationship between two or more words. (Kang & Zhou, 2016) The customers' belief can be directly

paired to the respective product feature(s). For example, in review 179, "Nice quality camera", nice can be linked to camera. (Review no. 179) There are different grammatical relationships in which one can express an opinion. These are distinguished in the process. (Kang & Zhou, 2016) Qiu et al. (2011) developed "DP", the double propagation method to extract subjective aspects. "DP" was used also by Kang & Zhou (2016) for the latter reason.

- "Indirect dependency" means that the feature of the product and its feedback can be guessed from a third word. (Kang & Zhou, 2016) For example, "Waited a long time b4 buying a smart data phone - glad I picked my iPhone 6s! Easy to use and not too large!" (Review no. 99), shows and indirect relationship between the feature and its ease of use. "Indirect dependency" is represented in three forms: "simple indirect dependency", "explicitly pivoted indirect dependency", and "implicitly pivoted indirect dependency". (Kang & Zhou, 2016) After differentiating between these three, a similar approach as "DP" is implemented to collect subjective features. (Kang & Zhou, 2016)
- "Comparative constructions" is the third way of identifying subjective responses by users. (Kang & Zhou, 2016) Sentences, including a comparative word, are valuable because consumers formulate their opinion about a product's feature against another, possibly a competitor's product. There are four types of expressing a comparison: '…comparative (e.g., longer), superlative (e.g., best), equality (e.g., the same as), and unique words (e.g., beat)…". (Kang & Zhou, 2016)

Objective features can be obtained by finishing two rule based methods, namely from "part-whole relation" and "review specific patterns". (Kang & Zhou, 2016) A "part-whole relation" points out that a feature can be an individual attribute of a product as well as a part of another attribute of a product. (Kang & Zhou, 2016) It is difficult to recognise such grammatical relationships. Therefore, different forms of such sentences can be categorized, such as "genitive phrases", "verb phrases" and "verb phrases with prefix". (Kang & Zhou, 2016)

After finishing the extraction of both, subjective and objective features, the list of words has to be refined. (Kang & Zhou, 2016) This is an important problem to be solved because consumer reviews are written in a simple writing style, containing

spelling mistakes and “conjoined words”. (Kang & Zhou, 2016) The “pruning” stage is carried out in two steps: firstly, words which do not refer to a product feature have to be eliminated. (Kang & Zhou, 2016) Either a word does not come up in the list of possible product features extracted before, or if more words are included in the same sentence, only one of them will be treated as a candidate feature. Afterwards, the rest of possible features will be evaluated. Terms, which appear less frequently in the dataset will be excluded as well as words which are not logically connected to the content of the review. RubE is one of the best performing methods among other approaches and more importantly, it can be used for a wider range of products than any other method. (Kang & Zhou, 2016)

2.2.5 Estimating aggregate consumer preferences from online product reviews

Decker & Trusov (2010) chose a different approach to summarize consumers’ opinion about a specific product by applying a “negative binomial regression approach”. This method seeks to receive an overall opinion of a specific product’s user which is very difficult to summarize from the actual review along with the star rating given for the product. To prepare the data for the regression, seven steps have to be done, starting with separating the positive and negative comments within one review. In both groups, each phrase and sentence will be re-examined and all terms which do not refer to a product feature will be removed. In the next stage, adjectives of the same meaning (e.g. ‘excellent’ and ‘very good’) will be grouped either in the pros or cons list of the respective attribute. As already described in the previous subchapter reviewers can express themselves either implicitly or explicitly. In step four, implicit features will be transformed into explicit expressions. (Decker & Trusov, 2010) For instance, a phone looking ‘nice’ or being ‘cheap’ could refer to the ‘design’ and ‘price’, respectively. After having a list of nouns belonging to negative, positive or to both groups of comments, out of all synonyms only one word will be kept for each attribute. In stage six, the less common features will be eliminated. (Decker & Trusov, 2010) As a final step, the obtained nominal data will be coded into a “binary” form. (Decker & Trusov, 2010)

Binary coding is defined by Techopedia.com (2018) as follows:

“Binary code is the simplest form of computer code or programming data. It is represented entirely by a binary system of digits consisting of a string of consecutive zeros and ones.”

The final data set of Decker and Trusov (2010) therefore, consists of product features being either a pro or con argument. The research could also be extended to brand and type, so the level of influence of the brand’s reputation on a specific model could be measured. After deciding on the aim of the research either using the simple or the extended version the “econometric preference analysis” is the final phase. (Decker & Trusov, 2010)

In order to carry out the “binomial regression” approach, three types of evaluations have to be classified: “homogeneous preference model”, “heterogeneous model with a discrete distribution of preferences”, and “heterogeneous model with a continuous distribution of preferences”. (Decker & Trusov, 2010) Firstly, the homogeneous choices are modelled. Since, in most cases of products, the brand name has an effect on the product’s evaluation, an additional variable for that is included in the formula of the Poisson regression. The Poisson regression is a tool for calculating the strength of the above mentioned relationship between the rating and positive or negative opinion and reveals the power of the brand. (Decker & Trusov, 2010) Secondly, “heterogeneous preferences” are considered. (Decker & Trusov, 2010) To predict the relationship of pros and cons, and how the brand is perceived by customers, either “negative binomial regression” or “latent class” Poisson regression has to be performed. (Decker & Trusov, 2010) It is a rather complex process, because as heterogeneity indicates, customers have different desires towards a product, so the widest range of aspects has to be taken into consideration. After carrying out all regression models, the p-value of each feature will give an answer on whether it is significant or not significant in the users’ perspective. This method used the 10% significance level. All p-values being smaller than 0.1 indicate a significant outcome, therefore each attribute meeting this requirement can be considered important for the customers. (Decker & Trusov, 2010)

2.2.6 Rule-based opinion target and aspect extraction

Gindl et al. (2013) developed an advanced method to extract opinion aspects. The approach is unique towards others because it "…combines opinion target extraction with aspect extraction using syntactic patterns." (Gindl et al., 2013) This process also overcomes the problems of other methods, performing relatively low in the grammatical area, especially at syntactic analysis. It seeks to get the reasoning in the review text, why the opinion is good or bad about a product's feature. Figure 5 exhibits this aim of the method. (Gindl et al., 2013)

1. opinion target $\xrightarrow{\text{good thanks to}}$ sentiment aspect, and
2. opinion target $\xrightarrow{\text{bad due to}}$ sentiment aspect.

Figure 5 "Object of the two abstract relations" (Gindl et al., 2013)

The whole process is carried out in 4 steps:

- "Preprocessing" includes the use of Weblyzard, to divide the sentences into parts and classify them. (Gindl et al., 2013) Finally, all expressions which seem to describe an opinion will be marked and word(s) being dependent on other parts of the sentence will be stated, similarly to other models, with Stanford sentence analyser. (Gindl et al., 2013)
- "Cross-sentence sentiment propagation" will connect the highlighted "sentiment indicator" with the matching object. (Gindl et al., 2013) There are various ways to formulate a sentence expressing an opinion about a product, therefore different rules are applied to recognize all the dependencies within a sentence and connect them. These rules are also able to filter out not only one opinion expression, but negative and positive at the same time, and distinguish between them. Overall, if there is a negative and positive thought about a product, the polarity of the sentence would be neutral using other methods. (Gindl et al., 2013) However, the rules of Gindl et al. (2013) overcome this problem and extract the accurate sentiments. Another challenge of obtaining "opinion targets" is to find dependencies among two or more sentences. (Gindl et al., 2013) The solution for this difficulty is the "heuristic anaphora resolution". (Gindl et al., 2013)

- "Infomation extraction patterns for sentiment aspect extraction" is the next step in the procedure, where POS models are identified and listed. (Gindl et al., 2013) These POS tags are then associated with the opinion elements collected in the previous stage. (Gindl et al., 2013)
- "Extraction of opinion targets" is the final as well as most important step to be performed. (Gindl et al., 2013) Another reason for this step being crucial is that faint aspects are also extracted. The list created through this action gives a clear and ranked list of positive and negative features based on their frequency. (Gindl et al., 2013)

2.3 Amazon

This section gives a short insight into Amazon's company history, highlights the importance of electronic commerce nowadays as well as introduces recommender systems and their relationship to Amazon. This subpart is followed by a paragraph on how Amazon reviews serve as a source for this research and how these reviews can be created.

2.3.1 Company introduction

Today, Amazon is one of the biggest online retailers. In the past year Amazon was also in the top 5 of the most valuable companies, being the only retailer company among the top 10 of the market value list. (Daneshkhu & Campbell, 2017) Amazon was founded in 1995 by Jeff Bezos. He was not only the brain behind a great business idea, but also the one who set down the first milestones of e-commerce. (Fundinguniverse, 2018) EC is defined as follows:

"Electronic commerce (EC) refers to using the Internet and other networks (e.g., intranets) to purchase, sell, transport, or trade data, goods, or services." (Turban et al., 2017)

The main idea of Amazon was selling books online. As in Seattle there is valuable high-tech atmosphere and it is located near Oregon's "book distribution center" the company's seat can be found in the former city. (Fundinguniverse, 2018) After a successful start, the selection got expanded already in the early years of operation. CDs, DVDs, electronic devices, clothing and various other products could be ordered

via the platform. Bezos realised in the initial stage of the business that the key to a bigger success lies in the customers' satisfaction. The ease of use, the affordability, the search options, and the recommender system made Amazon outstanding against its competitors. Additional tools, such as personalised notifications via e-mail, reviews and supplementary services contributed to the company's rise. After Amazon went public, Bezos continued enhancing the platform and opened a second warehouse in New Castle while extending the first one in Seattle. With the New Castle facility, the company was able to manage better logistics and the deliveries' duration decreased for the Eastern region of the U.S. (Fundinguniverse, 2018) Through the "Associates program", Amazon was able to increase its sales number and at the same time it rewarded private web sites with commission from sales that proceeded from placed ads on these web pages. (Fundinguniverse, 2018) In the next years, a continuous growth could be inspected and more expansions were implemented. The biggest achievements can be seen on Figure 6, on the timeline. (Fundinguniverse, 2018) The hard work paid off and only 5 years after the beginning, Jeff Bezos was awarded with Time magazine's "Person of the Year" award. (Fundinguniverse, 2018)

Despite the growth and success, only one goal was to be accomplished, to report a profit. This event occurred in the fourth quarter of 2001. In the 2000s Amazon's rise persisted by partnerring up with other leading wholesalers, acquiring smaller firms, broadening the product range and advancing the web site. One of the most important actions of this period was the debut of Amazon Prime. (Fundinguniverse, 2018) Amazon Prime grants students an all year "free premium delivery" at a rate of €69. (Amazon, 2018.) It also provides access to "unlimited movies and TV shows with Prime Video", allows users to listen to "over two million songs" and "secure unlimited photo storage". (Amazon, 2018) As it is set as a milestone on Figure 6, the launch of the first version of Kindle in 2007, was a very important development of Amazon. Two years later, Kindle 2 was exceeding all expectations, and its sales broke a record. (Fundinguniverse, 2018) "By 2011 more Kindle books were sold by Amazon than traditional printed books." (Fundinguniverse, 2018)

In the recent years, Amazon was working on various big projects, such as "Amazon Prime Air", revealing procedures on delivery by drones and the launch of Amazon Echo. (Quinn, 2015) "Amazon Echo is a new smart speaker product from Amazon that

combines voice recognition "intelligent assistant" capabilities with speaker functionality in a cylindrical speaker form factor." (Stroud, 2018)

In 2015, Amazon celebrated its twentieth anniversary of operation. (Quinn, 2015) 2017, being outranked only by Apple, Amazon is the second most valuable company based on market capitalisation with $423 bn. (Businesstech, 2017)

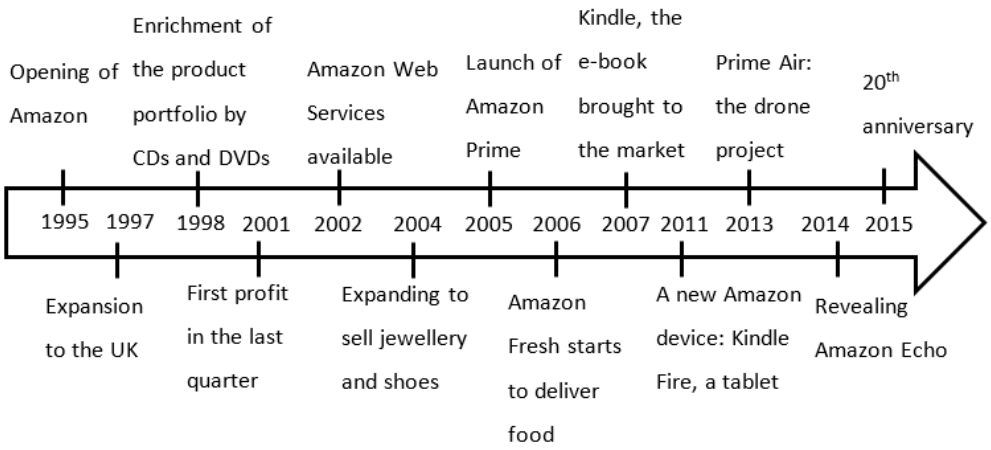

Figure 6 Timeline with Amazon's milestones (Quinn, 2015)

2.3.2 Amazon as a source for data collection

Amazon's infinite pool of reviews serves as a great source for the research. The process of data collection will be described in section 3.2.2. This subchapter explains how a review can be written and what types of evaluation are present.

Firstly, an account has to be created and it has to be debited with a sufficient amount of money to buy a product. There are tangible and intangible products that can be purchased as well as products which are free to acquire. (Amazon, 2018) In the case of "physical" and "digital" products the review can be submitted only 48 hours after the shipment and time of purchase respectively. (Amazon, 2018) There are two possibilities to express an opinion about the obtained product. (Amazon, 2018) The traditional way is writing a review in the form of free text and give a star rating on a scale from one to five in the "Customer review" section of the item. (Amazon, 2018) Additionally to the text, a picture of a product can be added to the review. Another way would be uploading a video to communicate comments about the good. Amazon

is constantly improving the quality of reviews and does not allow any promotions, manipulation, misleading or ruining a manufacturer's or the competition's perception by other customers. A brand's own products cannot be reviewed by the company, it is not approved to 'hire' customers to post reviews, neither writing negative reviews for rival brands' products. (Amazon, 2018) Furthermore, reviews can be classified by answering the question "Was this review helpful to you?". This helps future buyers to get a feedback on the product they are willing to purchase. (Amazon, 2018) For getting a comprehensive information on an item, there is a feature for product attributes. Single aspects of a product can be created and rated individually. (Amazon, 2018)

Figures 7 and 8 give an insight into how the "Customer Reviews" section looks. (Amazon, 2018) As an example, and iPhone 6S 64GB phone was chosen in Space Gray colour. (Apple iPhone 6S, 2018)

Average star rating

Distribution of star ratings

Total number of reviews

Individual feature's rating (when clicking on one of these features, all reviews containing it will be shown)

Section of top customer reviews

User name, star rating, short explanation of the rating

Date of the review

Information on the product purchased

Free text and an image added to the review

Figure 7 Customer reviews section, left side (Apple iPhone 6S, 2018)

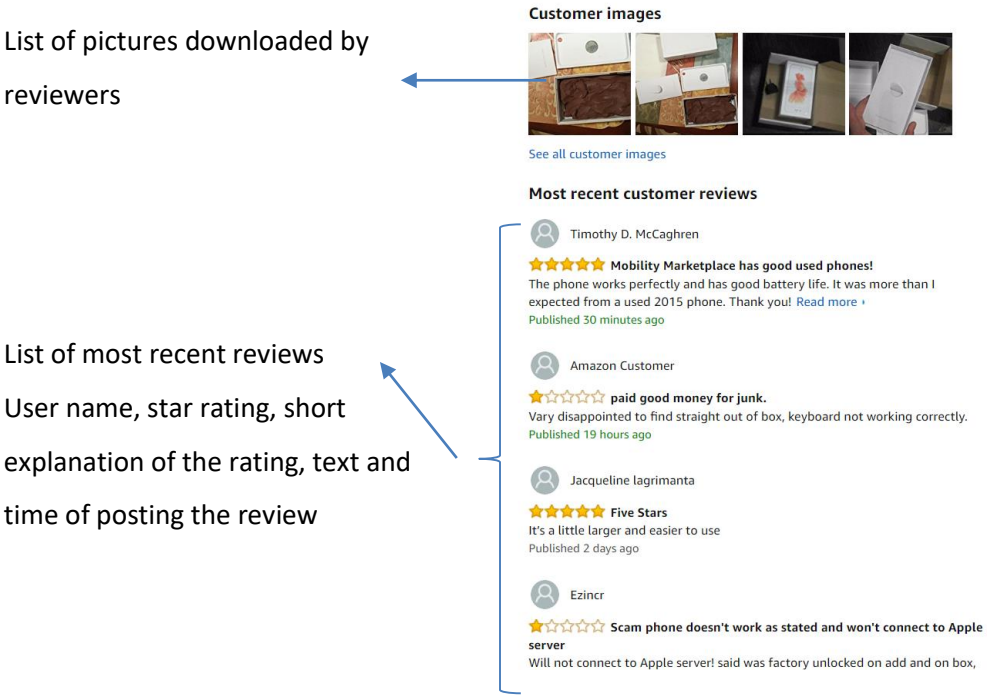

Figure 8 Customer reviews section, right side (Apple iPhone 6S, 2018)

2.4 Apple

This part of the literature review describes the history of Apple up to the present. The last two subchapters present the most important iPhone models in the research; iPhone 6S, 7 and iPhone 8 will be compared. The first two types of the study will be explored in detail, while iPhone 8 will only serve as an argument or proof whether iPhone takes customers' opinion into consideration in designing products or not.

2.4.1 The story of Apple

How did Apple become one of the top 10 companies of the Forbes Global 2000 list and how did it reach a market share of 51%, bigger than the rest of the whole smart phones industry? (Forbes, 2018; Fuscaldo, 2018) There is a very long way with ups and downs, back to the first day of Apple, when 'it opened its doors' on April the 1st, 1976. Steve Jobs and Steve Wozniak were the two main characters by founding the company, but in the background there was one more person, namely Ronald Wayne who is the brain behind iPhones, iPads or Macbooks. Apple I, their first computer was built by Wozniak from a keyboard which was connected to a TV screen. He built it only for a reason to prove to people that it is possible to produce a computer out of cheap components. When Jobs saw the result, he knew that there is potential in developing

the idea further. To start producing the first 50 pieces, a lot of things were required, such as materials, an order, support from friends and family, and most importantly, money. The solution came from Byte Shop by purchasing 50 computers.

After the success of Apple I, the second prototype was on its way and it was revealed during an exhibition in 1977. The Apple II had a colour screen already alongside other innovations. Throughout the next sixteen years, approximately six million pieces of Apple II were sold. In the 1980s Apple III was launched, but Jobs was already working on something new. Since Apple did not have the best resources yet, they asked for an access to an institution for research, in Xerox PARC. In exchange Xerox had the opportunity to buy shares from Apple. (Rawlinson, 2017) During the three days' access in the Xerox headquarter, which is commonly called "parc", Jobs was very inspired by Xerox Alto, the centre's own development with a mouse which was "used to point and click on objects on the screen." (Rawlinson, 2017)

Multiple development teams were working at Apple and each of them was involved in their own projects. Even a competition of being the first of delivering an Apple with a graphical screen evolved between them. One of them was working on Lisa that "…stood for Local Integrated System Architecture". (Rawlinson, 2017) The other team was developing the Macintosh. Jobs, being 'team Lisa' wanted to create a computer with a mouse for a reasonable price. (Rawlinson, 2017) He downgraded Xerox' "three-button gadget" and launched a mouse with one button. (Rawlinson, 2017) During this period he got distracted from some of his obligations on the management level. The chief executive officer of Apple at that time, Michael Scott, took Jobs out of several projects because of the lack of his commitment to his responsibilities, so he was seeking to find something new. He became part of the Macintosh undertaking. Jobs was innovating the design of the Macintosh and the visuals. Despite the hard work the Lisa was introduced a year before the Macintosh.

In the long-term however, Macintosh was the winner. It was the base for all the developments later on and even today's computers' roots date back to the 80s. The Lisa and even its follow-up, the Lisa 2 could not deliver the same sales numbers as the Macintosh so it had to be pulled out from the product portfolio of Apple. The original concept of the Macintosh came from Jef Raskin. (Rawlinson, 2017) Jobs was improving the idea and finally the Macintosh came with a mouse and with a "graphical user

interface". (Rawlinson, 2017) The key of Macintosh' success lied in the "GUI". (Rawlinson, 2017) The Macintosh was really appealing for various reasons: it had a great design and graphics, and with an integrated floppy drive it was much more easily portable than other computers. It was available on the market at the beginning of 1984. Additionally, a great external advertising team behind the Macintosh project contributed to a big success. The commercial, that they played during the halftime of the Super Bowl became viral and is said to be one of the greatest commercials ever.

The next milestone in Apple's story was advancing the performance of Macintosh by building a laser printer and connecting it to the device through a software. The application was called PageMaker created by a company named Aldus, and it became popular in the circle of creative workers and designers. Some years later, in 1994, Aldus had a merger with Adobe. Going back on the timeline of Apple, in the middle of the 1980s, they welcomed a new CEO, John Sculley. Jobs and Sculley had a lot of conflicts and they did not agree on the same terms regarding the pricing of Macintosh, for instance. Trying to solve the situation between the two, Sculley removed Jobs from the Macintosh team and he was offered to be Apple's director. This set-up did not last long, after Jobs left Apple, while his position got taken over by Jean-Louis Gassée.

However, Apple was continuing the hard work and presented Macintosh II in 1987. (Rawlinson, 2017) They were dominating the market of graphical computers until Microsoft's Windows 3, the first non "text-based" PC was launched. This also meant the first significant downturn in Apple's history. The only loophole in these circumstances was the creation of devices such as Macintosh Classic or Macintosh LC, pricing them to be available for more customers. The actions taken were not enough in the absence of Jobs, while the competition and threat from Windows was rising even more. Apple also tried to make changes in branding and focus on a new customer segment, but not even a collaboration with IBM and Motorola could help with the sales numbers. (Rawlinson, 2017) One benefit from teaming up with the latter two companies was the formation of the "Power PC processor", which served as a base for the future computers Apple drafted. (Rawlinson, 2017) The Power PC is still used today not only in computers, "…but in consumer devices like the Wii U, PlayStation 3 and Xbox 360, as well as in faceless computing applications…". (Rawlinson, 2017) In 1996 Apple needed another change and it was an advanced operating system. The

decision came to NeXTSTEP, an OS founded by Jobs. With NeXTSTEP, Jobs was back at Apple and he even became the new CEO. In the new era Microsoft and Apple got together again by creating Microsoft Office for Mac. At the same time Microsoft invested in Apple 150 million dollars in the form of stocks. (Rawlinson, 2017)

Another big milestone cannot be forgotten in the story: the launch of the iPhone in 2007. The iPhone 2G in its time, of course, possessed state-of-the-art technology. It had a touch screen and it could be connected to the internet. From year to year, new features were introduced and a new version was launched. For instance, in 2008, the Apple App store was presented. (The history of the iPhone, 2014) Only two years later, iPhone 4 had already a "high-resolution display" and a front camera. (The history of the iPhone, 2014) 2011 was a bittersweet year to Apple: unfortunately, they lost Jobs who gave up his fight with cancer, but they proudly launched iPhone 4S with a better processor, Siri, iCloud and iMessage. (The history of the iPhone, 2014) The next successor, iPhone 5 was the most successful version so far in the history. "It was also the very first iPhone to include LTE support." (The history of the iPhone, 2014) The next ones in line were iPhone 5S and 5C in 2013. 5C was presented in 5 colourways and both versions had Touch ID, which allowed users to unlock their phones with their own fingerprint. (The history of the iPhone, 2014) iPhone 6 brought a lot of innovations with itself: a bigger screen, better camera and Apple Pay. In addition, iPhone 6 Plus was released, the largest iPhone. To follow the pattern, iPhone 6 and 6 Plus were followed by iPhone 6S in 2015. (T3, 2018) Its uniqueness lies in the new home button: the "force touch". (T3, 2018) 2016 was the year of the iPhone SE and iPhone 7. Last but not least, the most recent versions are iPhone 8 and iPhone X. The latter dedicated for the 10th anniversary of the first iPhone, and its newest feature is the face ID. (T3, 2018)

To conclude, it can be seen that Apple never settled for a moment to enjoy the success but instead continued developing further ideas, new generations and new products were launched with cutting edge technology. These are the reasons for Apple standing there, where it is standing today, on the top, among the biggest rulers of the market of electronic devices. (Weinberger, 2015)

2.4.2 iPhone 6S, 7 & 8

This subchapter is dedicated to compare the three most recent versions except iPhone X. They are the three important generations for the study. As it is already described in 1.1 Aim of the research, iPhone 6S' and 7's most outstanding features will be ranked. To be able to recognize the attributes of iPhones during the data collection in the empirical part of the research, the following figures describe each type in detail.

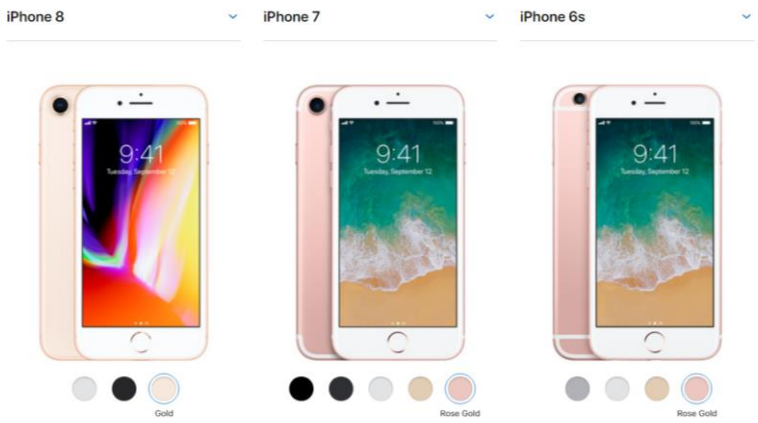

Figure 9 iPhone 8, 7 & 6S (Apple, 2018)

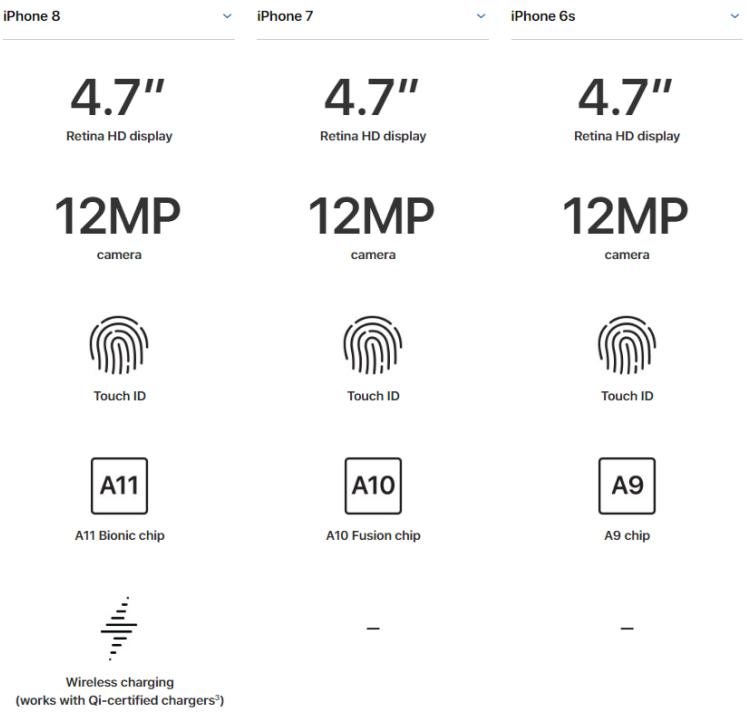

Figure 10 Ground information of iPhones (Apple, 2018)

iPhone 8	iPhone 7	iPhone 6s
Capacity[4]		
64GB	32GB	32GB
256GB	128GB	128GB
Display		
Retina HD display	Retina HD display	Retina HD display
4.7-inch (diagonal) widescreen LCD Multi-Touch display with IPS technology	4.7-inch (diagonal) widescreen LCD Multi-Touch display with IPS technology	4.7-inch (diagonal) widescreen LCD Multi-Touch display with IPS technology
—	—	—
1334-by-750-pixel resolution at 326 ppi	1334-by-750-pixel resolution at 326 ppi	1334-by-750-pixel resolution at 326 ppi
1400:1 contrast ratio (typical)	1400:1 contrast ratio (typical)	1400:1 contrast ratio (typical)
True Tone display	—	—
Wide color display (P3)	Wide color display (P3)	Full sRGB standard
3D Touch	3D Touch	3D Touch
625 cd/m2 max brightness (typical)	625 cd/m2 max brightness (typical)	500 cd/m2 max brightness (typical)

Figure 11 Information on iPhones' capacity and display (Apple, 2018)

iPhone 8	iPhone 7	iPhone 6s
Camera		
12MP camera	12MP camera	12MP camera
ƒ/1.8 aperture	ƒ/1.8 aperture	ƒ/2.2 aperture
Optical image stabilization	Optical image stabilization	—
Digital zoom up to 5x	Digital zoom up to 5x	Digital zoom up to 5x
Wide color capture for photos and Live Photos	Wide color capture for photos and Live Photos	—
Quad-LED True Tone flash with Slow Sync	Quad-LED True Tone flash	True Tone flash
—	—	—
—	—	—
Video Recording		
4K video recording at 24 fps, 30 fps, or 60 fps	4K video recording at 30 fps	4K video recording at 30 fps
1080p HD video recording at 30 fps or 60 fps	1080p HD video recording at 30 fps or 60 fps	1080p HD video recording at 30 fps or 60 fps
Optical image stabilization for video	Optical image stabilization for video	—
Digital zoom up to 3x	Digital zoom up to 3x	Digital zoom up to 3x
Slo-mo video support for 1080p at 120 fps or 240 fps	Slo-mo video support for 1080p at 120 fps and 720p at 240 fps	Slo-mo video support for 1080p at 120 fps and 720p at 240 fps
Time-lapse video with stabilization	Time-lapse video with stabilization	Time-lapse video with stabilization

Figure 12 Camera and Video Recording on iPhones (Apple, 2018)

iPhone 8	iPhone 7	iPhone 6s
Power and Battery[11]		
Lasts about the same as iPhone 7	Lasts up to 2 hours longer than iPhone 6s	—
Built-in rechargeable lithium-ion battery	Built-in rechargeable lithium-ion battery	Built-in rechargeable lithium-ion battery
Wireless charging (works with Qi-certified chargers[3])	—	—
Charging via USB to computer system or power adapter	Charging via USB to computer system or power adapter	Charging via USB to computer system or power adapter
Talk time (wireless): Up to 14 hours	**Talk time (wireless):** Up to 14 hours	**Talk time:** Up to 14 hours
Internet use: Up to 12 hours	**Internet use:** Up to 12 hours	**Internet use:** Up to 10 hours
Video playback (wireless): Up to 13 hours	**Video playback (wireless):** Up to 13 hours	**Video playback:** Up to 11 hours
Audio playback (wireless): Up to 40 hours	**Audio playback (wireless):** Up to 40 hours	**Audio playback:** Up to 50 hours
Fast-charge capable: Up to 50% charge 30 minutes[12]	—	—
Included Headphones		
EarPods with Lightning Connector	EarPods with Lightning Connector	EarPods with 3.5 mm Headphone Plug
Lightning to 3.5 mm Headphone Jack Adapter	Lightning to 3.5 mm Headphone Jack Adapter	—

Figure 13 Other important features of iPhones (Apple, 2018)

2.4.3 Customer analysis and segmentation of Apple

Another important aspect in the paper is to gain knowledge about the customers of Apple. In order to understand why some features are more or less significant in the users' eyes, the different target groups of Apple have to be investigated. After having a clear picture about the product and its customers, an explanation can be given why certain features stand out.

Apple's segmentation is quite complex but according to Dudovskiy (2018) Apple targets its customers based on four product types: "devices", "services", "operating system & software" and "accessories". Each of these targets people internationally, from the middle and upper classes, between the ages of 18 – 45. (Dudovskiy, 2018) This is a very wide range of targeted groups, but as it was mentioned in 2.4.1 The story of Apple, the product portfolio is very broad as well. (Rawlinson, 2017)

3 Research

This chapter of the study will describe the empirical part of the research. The process involves 3 stages. Firstly, the data collection and its coding will be explained in detail. The next step is the analysis of the data and the execution of regressions, group comparison tests and rankings. The final stage reveals the results of the previous step with the help of graphical representations such as charts and tables.

3.1 Data collection and preparation

This stage of the empirical part of the study describes the process of the data collection. The reviews which serve as the source of the data, were extracted from Amazon. Firstly, reviews written in English were collected. To avoid the cleaning of the data, reviews were considered only if they include at least one product feature of iPhone 6S or 7.

A product feature is a "…function of an item which is capable of gratifying a particular consumer need and is hence seen as a benefit of owning the item. In business, a product feature is one of the distinguishing characteristics of a product or service that helps boost its appeal to potential buyers, and might be used to formulate a product marketing strategy that highlights the usefulness of the product to targeted potential consumers." (Business Dictionary, 2018)

Before collecting the reviews, a list of possible product features was developed with the help of the mentioned attributes of iPhones from the comparison tables in 2.4.2 iPhone 6S, 7 & 8, and the Amazon option, which filters reviews based on different features as it is shown in Figure 8.

In total, 200 reviews were collected, 100 reviews about iPhone 6S and 100 reviews about iPhone 7. In order to have an accurate outcome, it was important to collect reviews with an equal share of each star rating category. Negative, neutral, and positive opinions may highlight different aspects of a product. Moreover, a focus was also put on the fact that there are different colour and capacity options available for both iPhone 6S and 7. Table 1 exhibits the possible combinations which were considered:

	iPhone 6S	iPhone 7
Colour	• Space gray • Silver • Gold • Rose Gold	• Jet black • Black • Silver • Gold • Rose Gold
Capacity	• 32 GB • 128 GB	• 32 GB • 128 GB

Table 1 iPhone combinations

Another important aspect was to exclude fake and irrelevant reviews, therefore a review was collected only, if it fit the criteria so far described, the phone was classified as new, it was a top rated review, and the reviewer's purchase was verified. This was a very necessary action because a lot of refurbished phones are sold on Amazon and most of the reviews on such purchases are based on the condition of the iPhone itself and the quality of the service, such as delivery time. Throughout the data collection, synonyms were also taken into consideration and they were listed within the same feature category, for instance screen and display. Also, not only synonym, but formulations, which referred to a feature, were evaluated in a specific aspect. If a review mentioned the quality of the photos, it was listed in the camera category.

The data collection was followed by the preparation of the data. Since the collecting process already disregarded irrelevant reviews, the cleaning was not necessary anymore, therefore before the analysis could start, the data had to be coded. This step was carried out manually. Each review was numbered for an easier identification. Next to the review text and the generation (6S or 7), its star rating was listed and the mentioned feature's sentiment was coded on a scale from -1 to 1. A value of -1 means a negative opinion about the specific feature, while 0 being neutral, and 1 referring to a positive experience towards the mentioned product feature. In each case, if a feature was not mentioned, it was considered as a neutral feedback, so there are no missing values in the data set.

Furthermore, one more column was created throughout the process. This additional line was generated by RapidMiner's Aylien extension. "RapidMiner is a software

platform for data science teams that unites data prep, machine learning, and predictive model deployment." (RapidMiner, 2018) The platform offers different solutions for businesses taking active part in various industries, such as banking, retail, manufacturing, telecommunications or travel industry. (RapidMiner, 2018) It includes solutions in important fields, such as "demand forecasting", "customer segmentation", "risk management" or "text mining". (RapidMiner, 2018) As already discussed in the paper, mining plays a crucial role in the life of firms nowadays. The understanding of qualitative data, for instance reviews or comments, can boost an organization's performance and the relationship to its customers. (RapidMiner, 2018) Aiming for a higher accuracy of the outcome and to extend the research perspective a sentiment analysis was also applied to all the reviews. RapidMiner is built up by different bundles, which have to be connected with each other and sequenced by the researcher for the desired outcome. Firstly, the extension for sentiment analysis had to be downloaded. Aylien, a text mining tool served for the purpose of this study. After that, the reviews were imported. Through the repository building block, the separator of the reviews and the format, which will be shown, had to be controlled. After the reviews were read into the system, the data 'piece' had to be dragged into the process and connected to the Aylien extension and to the outcome. The process having been run, the result file could be saved.

The result contained several columns, such as the accuracy of the polarity and the sentiment of each review being positive, neutral or negative. The new column was merged with the original data set file. This was followed by a ‚re-coding' in SPSS. The previously defined scale, -1 (negative), 0 (neutral) and +1 (positive) was applied again to transform the nominal variable into an ordinal one. This is a necessary step to be able to run tests requiring ordinal scaled variables.

3.2 Data analysis

After giving an insight into the SPSS software, the data analysis part finally delivers the outcome of the research. Descriptive statistics, will give general information about the data, and inferential statistics, such as a group comparison test and linear regression will be used to deliver the results.

3.2.1 Introduction of IBM SPSS Statistics software

The first version of SPSS dates back to 1968, to the year when three men, namely Norman H. Nie, C. Hadlai Hull and Dale H. Bent introduced the SPSS software. (SPSS, 2018) SPSS stands for "Statistical Package for the Social Sciences" and originally, it was developed only for a university research at Stanford. (SPSS, 2018) The software seemed to be very useful to turn unprocessed data into conclusions which are useful immediately for decision-makers. The demand for SPSS was quickly growing in the early phase of operation while the software was constantly developed. After releasing the manual for the software in 1970, the 70s brought a great success for the developers with steadily increasing number of sales and application of the software in more and more different fields. Businesses, institutions, the government and even NASA could profit from the benefits of the software. During these years two of the developers took control and created a company for SPSS. The continuous hard work and the anticipating behaviour was paying off; in 1992 the company introduced statistical programs for computers with Microsoft Windows. (SPSS, 2018) Since 2009 the ownership of SPSS belongs to IBM and it can be combined with other softwares. (Wikipeda, 2018) Until today, there were always new tools and methods added to the software which provided a wide variety of ways which serve different organizations' interests. (SPSS, 2018) The software has numerous statistical tools which are included in the base subscription. (Wikipeda, 2018) These basic statistics are:

- "Descriptive statistics: cross tabulation, frequencies, descriptives, explore, descriptive ratio statistics" (Wikipeda, 2018)
- "Bivariate statistics: means, t-test, ANOVA, correlation, …, nonparamteric tests,…" (Wikipeda, 2018)
- "Prediction for numerical outcomes: linear regression" (Wikipeda, 2018)
- "Prediction for identifying groups" (Wikipeda, 2018)
- "Geo spatial analysis, simulation" (Wikipeda, 2018)
- "R extension" (Wikipeda, 2018)

There are also tools which can be purchased additionally and serve different purposes. (IBM, 2018) These add-ons are the following:

"Custom tables and advanced statistics add-on" (IBM, 2018)

"Complex sampling and testing add-on" (IBM, 2018)

"Forecasting and decision trees add-on" (IBM, 2018)

For the aim of this research the base package of SPSS will be used.

3.2.2 Descriptive statistics

This subchapter deals with the collected data and presents the results from the previous step. As it has already been stated in 3.1 Data collection and preparation, in total, 200 reviews were collected, precisely 100 for each generation of iPhones.

Firstly, information will be given about the frequency and absolute values of features coming up in the dataset. To mention it again, there are no missing values, because all the features which were not mentioned in a review, were treated as a neutral opinion. Also, the frequency of the star rating has already been defined during the data collection process. For each star 20 reviews were collected for both phone versions. Regarding the reviews' sentiments, especially negative and positive ones, some features can already be highlighted and noted later on for closer evaluation.

When looking at the frequencies, the general options and features of both versions are rated relatively positive. The general option feature was mentioned 42 and 37 times out of all reviews in a positive way. Surprisingly, Apple as a brand does not play a role in the reviews. The good and bad comments outweigh each other in this case. Furthermore, the biggest outlier in the frequency tables in Appendix 2, is the battery of iPhone 6S. 37% of the reviews are negative and there is no positive statement pointed out about it. Users also expressed their opinion about the iOS and in both of the cases approximately 15% of them criticized the operating system of Apple. Physical attributes such as size, design or weight were slightly mentioned, and if they were, most of the time positive sentiments were shared. Another noticeable aspect is the robustness. Since iPhone 7 got waterproof, this change can also be seen in the frequency table (Appendix 2) of the 'robustness' feature. (Apple, 2018) Users of iPhone 6S complained about this feature and there were no positive thoughts about it, however, owners of the newer version welcomed this improvement positively. Last but not least, the feedback on the price has to be discussed. In both cases people find iPhones rather expensive.

To illustrate the results graphically and treat the data from a different approach, the following bar chart in Figure 14 exhibits the mean value distribution of the 17 features. The mean value can range between -1 and +1 in this study. After the calculation of the actual averages, it is visible, that overall, the values range between 0.32 and -0.37.

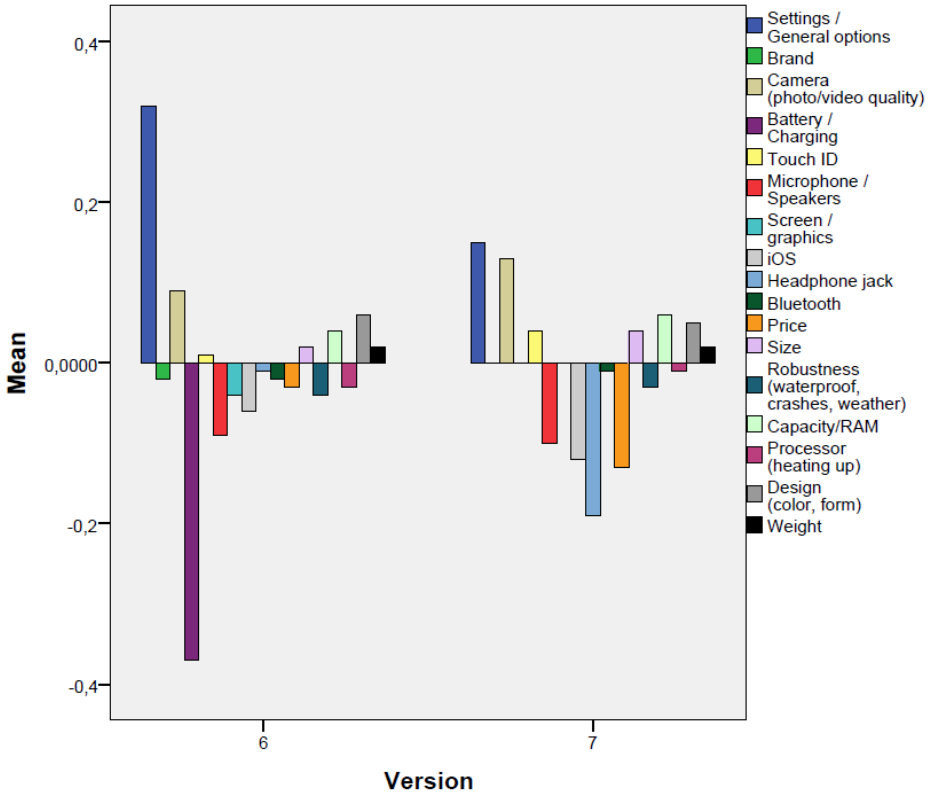

Figure 14 – Distribution and mean of the features (SPSS Output)

The left side of the graph shows the average of each feature measured in the case of iPhone 6S, while on the right iPhone 7's mean values can be seen. Users' found the general features and options of iPhone 6S with a mean value of 0.32 the most positive, followed by the camera, reaching an average of 0.09, which promises a better quality of photos than the previous generations. The third place is taken by the design of the phone with 0.06. Looking on the downside of the graph, it is clear, the battery is the most negative feature of iPhone 6S according to the customers. Its average is -0.37. On the second and third places on the 'negative' podium are the microphone/speakers and the iOS with an average of -0.06 and -0.09 respectively.

In comparison to iPhone 6S, it can be observed that in the case of iPhone 7 the mean value outliers are less extreme, being closer to a neutral opinion and more diversification. Users of iPhone 7 are also the most satisfied with the new version's general features with a mean value of 0.15 and the camera, 0.13. Another aspect being positively mentioned is the capacity/RAM. The negative side of the two versions differs completely in the top three places. Users believe that the change in the headphone jack is the worst thing that happened to the iPhone 7. It stands out with an average of -0.19 being followed by the values -0.13 and -0.12. The mean of -0.13 stands for the price, which is perceived to be too high, while -0.12 represents iOS.

The differences in the mean values between the two generations can be explained by various arguments listed in the following paragraphs.

With the help of the product details, shown in 2.4.2 iPhone 6S, 7 & 8 it can be seen that there are a lot of improvements between iPhone 6S and 7. Starting with the screen and graphical attributes, two changes can be detected. Firstly, the full sRGB standard display was replaced into a wide colour display, and secondly, the max brightness was extended. (Apple, 2018) This development can also be detected in the following tables.

Version		N	Minimum	Maximum	Mean	Std. Deviation
6	Review number	100	1,0	100,0	50,500	29,0115
	Settings / General options	100	-1,0	1,0	,320	,6495
	Brand	100	-1	1	-,02	,376
	Camera (photo/video quality)	100	-1	1	,09	,321
	Battery / Charging	100	-1	0	-,37	,485
	Touch ID	100	-1	1	,01	,266
	Microphone / Speakers	100	-1	1	-,09	,379
	Screen / graphics	100	-1	1	-,04	,281
	iOS	100	-1	1	-,06	,422
	Headphone jack	100	-1	0	-,01	,100
	Bluetooth	100	-1	0	-,02	,141
	Price	100	-1	1	-,03	,332
	Size	100	-1	1	,02	,245
	Robustness (waterproof, crashes, weather)	100	-1	0	-,04	,197
	Capacity/RAM	100	0	1	,04	,197
	Processor (heating up)	100	-1	1	-,03	,264
	Design (color, form)	100	-1	1	,06	,278
	Weight	100	0	1	,02	,141
	Valid N (listwise)	100				

Table 2 Descriptive statistics iPhone 6S (SPSS Output)

Version		N	Minimum	Maximum	Mean	Std. Deviation
7	Review number	100	101,0	200,0	150,500	29,0115
	Settings / General options	100	-1,0	1,0	,150	,7571
	Brand	100	-1	1	,00	,512
	Camera (photo/video quality)	100	-1	1	,13	,418
	Battery / Charging	100	-1	1	,00	,318
	Touch ID	100	-1	1	,04	,281
	Microphone / Speakers	100	-1	1	-,10	,389
	Screen / graphics	100	-1	1	,00	,376
	iOS	100	-1	1	-,12	,477
	Headphone jack	100	-1	1	-,19	,419
	Bluetooth	100	-1	0	-,01	,100
	Price	100	-1	1	-,13	,393
	Size	100	0	1	,04	,197
	Robustness (waterproof, crashes, weather)	100	-1	1	-,03	,413
	Capacity/RAM	100	0	1	,06	,239
	Processor (heating up)	100	-1	1	-,01	,301
	Design (color, form)	100	-1	1	,05	,297
	Weight	100	0	1	,02	,141
	Valid N (listwise)	100				

Table 3 Descriptive statistics iPhone 7 (SPSS Output)

The mean value also reflects the improvement regarding the screen, it changed from -0.04 to 0.00. This pattern can be observed with another example. The camera, its flash and the video recording experience were enhanced, and this significant change can also be discovered in the average values. In both of the cases the values are positive, but from older generation to the newer one, the mean rises from 0.09 to 0.13. Furthermore, there is one more aspect, in which iPhone 7 outperforms 6S. (Apple, 2018) As stated in the product description of iPhone 7, its battery life "lasts up to 2 hours longer than iPhone 6S." The reviews also expressed this development. The average value of iPhone 7's battery went up to neutral, being negative for iPhone 6S with -0.37. (Apple, 2018)

However, there is one thing, customers do not seem to be happy about: the disappearance of the headphone plug-in. iPhone 7 was the first type, which allows users only to use EarPods, that connect to the phone via Bluetooth, or alternatively buy a small transformation cable which enables a connection of a headphone jack to the phone through the charging port. (Apple, 2018) A remarkable decrease in the average can be noticed. It dropped from -0.01 to -0.19.

Overall, the improvements made to the newer iPhone version, namely the 7, are also reflected in the customer reviews. In the case of iPhone 6S 10 features out of 17 are perceived negatively, which does not imply predominant customer satisfaction. However, the iPhone 7's feedback in general got better. Out of all attributes, only 7 are negative, 3 neutral, and the rest are all positive.

The next subchapter will support and explain the findings so far discovered.

3.2.3 Inferential statistics

In this part of the paper, different methods are applied in order to come to a conclusion and answer the research question.

Continuing the analysis of the highlighted features in the descriptive statistics part, a Mann-Whitney U test was performed to find significant differences among the two iPhone versions being compared. The test was chosen, because it compares two independent groups. The fact, that the data is ordinal scaled with less than 10 values, is another reason for choosing the non-parametric test. Additionally, the test is two-

tailed, and the α-level is set at 5%. This implies, that a result is significant, if the p-value is < than 0.05. After running the Mann-Whitney U test, two tables include the results. The first one, the ranks table (Table 4), allows only to analyse the mean ranks and the sum of ranks, where one can only look for considerable differences between two values. However, this will just give an impression. Tables 5-7 with the test statistics deliver the numbers, from which conclusions can be drawn.

Ranks

	Version	N	Mean Rank	Sum of Ranks
Settings / General options	6	100	106,23	10623,00
	7	100	94,77	9477,00
	Total	200		
Brand	6	100	99,63	9963,00
	7	100	101,37	10137,00
	Total	200		
Camera (photo/video quality)	6	100	98,43	9843,00
	7	100	102,57	10257,00
	Total	200		
Battery / Charging	6	100	82,93	8292,50
	7	100	118,08	11807,50
	Total	200		
Touch ID	6	100	99,05	9905,00
	7	100	101,95	10195,00
	Total	200		
Microphone / Speakers	6	100	100,99	10098,50
	7	100	100,02	10001,50
	Total	200		
Screen / graphics	6	100	98,64	9864,00
	7	100	102,36	10236,00
	Total	200		
iOS	6	100	103,32	10332,00
	7	100	97,68	9768,00
	Total	200		
Headphone jack	6	100	109,51	10950,50
	7	100	91,50	9149,50
	Total	200		
Bluetooth	6	100	100,00	10000,00
	7	100	101,00	10100,00
	Total	200		
Price	6	100	105,27	10527,00
	7	100	95,73	9573,00
	Total	200		
Size	6	100	99,54	9954,00
	7	100	101,46	10146,00
	Total	200		
Robustness (waterproof, crashes, weather)	6	100	100,14	10014,00
	7	100	100,86	10086,00
	Total	200		
Capacity/RAM	6	100	99,50	9950,00
	7	100	101,50	10150,00
	Total	200		
Processor (heating up)	6	100	99,55	9955,00
	7	100	101,45	10145,00
	Total	200		
Design (color, form)	6	100	100,97	10096,50
	7	100	100,04	10003,50
	Total	200		
Weight	6	100	100,50	10050,00
	7	100	100,50	10050,00
	Total	200		

Table 4 Mann-Whitney U test, part 1 (SPSS Output)

Test Statistics[a]

	Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging	Touch ID
Mann-Whitney U	4427,000	4913,000	4793,000	3242,500	4855,000
Wilcoxon W	9477,000	9963,000	9843,000	8292,500	9905,000
Z	-1,522	-,305	-,817	-5,827	-,776
Asymp. Sig. (2-tailed)	,128	,760	,414	,000	,438

Table 5 Mann-Whitney U test, part 2 (SPSS Output)

Test Statistics[a]

	Microphone / Speakers	Screen / graphics	iOS	Headphone jack	Bluetooth	Price
Mann-Whitney U	4951,500	4814,000	4718,000	4099,500	4950,000	4523,000
Wilcoxon W	10001,500	9864,000	9768,000	9149,500	10000,000	9573,000
Z	-,189	-,837	-,971	-4,059	-,580	-1,936
Asymp. Sig. (2-tailed)	,850	,402	,331	,000	,562	,053

Table 6 Mann-Whitney U test, part 3 (SPSS Output)

Test Statistics[a]

	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)	Design (color, form)	Weight
Mann-Whitney U	4904,000	4964,000	4900,000	4905,000	4953,500	5000,000
Wilcoxon W	9954,000	10014,000	9950,000	9955,000	10003,500	10050,000
Z	-,621	-,165	-,647	-,494	-,235	,000
Asymp. Sig. (2-tailed)	,534	,869	,517	,622	,814	1,000

Table 7 Mann-Whitney U test, part 4 (SPSS Output)

Starting with Table 5, a significant difference can be detected between the battery of iPhone 6S and 7. Referring back to Table 4, with the help of mean ranks it can be interpreted whether the 6S or 7's battery had better reviews. By applying the rule: the higher the mean rank, the better the evaluation of the feature is, it is clear, that iPhone 7 outweighs the older version. This pattern was realised already in the subchapter 3.2.2 Descriptive statistics. Back then, it was only a proposal, which is verified now with the applied test.

Continuing the evaluation with Table 6, another significant difference can be identified. As the technical change about the disappearance of headphone jack was discussed above, it is obvious that customers feel uncomfortable about the new solution. This difference in the satisfaction level is demonstrated not only by a p-value

of < 0.001, but also the mean rank of the new generation is lower than for iPhone 6S, reflecting the dissatisfaction of iPhone 7 owners.

To highlight a last example, the price having a p-value of 0.053 is close to be significant. Again, looking at Table 4, the lower mean rank of iPhone 7 implies that the older version is more reasonably priced. This can be assumed to be true only by comparing the price of the two versions. This difference in the price might be the reason for the significant results, and it can be concluded that the raise in the price does not hold up to the expectations regarding improvements and additional features. According to Apple's official website (2018) the iPhone 6S in each colourway costs € 519,00 with an internal capacity of 32 GB and the 128 GB version is available from € 629,00. In contrast, iPhone 7 starts at a rate of € 629,00 with 32 GB space and the version with 128 GB storage costs € 739,00. (Apple, 2018) It seems, that the 21.19 % and the 17.49% increase in the price does not equal the value of developments made to iPhone 7 in the customers' opinion. The example of review number 139 shares the thoughts just described above:

"I have to say, this is a good phone but it's basically a 6s without a phone jack. Same display as the 6s. The camera is better, so that's good news for camera peeps. Overall, the phone is getting the job done, but for the price, I'd say, if you already have a 6s, you can skip the 7 and save almost a $1000." (Review no. 139)

Finally, linear regression was applied to fulfil the unanswered questions in the study. So far it was not revealed, how accurate the automatic tool was analysing the reviews by their sentiment. The dependent variable in the model was the overall star rating, and the independent variable was the numeric polarity created with the help of RapidMiner. After running the simple linear regression, three tables assist for answering whether the overall star rating can be predicted by the automatic sentiment analysis tool.

Table 8 concludes the model summary. The adjusted R square value gives an impression, how stable the model is. However, there is no standard value to determine whether the model is good or bad, it depends on various factors, such as how many predictors are included or in which area is the research conducted. In this case, the value of 0.209 or transformed, 20.9 % does not imply to be good. This result

could be explained by the fact, that only a snapshot of the overall review assessment is evaluated by the tool. Furthermore, the efficiency of the tool regarding the aspect-based sentiment detection might also have an influence on the stability of the model.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,461[a]	,213	,209	1,261

a. Predictors: (Constant), polarity_numeric

Table 8 Linear regression for sentiment, part 1 (SPSS Output)

The ANOVA table, reports the result on the global significance. The p-value of < 0.001 in Table 9 verifies the first expected answer. The automatic sentiment analysis therefore is useful to predict the overall star rating of a review.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85,169	1	85,169	53,563	,000[b]
	Residual	314,831	198	1,590		
	Total	400,000	199			

a. Dependent Variable: Overall star rating

b. Predictors: (Constant), polarity_numeric

Table 9 Linear regression for sentiment, part 2 (SPSS Output)

The coefficients table usually lists all the independent variables and evaluates which ones are relevant predictors and which ones are not. Since this regression was only a simple one, there is only one predictor in the table, namely the numeric polarity. It is clear that the variable with a p-value of < 0.001 is a significant predictor, but what kind of influence does it have on the dependent variable? With the help of Table 10, it can be suggested, that if the polarity increases by 1 unit, the overall rating increases by 0.741 stars.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,674	,100		26,832	,000
	polarity_numeric	,741	,101	,461	7,319	,000

a. Dependent Variable: Overall star rating

Table 10 Linear regression for sentiment, part 3 (SPSS Output)

To confirm the findings above, a random examination check was done to see if the automatic tool is really that precise as the linear regression declares. This can be done manually by reading the reviews one by one. Some examples support the statement above. Their polarity by the software corresponds with the opinion shared in the reviews.

As final steps of the research, two multiple linear regressions were applied to reveal which features are the most important for the users of iPhone 6S and 7. Before running any of the regressions, attention has to be given to multicollinearity. Given the list, there are no features which measure the same aspects of a phone, as well as there is no high correlation expected between them. Additionally, before running the tests, the correlation between the features were calculated. Since the variables are ordinal scaled, a Spearman correlation was applied. For all the results see Appendix 4. Some pairs seemed to be significant on a 5% level. Out of 256 pairs, only 32 had p-value under 0.05. When looking at the correlation of these significant pairs, the highest correlation coefficient was 0.338 between the internal capacity and the processor. This implies rather weak correlations. Since none of the pairs showed a strong correlation, with a coefficient higher than 0.7, all features were put into the model. This correlation was applied overall to the whole dataset. Before running the regression, the data was split based on the version. As a last check, the correlation was also evaluated on the group level and no remarkable difference was discovered in comparison to the overall regression.

Starting with iPhone 6S, the dependent variable is the overall star rating, and after careful consideration, all 17 features are tested as predictors in the model. The linear regression was performed whereby all variables entered the model at the same time.

As already described above, the combination of three tables will lead to the final results.

Even though there were a lot of features put into the regression, Table 11, the model summary shows a moderate percentage value of 41.6 %.

Model Summary

Version	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	1	,718[a]	,516	,416	1,0864

a. Predictors: (Constant), Weight, Touch ID, Brand , Headphone jack, Bluetooth, Microphone / Speakers, Design (color, form), Screen / graphics, Price, Robustness (waterproof, crashes, weather), Capacity/RAM, Processor (heating up), Battery / Charging, iOS, Settings / General options, Camera (photo/video quality), Size

Table 11 Linear regression iPhone 6S, part 1 (SPSS Output)

Table 12 gives an insight into the global significance of the whole model. The p-value of < 0.001 is significant on the 5% α-level, therefore it makes sense to look at the third table, where each feature can be evaluated whether they are useful predictors or not.

ANOVA[a]

Version	Model		Sum of Squares	df	Mean Square	F	Sig.
6	1	Regression	103,216	17	6,072	5,144	,000[b]
		Residual	96,784	82	1,180		
		Total	200,000	99			

a. Dependent Variable: Overall star rating

b. Predictors: (Constant), Weight, Touch ID, Brand , Headphone jack, Bluetooth, Microphone / Speakers, Design (color, form), Screen / graphics, Price, Robustness (waterproof, crashes, weather), Capacity/RAM, Processor (heating up), Battery / Charging, iOS, Settings / General options, Camera (photo/video quality), Size

Table 12 Linear regression iPhone 6S, part 2 (SPSS Output)

Coefficients[a]

Version	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
6S	1	(Constant)	3,011	,218		13,791	,000
		Settings / General options	,706	,214	,323	3,293	,001
		Brand	,569	,322	,150	1,767	,081
		Camera (photo/video quality)	,065	,450	,015	,145	,885
		Battery / Charging	,647	,265	,221	2,442	,017
		Touch ID	,753	,500	,141	1,505	,136
		Microphone / Speakers	,813	,305	,217	2,666	,009
		Screen / graphics	,352	,455	,070	,772	,442
		iOS	,415	,289	,123	1,437	,154
		Headphone jack	,011	1,108	,001	,010	,992
		Bluetooth	-,429	,813	-,042	-,527	,599
		Price	,249	,353	,058	,707	,481
		Size	,123	,606	,021	,203	,839
		Robustness (waterproof, crashes, weather)	-,247	,675	-,034	-,366	,715
		Capacity/RAM	,886	,618	,123	1,433	,156
		Processor (heating up)	-,185	,454	-,034	-,407	,685
		Design (color, form)	,380	,436	,074	,872	,386
		Weight	1,781	,848	,176	2,100	,039

a. Dependent Variable: Overall star rating

Table 13 Linear regression iPhone 6S (SPSS Output)

In Table 13 above, the most important information considering the aim of the research, is the last column, including the significance value of each attribute of iPhone 6S as a relevant independent variable. Four of the 17 features turned out to be significant, therefore the overall star rating can be predicted by the following aspects: general features and settings, the battery, audio features including the quality of the speakers and the microphone, just as the weight. If the α-level is allowed to be expanded to 10%, as a fifth predictor, the brand can be included. Continuing the analysis of Table 13, unstandardized coefficients B defines the degree of change by the independent variables on the dependent one. In Table 13 above, the coefficients' strength that applies in the case of all variables are included in the model. To see the influence only by the significant predictors, the regression has to be run once more only with the 5 significant independent variables. (See Appendix 3) The model can be defined as follows:

Overall star rating of iPhone 6S = 3.009 + 0.452 × Settings/General options + 0.122 × Brand + 0.258 × Battery/Charging + 0.228 × Microphone/Speakers + 0.197 × Weight

This means, if the polarity of these features increases by one unit, for instance from negative to neutral, the overall star rating also increases by the values added to the formula. For example, if the polarity of the settings increases from neutral to positive, so will the overall star rating have a raise by 0.452 stars.

Finally, these features can be compared by their importance. The values of standardized coefficients beta determine this ranking between the features. The top feature with the highest beta of 0.323 is the general features variable followed by the battery (0.221), the audio attributes (0.217), the weight (0.176), and the brand (0.150). The final list about the most important features of iPhone 6S will be discussed later on in 4.1 Summary of the results.

Continuing the evaluation of iPhone 7, the same type of multiple linear regression was run. Again, the dependent variable stayed the same, and so did the list of predictors with the 17 features. Comparing the adjusted R square value in Table 14 with Table 11, the model for iPhone 7 seems to be more stable, also with its rather moderate 49.5 %.

Model Summary

Version	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	1	,763[b]	,582	,495	1,0101

b. Predictors: (Constant), Weight, Brand , Bluetooth, Size, Design (color, form), Robustness (waterproof, crashes, weather), Screen / graphics, iOS, Microphone / Speakers, Battery / Charging, Price, Headphone jack, Settings / General options, Processor (heating up), Touch ID, Camera (photo/video quality), Capacity/RAM

Table 14 Linear regression iPhone 7, part 1 (SPSS Output)

As already mentioned, the further evaluation requires a global significance value under 0.05. Therefore, the ANOVA table has to be examined before carrying on to Table 16. The condition for continuing is with a p-value of < 0.001 fulfilled.

ANOVA[a]

Version	Model		Sum of Squares	df	Mean Square	F	Sig.
7	1	Regression	116,329	17	6,843	6,706	,000[c]
		Residual	83,671	82	1,020		
		Total	200,000	99			

a. Dependent Variable: Overall star rating

c. Predictors: (Constant), Weight, Brand , Bluetooth, Size, Design (color, form), Robustness (waterproof, crashes, weather), Screen / graphics, iOS, Microphone / Speakers, Battery / Charging, Price, Headphone jack, Settings / General options, Processor (heating up), Touch ID, Camera (photo/video quality), Capacity/RAM

Table 15 Linear regression iPhone 7, part 2 (SPSS Output)

With the help of the coefficients table, first, the useful predictors of iPhone 7 will be revealed. This time, there were only three significant independent variables at the 5% α-level. The overall star rating can be predicted by the general features, the brand and the audio characteristics. When extending the α-level again to 10 %, additionally the camera with its photo and video quality, the robustness including the waterproofness aspect, and the design are also added in the model as useful predictors.

Similarly, to iPhone 6S after running the regression again with the predictors, the model can be summarized in the following formula:

Overall star rating of iPhone 7 = 2.882 + 0.382 × Settings/General options + 0.203 × Brand + 0.198 × Camera + 0.278 × Microphone/Speakers + 0.169 × Robustness + 0.173 × Design

The same approach applies here as well. When the polarity rises by 1 unit in the case of the listed features, the overall star rating will increase by the values given in the unstandardized coefficients B column. For instance, if the robustness changes from negative to neutral, the star rating will increase by 0.169 stars.

Last but not least, the ranking will be set up based on the strength of the influence by the predictors. With the help of the standardized coefficients Beta values, it can be seen that settings and general options turned out to be the most important also in the case of iPhone 7. The second and third place are taken by the audio quality and brand

with Betas of 0.322 and 0.186 respectively. These are followed by the camera (0.148), the robustness (0.140), and the design with a Beta value of 0.130.

Coefficients[a]

Version	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
7	1	(Constant)	3,006	,147		20,444	,000
		Settings / General options	,658	,158	,351	4,170	,000
		Brand	,517	,222	,186	2,326	,022
		Camera (photo/video quality)	,502	,298	,148	1,685	,096
		Battery / Charging	,479	,346	,107	1,383	,170
		Touch ID	-,413	,437	-,082	-,944	,348
		Microphone / Speakers	1,177	,298	,322	3,949	,000
		Screen / graphics	,116	,327	,031	,355	,724
		iOS	,302	,250	,101	1,207	,231
		Headphone jack	,156	,276	,046	,565	,574
		Bluetooth	-,287	1,099	-,020	-,261	,795
		Price	,056	,290	,015	,192	,849
		Size	,193	,641	,027	,301	,764
		Robustness (waterproof, crashes, weather)	,482	,277	,140	1,741	,085
		Capacity/RAM	,375	,613	,063	,612	,542
		Processor (heating up)	,604	,464	,128	1,302	,197
		Design (color, form)	,621	,369	,130	1,682	,096
		Weight	-,320	,962	-,032	-,333	,740

a. Dependent Variable: Overall star rating

Table 16 Linear regression iPhone 7, part 3 (SPSS Output)

Finally, after completing the empirical part of the study, the similarities and differences between the various tests and iPhone versions will be discussed in the conclusion chapter.

4 Conclusion

The last chapter of the research sums up the results of the descriptive and inferential statistics subchapters, and based on those outcomes the research question will be answered and a ranking of the top features of each version will be set up. Subchapter 4.2 Limitations introduces the difficulties occurring during the research and in order to improve the accuracy of further studies, it suggests possible solutions for these upcoming problems. The last part of the paper describes what future smartphones could look like, what new features should be expected and how will these change the everyday life of people. Finally, a possible extension of this research will be proposed.

4.1 Summary of the results

This part summarizes all the tests used throughout the research and reveals the answer for the research question: 'Apple's iPhones in the customers' eyes: Which features are the most important?'.

For the final ranking of features for each version, the results of both, the descriptive and the inferential statistics were considered, as well as negative and positive sentiments.

After considering the various tests and descriptives mentioned above, the most important attribute of iPhone 6S, is the general features and options. This covers all the reviews mentioning the user interface of iPhones, the ease of use, the options for personalizing the device and so on. The 'general features' is the most outstanding of the 17 features. It had the highest mean value and it turned out to be a useful predictor for the overall star rating of iPhone 6S. Regarding the strength of its predicting power, it is also the most dominant one. Even though the battery is perceived negatively by the users, it has a significant influence on the overall rating of iPhone 6S. This feature is considered as the second most important feature based on its mean value which is the highest negative average value in the dataset. Another reason, why the battery has to be highlighted, is its strong predicting power in the regression model of iPhone 6S. The third place is taken by the audio quality, which takes both the microphone's and speakers' performance into consideration. It is one

of the outliers on the mean value distribution bar chart, as well as it is one of the useful predictors for the earlier iPhone version.

In contrast to the 6S, iPhone 7's preference of features changed more or less. Again, the general features and options overtook all the other aspects. It seems to play a very important role in the users' eyes, how easily they can handle their phone, how fast they can find solution for everyday incidents or how they can have their own settings. The general features have not only the highest average value, but also they are the strongest predictors of the overall star rating of iPhone 7. The second place is taken by the camera, and its photo and video quality. It was mentioned positively among users, also it is a good indicator to predict the stars iPhone 7 earns by customer reviews. This attribute is followed by a controversial aspect; the headphone jack port. As it was already discussed in the study, Apple made an innovation, and the headphone plug-ins disappeared in all the new iPhone versions. (Apple, 2018) The change was received with a negative mindset from the customers' side. This feature had a fairly negative mean value. Even though, it is not a useful predictor in the regression model, the lack of the plug-in is still one of the most important aspects of iPhone 7.

Overall, a further feature has to be mentioned, which turned out to be important for both of the generations, it is the design. A lot of reviews expressed positive opinion about it. Throughout the years, for the first sight, the appearance of iPhones did not change incrementally. The shape, the colours and the size only had a minimal adjustment, but iPhones could always be recognized from far away. Their design is their signature characteristic. So, this is definitely something that customers associate with Apple, and for a strong brand awareness it needs to stay the same.

To conclude, for both versions it can be easily interpreted why particular aspects turned out to be important. Features like the ease of use, the options for personalizing iPhones, the battery life, and the design can be led back to the customer demographics described in subchapter 2.4.3. Customer analysis and segmentation of Apple. People between the ages of 18 and 45 also pay attention to the general, simple but useful features, which make their busy life easier. Most of them are on their way all day, are sitting at university, or are going from one meeting to another. Therefore, they need a long battery life. Finally, the social status of Apple device owners requires

a well-designed telephone with an excellent camera. They need to stay up-to-date to the new trends by owning the newest and best looking iPhones, as well as they want to capture important moments of their life in order to share it with others.

4.2 Limitations

There are some limitations to the study which may affect the accuracy of the results. The main reason for this is, that older generations of iPhones, such as 6S and 7, were analysed and evaluated. Most of these phones are not available on Amazon in a new condition anymore, but mostly used and/or certified, refurbished. Even though there is an option to filter the condition of the phones, reviews about refurbished phones appear within the comments on new phones in the search results. This fact had an influence on two aspects. Firstly, the process of data collection was more time consuming than expected, because each review had to be sorted out after careful consideration. The other reason of limitation is due also to the filtering problem. There are reviews where it was not mentioned and it was impossible to evaluate the state of the phone being new or refurbished. The condition of the phone is important especially in case of the touch screen and the battery life. There may be reviews in the dataset, which mention bad battery life, and in fact, the comment is written about a used phone and not about a new one. Therefore, the outcome of such features may be inaccurate.

Another limitation to the study could be that often the review lacks information on the type of the purchased phone. In most of the cases, the colour and the capacity is entered into the system, before the review appears, but there are numerous cases where there is no information about these features in the review. This might cause false interpretation of the popularity of the available colours or capacity.

When it comes to colours, another fact has to be mentioned. In the case of iPhone 7, the portfolio of available colours differs from the offers on Amazon. The red iPhone, which is a special edition, is not available for purchase at Apple, but in used form it can still be found on Amazon. Again, this could not be filtered out, and it led to a longer sorting process. This discrepancy was also experienced when looking at the internal capacity. On Apple's website only two possibilities are mentioned, 32 GB or 128 GB. On Amazon however, one can choose between 32 GB, 64 GB, 128 GB or 256 GB. This

feature was not expected to turn out as one of the most important features, therefore the reviews about iPhone with an internal capacity of 64 GB or 256 GB were not excluded in the study. Also, it is unlikely to be mentioned in comments for another reason, as each user chooses the colour and the size of the internal memory of the phone before buying it, so in most of the cases people may estimate the capacity they need and being aware of that, they make the purchase decision.

Furthermore, for iPhone 7 there is a limited version available on the market. However, despite of including more types of internal capacity, reviews about red iPhone 7 were not considered in the study, because they came up only a few times and creating a separate group for it, as it was done for the other colourways, was impossible.

Finally, the study could be improved if some of the rare single features would be grouped, and as a feature category, they might turn out to be significant predictors of the overall star rating. For example, physical characteristics, such as the size, the colour, the shape and the weight were mentioned in total only 22 times within 200 reviews. Separately, each feature is under a 10% percent frequency. None of these single attributes were identified as important for the customers. This problem could be solved by rating these aspects within a group.

Most of the limitations mentioned in the study affected the accuracy of the results only a little, and rather made the data collection process more difficult. The problems and their solutions would be considered in a further research and would improve its quality.

4.3 Proposal of further research & Outlook

Beside the improvements mentioned in the limitations part, the study could be extended to a wider perspective. In an annual period, a new generation of iPhone can be added to the research. The latest version, the iPhone 8, is already on the market, so with a sufficient amount of reviews by now, it is possible to continue the analysis of the most important features. By doing so, it is easy to follow how iPhones are evolving, and how are these changes perceived by the users. It also gives an insight how customer preferences are changing in today's world, which features play a more or less important role by elapsing time.

Coming fall, new Apple devices will be introduced. Though, the question is whether it will be called iPhone 8S, iPhone 9 or will the new iPhone get another name? A further point that can be only speculated, how the sequel will look like? Will the iPhone 8 be developed, or the new basis for Apple's phones will be the iPhone X or possibly the two will be combined?

Even more and more questions come up when thinking about new features and developments of existing smart phones. Mobile Business Insights (2018) reported from the Mobile World Congress 2018 about some new tools that can be expected to be used soon. So far, only with the iPhone X it is possible to unlock the screen with facial recognition. In the future, this technology should be applied more often, since it is difficult to hack the software operating the face recognition. In the long-term, smartphones will identify their owners by their behaviour, such as typing, the way of holding and touching the phone and the users' voice. (Holland, 2018)

Furthermore, manufacturers are also working on a solution for more robust phones. (Holland, 2018) One way would be to break phones' screen not so simply by implementing a so-called "graphene glass". (Holland, 2018) Another approach to develop smartphones would be producing elastic screens, which can also be folded and carried way more easily. The battery life of mobile devices plays a crucial role in the everyday life of people. Wireless chargers already allow users to charge phones faster and wireless, but the charging port is still built in in smartphones. This is a highly possible change in the future, and there will be devices that can be charged only wirelessly. (Holland, 2018)

Another popular topic nowadays is the augmented and virtual reality. Its existence changed already a lot in the world, but it is still not applicable for all smartphones. When will users enjoy AR benefits is still a question mark, but projectors and holograms are already in a development process. Last but not least, most of the buttons will disappear and phones will consist only of a front screen. With the help of artificial intelligence, that recognizes patterns of use, smartphones will be remoted in a personalized way. (Holland, 2018)

Another area, where smartphone developers are concerned, is the approaching arrival of the eSIM and 5G. The embedded SIM is expected to spread in the coming

years. It is a programmable chip, that is already included in mobile devices. It has numerous advantages for the users: it is smaller than a nanoSIM and it is already built in, therefore devices will become thinner and more water resistant. Not only phones can be equipped with an eSIM and therefore connected to mobile carriers, but also wearables, such as smart watches. When it comes to mobile carriers, it will be a lot easier to change contracts, the long waiting hours, the nerve-racking SIM card changing will be a thing of the past. (Williams, 2018) When it comes to 5G, one fact has to be mentioned: it will provide an incomparable internet speed on smartphones. (Ranger, 2018)

To conclude, smartphone manufacturers have to pay attention to emerging trends of the future in the designing process of their devices, and also to novelties, such as the eSIM or 5G, they have to adapt to if they want to stay among the market leaders.

How smartphones will really look like and which improvements will users benefit in the future, can only time tell.

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Appendices

Appendix 1 – List of features

The 17 features + a bit of explanation what was said in the review so that it was allocated to the feature

- Settings / General options
- Brand
- Camera (photo / video quality)
- Battery / Charging
- Touch ID
- Microphone / Speakers
- Screen / Graphics
- iOS
- Headphone jack
- Bluetooth
- Price
- Size
- Robustness (waterproofness, crashes, weather conditions)
- Capacity / RAM
- Processor (heating up)
- Design (colour, shape)
- Weight

Appendix 2 – SPSS Output (Descriptive Statistics)

Descriptives

Descriptive Statistics

Version		N	Minimum	Maximum	Mean	Std. Deviation
6	Review number	100	1,0	100,0	50,500	29,0115
	Settings / General options	100	-1,0	1,0	,320	,6495
	Brand	100	-1	1	-,02	,376
	Camera (photo/video quality)	100	-1	1	,09	,321
	Battery / Charging	100	-1	0	-,37	,485
	Touch ID	100	-1	1	,01	,266
	Microphone / Speakers	100	-1	1	-,09	,379
	Screen / graphics	100	-1	1	-,04	,281
	iOS	100	-1	1	-,06	,422
	Headphone jack	100	-1	0	-,01	,100
	Bluetooth	100	-1	0	-,02	,141
	Price	100	-1	1	-,03	,332
	Size	100	-1	1	,02	,245
	Robustness (waterproof, crashes, weather)	100	-1	0	-,04	,197
	Capacity/RAM	100	0	1	,04	,197
	Processor (heating up)	100	-1	1	-,03	,264
	Design (color, form)	100	-1	1	,06	,278
	Weight	100	0	1	,02	,141
	Valid N (listwise)	100				
7	Review number	100	101,0	200,0	150,500	29,0115
	Settings / General options	100	-1,0	1,0	,150	,7571
	Brand	100	-1	1	,00	,512
	Camera (photo/video quality)	100	-1	1	,13	,418
	Battery / Charging	100	-1	1	,00	,318
	Touch ID	100	-1	1	,04	,281
	Microphone / Speakers	100	-1	1	-,10	,389
	Screen / graphics	100	-1	1	,00	,376
	iOS	100	-1	1	-,12	,477
	Headphone jack	100	-1	1	-,19	,419
	Bluetooth	100	-1	0	-,01	,100
	Price	100	-1	1	-,13	,393
	Size	100	0	1	,04	,197
	Robustness (waterproof, crashes, weather)	100	-1	1	-,03	,413
	Capacity/RAM	100	0	1	,06	,239
	Processor (heating up)	100	-1	1	-,01	,301
	Design (color, form)	100	-1	1	,05	,297
	Weight	100	0	1	,02	,141
	Valid N (listwise)	100				

Frequencies

Statistics

Version			Overall star rating	Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging
6	N	Valid	100	100	100	100	100
		Missing	0	0	0	0	0
7	N	Valid	100	100	100	100	100
		Missing	0	0	0	0	0

Statistics

Version			Touch ID	Microphone / Speakers	Screen / graphics	iOS	Headphone jack	Bluetooth
6	N	Valid	100	100	100	100	100	100
		Missing	0	0	0	0	0	0
7	N	Valid	100	100	100	100	100	100
		Missing	0	0	0	0	0	0

Statistics

Version			Price	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)
6	N	Valid	100	100	100	100	100
		Missing	0	0	0	0	0
7	N	Valid	100	100	100	100	100
		Missing	0	0	0	0	0

Statistics

Version			Design (color, form)	Weight
6	N	Valid	100	100
		Missing	0	0
7	N	Valid	100	100
		Missing	0	0

Frequency Table

Overall star rating

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	1,0	20	20,0	20,0	20,0
		2,0	20	20,0	20,0	40,0
		3,0	20	20,0	20,0	60,0
		4,0	20	20,0	20,0	80,0
		5,0	20	20,0	20,0	100,0
		Total	100	100,0	100,0	
7	Valid	1,0	20	20,0	20,0	20,0
		2,0	20	20,0	20,0	40,0
		3,0	20	20,0	20,0	60,0
		4,0	20	20,0	20,0	80,0
		5,0	20	20,0	20,0	100,0
		Total	100	100,0	100,0	

Settings / General options

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1,0	10	10,0	10,0	10,0
		,0	48	48,0	48,0	58,0
		1,0	42	42,0	42,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1,0	22	22,0	22,0	22,0
		,0	41	41,0	41,0	63,0
		1,0	37	37,0	37,0	100,0
		Total	100	100,0	100,0	

Brand

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	8	8,0	8,0	8,0
		0	86	86,0	86,0	94,0
		1	6	6,0	6,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	13	13,0	13,0	13,0
		0	74	74,0	74,0	87,0
		1	13	13,0	13,0	100,0
		Total	100	100,0	100,0	

Camera (photo/video quality)

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	1	1,0	1,0	1,0
		0	89	89,0	89,0	90,0
		1	10	10,0	10,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	3	3,0	3,0	3,0
		0	81	81,0	81,0	84,0
		1	16	16,0	16,0	100,0
		Total	100	100,0	100,0	

Battery / Charging

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	37	37,0	37,0	37,0
		0	63	63,0	63,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	5	5,0	5,0	5,0
		0	90	90,0	90,0	95,0
		1	5	5,0	5,0	100,0
		Total	100	100,0	100,0	

Touch ID

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	3	3,0	3,0	3,0
		0	93	93,0	93,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	2	2,0	2,0	2,0
		0	92	92,0	92,0	94,0
		1	6	6,0	6,0	100,0
		Total	100	100,0	100,0	

Microphone / Speakers

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	12	12,0	12,0	12,0
		0	85	85,0	85,0	97,0
		1	3	3,0	3,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	13	13,0	13,0	13,0
		0	84	84,0	84,0	97,0
		1	3	3,0	3,0	100,0
		Total	100	100,0	100,0	

Screen / graphics

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	6	6,0	6,0	6,0
		0	92	92,0	92,0	98,0
		1	2	2,0	2,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	7	7,0	7,0	7,0
		0	86	86,0	86,0	93,0
		1	7	7,0	7,0	100,0
		Total	100	100,0	100,0	

iOS

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	12	12,0	12,0	12,0
		0	82	82,0	82,0	94,0
		1	6	6,0	6,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	18	18,0	18,0	18,0
		0	76	76,0	76,0	94,0
		1	6	6,0	6,0	100,0
		Total	100	100,0	100,0	

Headphone jack

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	1	1,0	1,0	1,0
		0	99	99,0	99,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	20	20,0	20,0	20,0
		0	79	79,0	79,0	99,0
		1	1	1,0	1,0	100,0
		Total	100	100,0	100,0	

Bluetooth

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	2	2,0	2,0	2,0
		0	98	98,0	98,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	1	1,0	1,0	1,0
		0	99	99,0	99,0	100,0
		Total	100	100,0	100,0	

Price

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	7	7,0	7,0	7,0
		0	89	89,0	89,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	15	15,0	15,0	15,0
		0	83	83,0	83,0	98,0
		1	2	2,0	2,0	100,0
		Total	100	100,0	100,0	

Size

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	2	2,0	2,0	2,0
		0	94	94,0	94,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	
7	Valid	0	96	96,0	96,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	

Robustness
(waterproof, crashes, weather)

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	4	4,0	4,0	4,0
		0	96	96,0	96,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	10	10,0	10,0	10,0
		0	83	83,0	83,0	93,0
		1	7	7,0	7,0	100,0
		Total	100	100,0	100,0	

Capacity/RAM

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	0	96	96,0	96,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	
7	Valid	0	94	94,0	94,0	94,0
		1	6	6,0	6,0	100,0
		Total	100	100,0	100,0	

Processor
(heating up)

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	5	5,0	5,0	5,0
		0	93	93,0	93,0	98,0
		1	2	2,0	2,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	5	5,0	5,0	5,0
		0	91	91,0	91,0	96,0
		1	4	4,0	4,0	100,0
		Total	100	100,0	100,0	

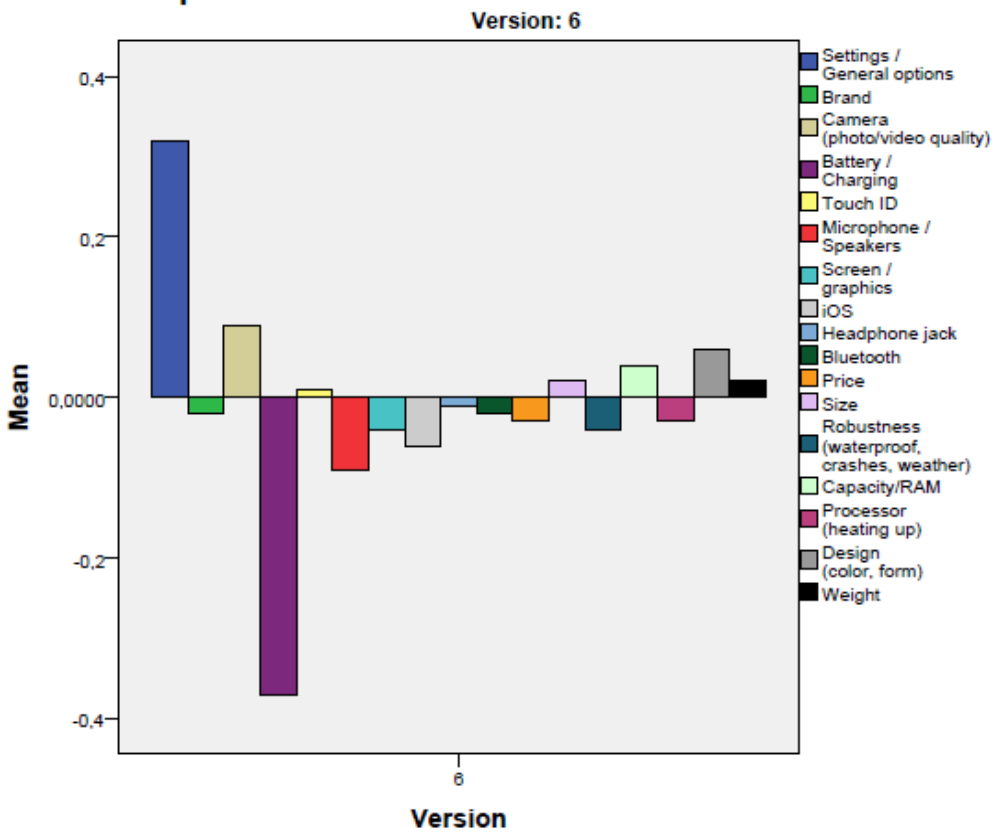
Design (color, form)

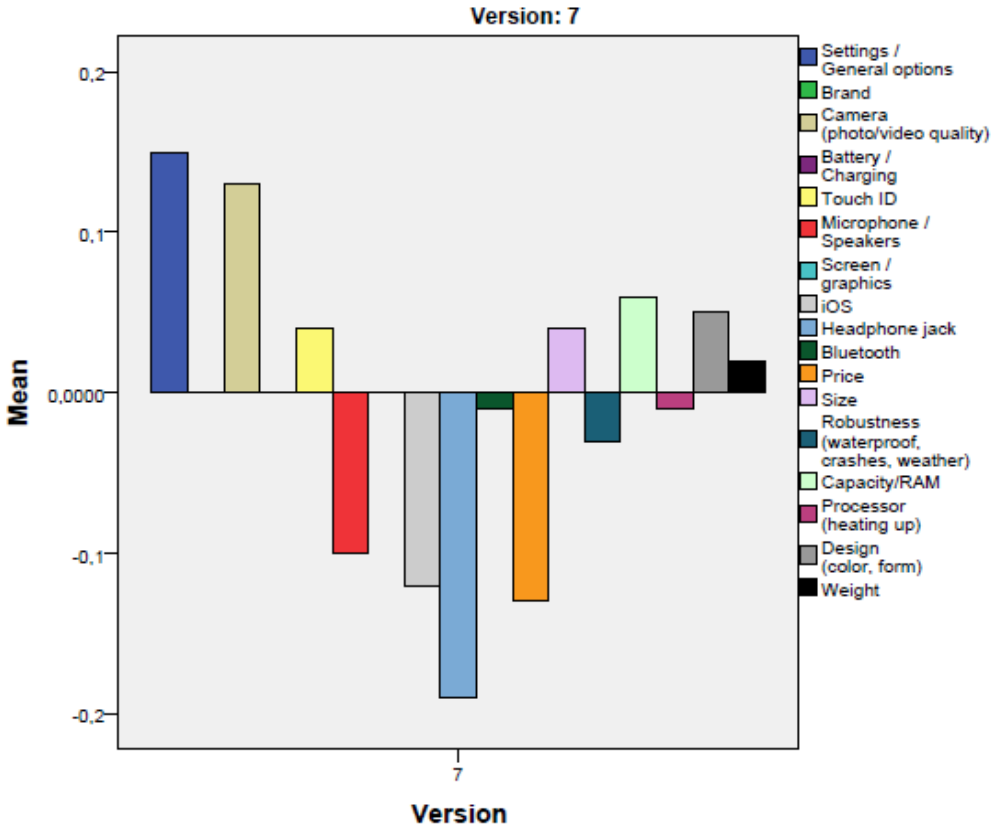
Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	-1	1	1,0	1,0	1,0
		0	92	92,0	92,0	93,0
		1	7	7,0	7,0	100,0
		Total	100	100,0	100,0	
7	Valid	-1	2	2,0	2,0	2,0
		0	91	91,0	91,0	93,0
		1	7	7,0	7,0	100,0
		Total	100	100,0	100,0	

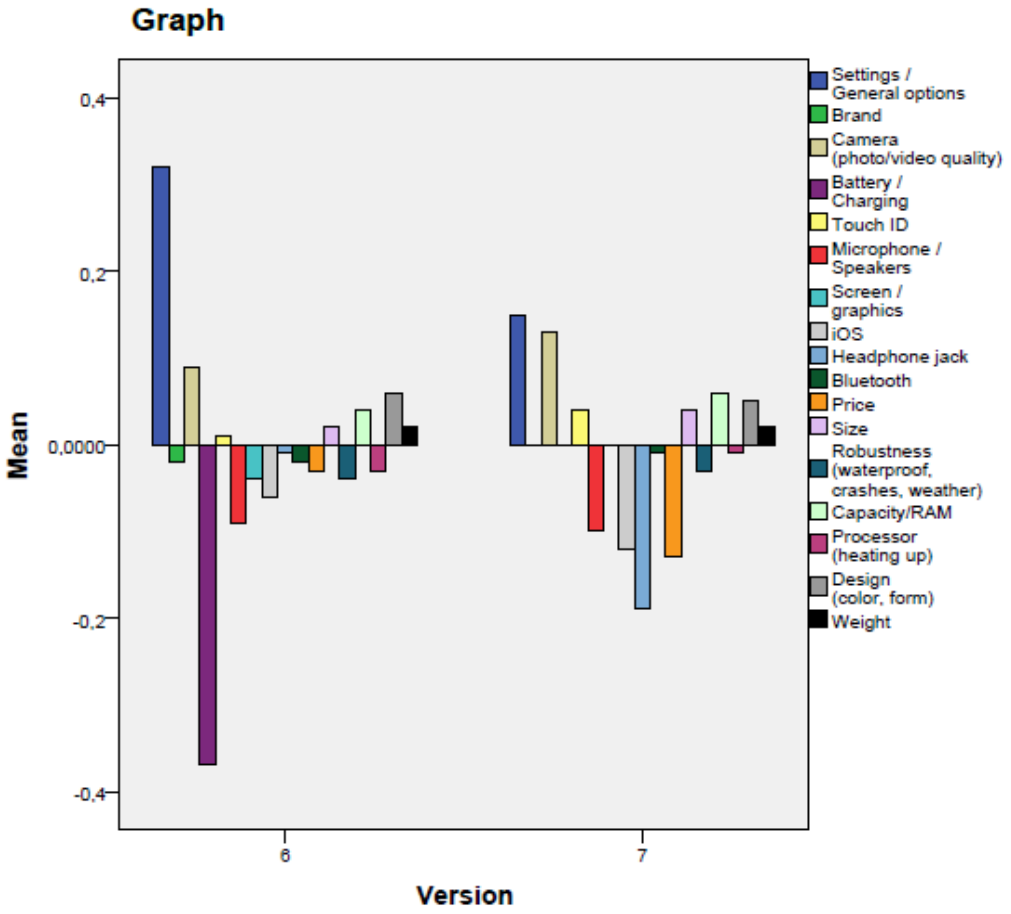
Weight

Version			Frequency	Percent	Valid Percent	Cumulative Percent
6	Valid	0	98	98,0	98,0	98,0
		1	2	2,0	2,0	100,0
		Total	100	100,0	100,0	
7	Valid	0	98	98,0	98,0	98,0
		1	2	2,0	2,0	100,0
		Total	100	100,0	100,0	

Graph


Version: 6
Mean
0,4
0,2
0,0000
-0,2
-0,4
6
Version
Settings / General options
Brand
Camera (photo/video quality)
Battery / Charging
Touch ID
Microphone / Speakers
Screen / graphics
iOS
Headphone jack
Bluetooth
Price
Size
Robustness (waterproof, crashes, weather)
Capacity/RAM
Processor (heating up)
Design (color, form)
Weight


Version: 7
Mean
0,2
0,1
0,0000
-0,1
-0,2
7
Version
Settings / General options
Brand
Camera (photo/video quality)
Battery / Charging
Touch ID
Microphone / Speakers
Screen / graphics
iOS
Headphone jack
Bluetooth
Price
Size
Robustness (waterproof, crashes, weather)
Capacity/RAM
Processor (heating up)
Design (color, form)
Weight


Graph
Mean
0,4
0,2
0,0000
-0,2
-0,4
6
7
Version
Settings / General options
Brand
Camera (photo/video quality)
Battery / Charging
Touch ID
Microphone / Speakers
Screen / graphics
iOS
Headphone jack
Bluetooth
Price
Size
Robustness (waterproof, crashes, weather)
Capacity/RAM
Processor (heating up)
Design (color, form)
Weight

Appendix 3 – SPSS Output (Inferential Statistics)

Mann-Whitney Test

Ranks

	Version	N	Mean Rank	Sum of Ranks
Settings / General options	6	100	106,23	10623,00
	7	100	94,77	9477,00
	Total	200		
Brand	6	100	99,63	9963,00
	7	100	101,37	10137,00
	Total	200		
Camera (photo/video quality)	6	100	98,43	9843,00
	7	100	102,57	10257,00
	Total	200		
Battery / Charging	6	100	82,93	8292,50
	7	100	118,08	11807,50
	Total	200		
Touch ID	6	100	99,05	9905,00
	7	100	101,95	10195,00
	Total	200		
Microphone / Speakers	6	100	100,99	10098,50
	7	100	100,02	10001,50
	Total	200		
Screen / graphics	6	100	98,64	9864,00
	7	100	102,36	10236,00
	Total	200		
iOS	6	100	103,32	10332,00
	7	100	97,68	9768,00
	Total	200		
Headphone jack	6	100	109,51	10950,50
	7	100	91,50	9149,50
	Total	200		
Bluetooth	6	100	100,00	10000,00
	7	100	101,00	10100,00
	Total	200		
Price	6	100	105,27	10527,00
	7	100	95,73	9573,00
	Total	200		
Size	6	100	99,54	9954,00
	7	100	101,46	10146,00
	Total	200		
Robustness (waterproof, crashes, weather)	6	100	100,14	10014,00
	7	100	100,86	10086,00
	Total	200		

Ranks

	Version	N	Mean Rank	Sum of Ranks
Capacity/RAM	6	100	99,50	9950,00
	7	100	101,50	10150,00
	Total	200		
Processor (heating up)	6	100	99,55	9955,00
	7	100	101,45	10145,00
	Total	200		
Design (color, form)	6	100	100,97	10096,50
	7	100	100,04	10003,50
	Total	200		
Weight	6	100	100,50	10050,00
	7	100	100,50	10050,00
	Total	200		

Test Statistics[a]

	Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging	Touch ID
Mann-Whitney U	4427,000	4913,000	4793,000	3242,500	4855,000
Wilcoxon W	9477,000	9963,000	9843,000	8292,500	9905,000
Z	-1,522	-,305	-,817	-5,827	-,776
Asymp. Sig. (2-tailed)	,128	,760	,414	,000	,438

Test Statistics[a]

	Microphone / Speakers	Screen / graphics	iOS	Headphone jack	Bluetooth	Price
Mann-Whitney U	4951,500	4814,000	4718,000	4099,500	4950,000	4523,000
Wilcoxon W	10001,500	9864,000	9768,000	9149,500	10000,000	9573,000
Z	-,189	-,837	-,971	-4,059	-,580	-1,936
Asymp. Sig. (2-tailed)	,850	,402	,331	,000	,562	,053

Test Statistics[a]

	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)	Design (color, form)
Mann-Whitney U	4904,000	4964,000	4900,000	4905,000	4953,500
Wilcoxon W	9954,000	10014,000	9950,000	9955,000	10003,500
Z	-,621	-,165	-,647	-,494	-,235
Asymp. Sig. (2-tailed)	,534	,869	,517	,622	,814

Test Statistics[a]

	Weight
Mann-Whitney U	5000,000
Wilcoxon W	10050,000
Z	,000
Asymp. Sig. (2-tailed)	1,000

a. Grouping Variable: Version

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	polarity_numeric[b]	.	Enter

a. Dependent Variable: Overall star rating

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,461[a]	,213	,209	1,261

a. Predictors: (Constant), polarity_numeric

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85,169	1	85,169	53,563	,000[b]
	Residual	314,831	198	1,590		
	Total	400,000	199			

a. Dependent Variable: Overall star rating

b. Predictors: (Constant), polarity_numeric

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,674	,100		26,832	,000
	polarity_numeric	,741	,101	,461	7,319	,000

a. Dependent Variable: Overall star rating

Model Summary

Version	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	1	,718[a]	,516	,416	1,0864
7	1	,763[b]	,582	,495	1,0101

a. Predictors: (Constant), Weight, Touch ID, Brand , Headphone jack, Bluetooth, Microphone / Speakers, Design
(color, form), Screen /
graphics, Price, Robustness
(waterproof, crashes, weather), Capacity/RAM, Processor
(heating up), Battery /
Charging, iOS, Settings /
General options, Camera
(photo/video quality), Size

b. Predictors: (Constant), Weight, Brand , Bluetooth, Size, Design
(color, form), Robustness
(waterproof, crashes, weather), Screen /
graphics, iOS, Microphone /
Speakers, Battery /
Charging, Price, Headphone jack, Settings /
General options, Processor
(heating up), Touch ID, Camera
(photo/video quality), Capacity/RAM

ANOVA[a]

Version	Model		Sum of Squares	df	Mean Square	F	Sig.
6	1	Regression	103,216	17	6,072	5,144	,000[b]
		Residual	96,784	82	1,180		
		Total	200,000	99			
7	1	Regression	116,329	17	6,843	6,706	,000[c]
		Residual	83,671	82	1,020		
		Total	200,000	99			

a. Dependent Variable: Overall star rating

b. Predictors: (Constant), Weight, Touch ID, Brand , Headphone jack, Bluetooth, Microphone / Speakers, Design
(color, form), Screen /
graphics, Price, Robustness
(waterproof, crashes, weather), Capacity/RAM, Processor
(heating up), Battery /
Charging, iOS, Settings /
General options, Camera
(photo/video quality), Size

c. Predictors: (Constant), Weight, Brand , Bluetooth, Size, Design
(color, form), Robustness
(waterproof, crashes, weather), Screen /
graphics, iOS, Microphone /
Speakers, Battery /
Charging, Price, Headphone jack, Settings /
General options, Processor
(heating up), Touch ID, Camera
(photo/video quality), Capacity/RAM

Coefficients[a]

Version	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
6	1	(Constant)	3,011	,218		13,791	,000
		Settings / General options	,706	,214	,323	3,293	,001
		Brand	,569	,322	,150	1,767	,081
		Camera (photo/video quality)	,065	,450	,015	,145	,885
		Battery / Charging	,647	,265	,221	2,442	,017
		Touch ID	,753	,500	,141	1,505	,136
		Microphone / Speakers	,813	,305	,217	2,666	,009
		Screen / graphics	,352	,455	,070	,772	,442
		iOS	,415	,289	,123	1,437	,154
		Headphone jack	,011	1,108	,001	,010	,992
		Bluetooth	-,429	,813	-,042	-,527	,599
		Price	,249	,353	,058	,707	,481
		Size	,123	,606	,021	,203	,839
		Robustness (waterproof, crashes, weather)	-,247	,675	-,034	-,366	,715
		Capacity/RAM	,886	,618	,123	1,433	,156
		Processor (heating up)	-,185	,454	-,034	-,407	,685
		Design (color, form)	,380	,436	,074	,872	,386
		Weight	1,781	,848	,176	2,100	,039
7	1	(Constant)	3,006	,147		20,444	,000
		Settings / General options	,658	,158	,351	4,170	,000
		Brand	,517	,222	,186	2,326	,022
		Camera (photo/video quality)	,502	,298	,148	1,685	,096
		Battery / Charging	,479	,346	,107	1,383	,170
		Touch ID	-,413	,437	-,082	-,944	,348
		Microphone / Speakers	1,177	,298	,322	3,949	,000
		Screen / graphics	,116	,327	,031	,355	,724
		iOS	,302	,250	,101	1,207	,231
		Headphone jack	,156	,276	,046	,565	,574
		Bluetooth	-,287	1,099	-,020	-,261	,795
		Price	,056	,290	,015	,192	,849
		Size	,193	,641	,027	,301	,764
		Robustness (waterproof, crashes, weather)	,482	,277	,140	1,741	,085
		Capacity/RAM	,375	,613	,063	,612	,542
		Processor (heating up)	,604	,464	,128	1,302	,197
		Design (color, form)	,621	,369	,130	1,682	,096
		Weight	-,320	,962	-,032	-,333	,740

a. Dependent Variable: Overall star rating

Regression

Variables Entered/Removed[a]

Version	Model	Variables Entered	Variables Removed	Method
6S	1	Brand , Weight, Microphone / Speakers, Battery / Charging, Settings / General options[b]	.	Enter

a. Dependent Variable: Overall star rating

b. All requested variables entered.

Model Summary

Version	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6S	1	,661[a]	,437	,407	1,095

a. Predictors: (Constant), Brand , Weight, Microphone / Speakers, Battery / Charging, Settings / General options

ANOVA[a]

Version	Model		Sum of Squares	df	Mean Square	F	Sig.
6S	1	Regression	87,306	5	17,461	14,565	,000[b]
		Residual	112,694	94	1,199		
		Total	200,000	99			

a. Dependent Variable: Overall star rating

b. Predictors: (Constant), Brand , Weight, Microphone / Speakers, Battery / Charging, Settings / General options

Coefficients[a]

Version	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
6S	1	(Constant)	3,009	,167		17,967	,000
		Settings / General options	,990	,186	,452	5,327	,000
		Battery / Charging	,755	,234	,258	3,234	,002
		Microphone / Speakers	,858	,297	,228	2,890	,005
		Weight	1,986	,807	,197	2,460	,016
		Brand	,462	,310	,122	1,492	,139

a. Dependent Variable: Overall star rating

Regression

Variables Entered/Removed[a]

Version	Model	Variables Entered	Variables Removed	Method
7	1	Design (color, form), Robustness (waterproof, crashes, weather), Camera (photo/video quality), Settings / General options, Brand , Microphone / Speakers[b]	.	Enter

a. Dependent Variable: Overall star rating

b. All requested variables entered.

Model Summary

Version	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
7	1	,719[b]	,516	,485	1,020

b. Predictors: (Constant), Design (color, form), Robustness (waterproof, crashes, weather), Camera (photo/video quality), Settings / General options, Brand , Microphone / Speakers

ANOVA[a]

Version	Model		Sum of Squares	df	Mean Square	F	Sig.
7	1	Regression	103,291	6	17,215	16,555	,000[c]
		Residual	96,709	93	1,040		
		Total	200,000	99			

a. Dependent Variable: Overall star rating

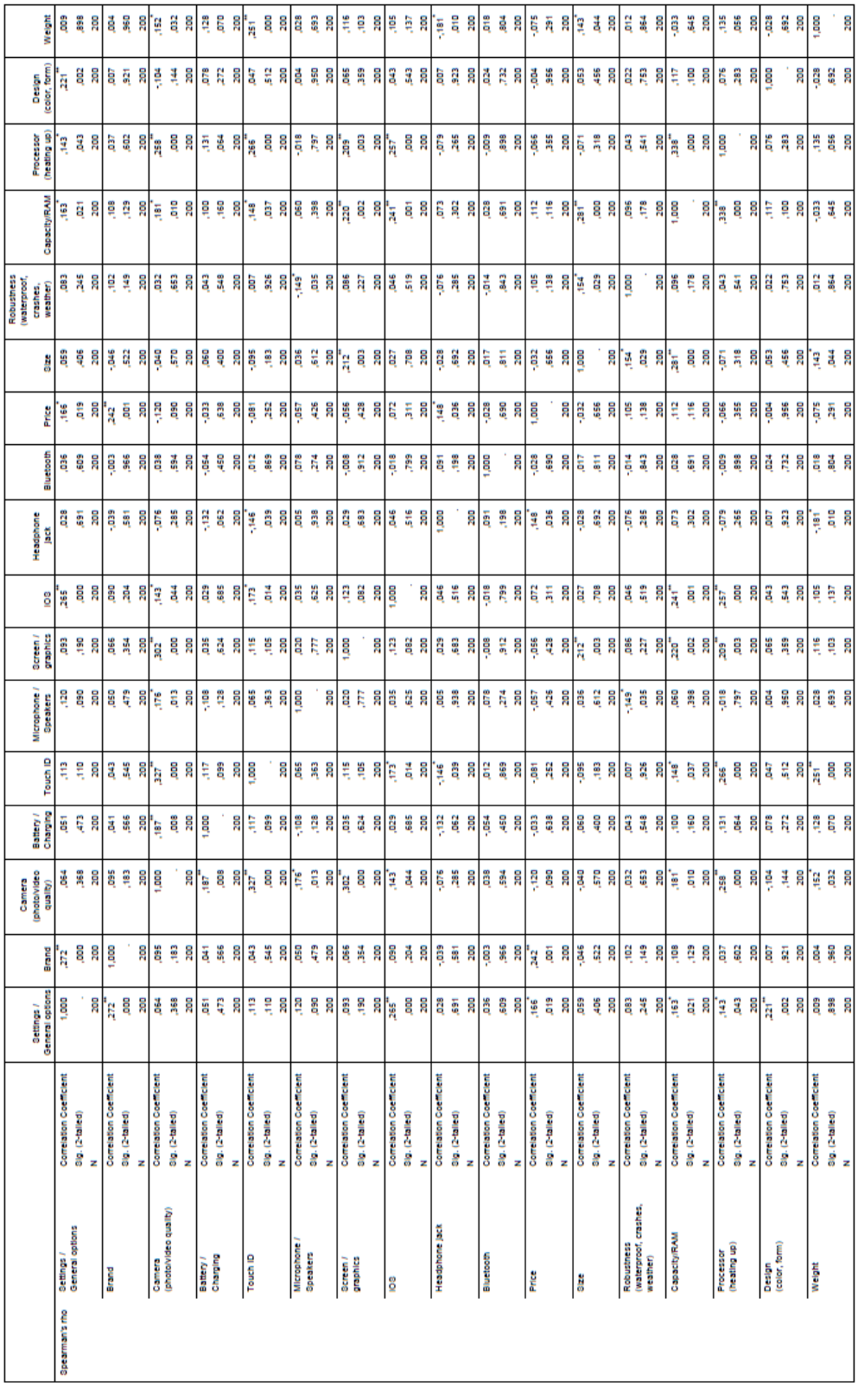
c. Predictors: (Constant), Design (color, form), Robustness (waterproof, crashes, weather), Camera (photo/video quality), Settings / General options, Brand , Microphone / Speakers

Coefficients[a]

Version	Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
7	1	(Constant)	2,882	,118		24,360	,000
		Settings / General options	,717	,145	,382	4,950	,000
		Brand	,563	,212	,203	2,657	,009
		Microphone / Speakers	1,014	,280	,278	3,619	,000
		Camera (photo/video quality)	,673	,255	,198	2,638	,010
		Robustness (waterproof, crashes, weather)	,582	,263	,169	2,215	,029
		Design (color, form)	,827	,352	,173	2,348	,021

a. Dependent Variable: Overall star rating

Appendix 4 – Correlation Tables



Correlations

			Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging	Touch ID	Microphone / Speakers	Screen / graphics	IOS	Headphone jack	Bluetooth	Price	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)	Design (color, form)	Weight
Spearman's rho	Settings / General options	Correlation Coefficient	1,000	,272**	,064	,051	,113	,120	,093	,365**	,028	,036	,166*	,059	,083	,163*	,143*	,221**	,009
		Sig. (2-tailed)	.	,000	,368	,473	,110	,090	,190	,000	,691	,609	,019	,406	,245	,021	,043	,002	,898
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Brand	Correlation Coefficient	,272**	1,000	,095	,041	,043	,050	,066	,090	-,039	-,003	,242**	-,046	,102	,108	,037	,007	,004
		Sig. (2-tailed)	,000	.	,183	,566	,545	,479	,354	,204	,581	,966	,001	,522	,149	,129	,602	,921	,960
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Camera (photo/video quality)	Correlation Coefficient	,064	,095	1,000	,187**	,327**	,376**	,302**	,143*	-,076	,038	-,130	-,040	,032	,181*	,258**	-,104	,152*
		Sig. (2-tailed)	,368	,183	.	,008	,000	,013	,000	,044	,285	,594	,090	,570	,653	,010	,000	,144	,032
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Battery / Charging	Correlation Coefficient	,051	,041	,187**	1,000	,117	-,108	,035	,029	-,132	-,054	-,033	,060	,043	,100	,131	,078	,128
		Sig. (2-tailed)	,473	,566	,008	.	,099	,128	,624	,685	,062	,450	,638	,400	,548	,160	,064	,272	,070
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Touch ID	Correlation Coefficient	,113	,043	,327**	,117	1,000	,065	,115	,173*	,146*	,012	,081	-,095	,007	,148*	,266**	,047	,251**
		Sig. (2-tailed)	,110	,545	,000	,099	.	,363	,105	,014	,039	,869	,252	,183	,926	,037	,000	,512	,000
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Microphone / Speakers	Correlation Coefficient	,120	,050	,176*	-,108	,065	1,000	,020	,035	,005	,078	-,057	,036	-,149*	,060	-,018	,004	,028
		Sig. (2-tailed)	,090	,479	,013	,128	,363	.	,777	,625	,938	,274	,426	,612	,035	,398	,797	,950	,693
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Screen / graphics	Correlation Coefficient	,093	,066	,302**	,035	,115	,020	1,000	,123	,029	,081	,056	,212**	,086	,220**	,209**	,065	,116
		Sig. (2-tailed)	,190	,354	,000	,624	,105	,777	.	,082	,683	,912	,428	,003	,227	,002	,003	,359	,103
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	IOS	Correlation Coefficient	,365**	,090	,143*	,029	,173*	,035	,123	1,000	,046	,091	,148*	,027	,046	,241**	,257**	,043	,105
		Sig. (2-tailed)	,000	,204	,044	,685	,014	,625	,082	.	,516	,199	,036	,692	,519	,001	,000	,543	,137
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Headphone jack	Correlation Coefficient	,028	-,039	-,076	-,132	-,146*	,005	,029	,046	1,000	,091	,148*	-,028	-,076	,073	-,079	,007	-,181*
		Sig. (2-tailed)	,691	,581	,285	,062	,039	,938	,683	,516	.	,198	,036	,692	,285	,302	,265	,923	,010
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Bluetooth	Correlation Coefficient	,036	-,003	,038	-,054	,012	,078	-,008	-,018	,091	1,000	-,028	,017	-,014	,028	-,009	,024	,018
		Sig. (2-tailed)	,609	,966	,594	,450	,869	,274	,912	,799	,198	.	,690	,811	,843	,691	,898	,732	,804
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Price	Correlation Coefficient	,166*	,242**	-,120	-,033	-,081	-,057	-,056	,072	,148*	-,028	1,000	-,032	,105	,112	-,066	-,004	-,075
		Sig. (2-tailed)	,019	,001	,090	,638	,252	,426	,428	,311	,036	,690	.	,656	,138	,116	,355	,956	,291
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Size	Correlation Coefficient	,059	-,046	-,040	,060	-,095	,036	,212**	,027	-,028	,017	-,032	1,000	,154*	,281**	-,071	,053	,143*
		Sig. (2-tailed)	,406	,522	,570	,400	,183	,612	,003	,708	,692	,811	,656	.	,029	,000	,319	,456	,044
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Robustness (waterproof, crashes, weather)	Correlation Coefficient	,083	,102	,032	,043	,007	-,149*	,086	,046	-,076	-,014	,105	,154*	1,000	,095	,043	,022	,012
		Sig. (2-tailed)	,245	,149	,653	,548	,926	,035	,227	,519	,285	,843	,138	,029	.	,178	,541	,753	,864
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Capacity/RAM	Correlation Coefficient	,163*	,108	,181*	,100	,148*	,060	,220**	,241**	,073	,028	,112	,281**	,095	1,000	,338**	,117	,033
		Sig. (2-tailed)	,021	,129	,010	,160	,037	,398	,002	,001	,302	,691	,116	,000	,178	.	,000	,100	,645
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Processor (heating up)	Correlation Coefficient	,143*	,037	,258**	,131	,266**	-,018	,209**	,257**	-,079	-,009	-,066	-,071	,043	,338**	1,000	,076	,135
		Sig. (2-tailed)	,043	,602	,000	,064	,000	,797	,003	,000	,265	,898	,355	,318	,541	,000	.	,283	,056
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Design (color, form)	Correlation Coefficient	,221**	,007	-,104	,078	,047	,004	,065	,043	,007	,024	-,004	,053	,022	,117	,076	1,000	-,028
		Sig. (2-tailed)	,002	,921	,144	,272	,512	,950	,359	,543	,923	,732	,956	,456	,753	,100	,283	.	,692
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
	Weight	Correlation Coefficient	,009	,004	,152*	,128	,251**	,028	,116	,105	-,181*	,018	-,075	,143*	,012	-,033	,135	-,028	1,000
		Sig. (2-tailed)	,898	,960	,032	,070	,000	,693	,103	,137	,010	,804	,291	,044	,864	,645	,056	,692	.
		N	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Version			Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging	Touch ID	Microphone / Speakers	Screen / graphics	iOS	Headphone jack	Bluetooth	Price	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)	Design (color, form)	Weight
Spearman's rho	6S	Settings / General options	Correlation Coefficient	1,000	,307**	,176	,146	,238*	,146	,291**	,238*	,062	-,036	,088	-,023	-,051	,227*	,243*	,246*	-,167
			Sig. (2-tailed)	.	,002	,081	,146	,017	,148	,003	,017	,542	,725	,384	,817	,615	,023	,015	,014	,096
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Brand	Correlation Coefficient	,307**	1,000	,013	,013	,002	,059	-,008	,057	-,006	-,008	,160	-,102	-,147	,012	-,007	-,078	,008
			Sig. (2-tailed)	,002	.	,899	,897	,982	,561	,933	,574	,955	,935	,112	,313	,145	,908	,947	,441	,935
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Camera (photo/video quality)	Correlation Coefficient	,176	,013	1,000	,280**	,469**	,150	,042	,189	,029	,041	-,166	-,152	-,103	,264**	,269**	-,172	-,041
			Sig. (2-tailed)	,081	,899	.	,005	,000	,136	,676	,060	,775	,685	,098	,131	,309	,008	,007	,087	,685
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Battery / Charging	Correlation Coefficient	,146	,013	,280**	1,000	,108	-,137	-,038	,032	-,077	-,109	-,008	,065	-,156	,156	,148	,094	,109
			Sig. (2-tailed)	,146	,897	,005	.	,285	,175	,706	,750	,446	,278	,938	,524	,120	,120	,140	,353	,278
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Touch ID	Correlation Coefficient	,238*	,002	,469**	,108	1,000	,010	,142	,271**	,004	,006	-,113	-,157	-,186	,186	,287**	-,009	-,006
			Sig. (2-tailed)	,017	,982	,000	,285	.	,923	,160	,006	,969	,956	,265	,119	,064	,064	,004	,932	,956
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Microphone / Speakers	Correlation Coefficient	,146	,059	,150	-,137	,010	1,000	,061	,083	-,025	-,036	-,024	,021	-,051	,051	,075	-,043	,036
			Sig. (2-tailed)	,148	,561	,136	,175	,923	.	,548	,412	,803	,723	,812	,834	,612	,612	,461	,669	,723
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Screen / graphics	Correlation Coefficient	,291**	-,008	,042	-,038	,142	,061	1,000	,241*	-,015	-,021	-,014	,298**	-,030	,207*	,121	,033	,021
			Sig. (2-tailed)	,003	,933	,676	,706	,160	,548	.	,016	,884	,835	,889	,003	,766	,039	,229	,748	,835
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		iOS	Correlation Coefficient	,238*	,057	,189	,032	,271**	,083	,241*	1,000	-,016	-,185	-,015	,015	-,148	,148	,160	,034	,022
			Sig. (2-tailed)	,017	,574	,060	,750	,006	,412	,016	.	,877	,065	,883	,882	,141	,141	,112	,734	,826
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Headphone jack	Correlation Coefficient	,062	-,006	,029	-,077	,004	-,025	-,015	-,016	1,000	-,014	-,010	,008	-,021	,021	-,012	,022	,014
			Sig. (2-tailed)	,542	,955	,775	,446	,969	,803	,884	,877	.	,887	,924	,933	,839	,839	,907	,826	,887
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Bluetooth	Correlation Coefficient	-,036	-,008	,041	-,109	,006	-,036	-,021	-,185	-,014	1,000	-,014	,012	-,029	,029	-,017	,032	,020
			Sig. (2-tailed)	,725	,935	,685	,278	,956	,723	,835	,065	,887	.	,893	,905	,773	,773	,868	,755	,840
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Price	Correlation Coefficient	,088	,160	-,166	-,008	-,113	-,024	-,014	-,015	-,010	-,014	1,000	-,118	-,020	,020	-,125	-,091	,007
			Sig. (2-tailed)	,384	,112	,098	,938	,265	,812	,889	,883	,924	,893	.	,241	,847	,847	,214	,370	,946
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Size	Correlation Coefficient	-,023	-,102	-,152	,065	-,157	,021	,298**	,015	,008	,012	-,118	1,000	,430**	,193	,010	-,019	,283**
			Sig. (2-tailed)	,817	,313	,131	,524	,119	,834	,003	,882	,933	,905	,241	.	,000	,054	,922	,854	,004
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Robustness (waterproof, crashes, weather)	Correlation Coefficient	-,051	-,147	-,103	-,156	-,186	-,051	-,030	-,148	-,021	-,029	-,020	,430**	1,000	,042	-,024	,045	,029
			Sig. (2-tailed)	,615	,145	,309	,120	,064	,612	,766	,141	,839	,773	,847	,000	.	,681	,813	,656	,773
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Capacity/RAM	Correlation Coefficient	,227*	,012	,264**	,156	,186	,051	,207*	,148	,021	,029	,020	,193	,042	1,000	,214*	-,045	-,029
			Sig. (2-tailed)	,023	,908	,008	,120	,064	,612	,039	,141	,839	,773	,847	,054	,681	.	,033	,656	,773
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Processor (heating up)	Correlation Coefficient	,243*	-,007	,269**	,148	,287**	,075	,121	,160	-,012	-,017	-,125	,010	-,024	,214*	1,000	,026	,017
			Sig. (2-tailed)	,015	,947	,007	,140	,004	,461	,229	,112	,907	,868	,214	,922	,813	,033	.	,798	,868
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Design (color, form)	Correlation Coefficient	,246*	-,078	-,172	,094	-,009	-,043	,033	,034	,022	,032	-,091	-,019	,045	-,045	,026	1,000	-,032
			Sig. (2-tailed)	,014	,441	,087	,353	,932	,669	,748	,734	,826	,755	,370	,854	,656	,656	,798	.	,755
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
		Weight	Correlation Coefficient	-,167	,008	-,041	,109	-,006	,036	,021	,022	,014	,020	,007	,283**	,029	-,029	,017	-,032	1,000
			Sig. (2-tailed)	,096	,935	,685	,278	,956	,723	,835	,826	,887	,840	,946	,004	,773	,773	,868	,755	.
			N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Version			Settings / General options	Brand	Camera (photo/video quality)	Battery / Charging	Touch ID	Microphone / Speakers	Screen / graphics	iOS	Headphone jack	Bluetooth	Price	Size	Robustness (waterproof, crashes, weather)	Capacity/RAM	Processor (heating up)	Design (color, form)	Weight
7	Settings / General options	Correlation Coefficient	1,000	,257**	,000	,055	,023	,108	-,031	,278**	-,016	,146	,201*	,165	,147	,124	,066	,199*	,167
		Sig. (2-tailed)	.	,010	1,000	,589	,817	,286	,757	,005	,872	,148	,045	,101	,145	,218	,511	,047	,096
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Brand	Correlation Coefficient	,257**	1,000	,139	,062	,071	,046	,105	,112	-,038	,000	,300**	,000	,192	,165	,065	,067	,000
		Sig. (2-tailed)	,010	.	,169	,540	,484	,646	,299	,267	,704	1,000	,002	1,000	,056	,101	,520	,507	1,000
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Camera (photo/video quality)	Correlation Coefficient	,000	,139	1,000	,078	,222*	,200*	,452**	,118	-,085	,033	-,078	,058	,083	,124	,247*	-,053	,305**
		Sig. (2-tailed)	1,000	,169	.	,441	,026	,046	,000	,243	,398	,743	,438	,564	,411	,218	,013	,598	,002
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Battery / Charging	Correlation Coefficient	,055	,062	,078	1,000	,114	-,083	,085	,129	,000	,000	,082	,000	,229*	,000	,105	,108	,226*
		Sig. (2-tailed)	,589	,540	,441	.	,258	,409	,403	,199	1,000	1,000	,415	1,000	,022	1,000	,299	,284	,024
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Touch ID	Correlation Coefficient	,023	,071	,222*	,114	1,000	,116	,096	,100	-,194	,015	-,043	-,030	,095	,115	,245*	,098	,495**
		Sig. (2-tailed)	,817	,484	,026	,258	.	,251	,340	,323	,053	,884	,670	,766	,347	,255	,014	,333	,000
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Microphone / Speakers	Correlation Coefficient	,108	,046	,200*	-,083	,116	1,000	-,007	-,005	,008	,238*	-,087	,056	-,206*	,069	-,097	,048	,019
		Sig. (2-tailed)	,286	,646	,046	,409	,251	.	,943	,961	,937	,017	,390	,583	,040	,497	,337	,639	,848
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Screen / graphics	Correlation Coefficient	-,031	,105	,452**	,085	,096	-,007	1,000	,051	,065	,000	-,070	,136	,130	,225*	,267**	,091	,191
		Sig. (2-tailed)	,757	,299	,000	,403	,340	,943	.	,615	,521	1,000	,491	,176	,199	,024	,007	,366	,057
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	iOS	Correlation Coefficient	,278**	,112	,118	,129	,100	-,005	,051	1,000	,043	,192	,117	,043	,131	,311**	,336**	,049	,176
		Sig. (2-tailed)	,005	,267	,243	,199	,323	,961	,615	.	,673	,056	,245	,673	,194	,002	,001	,630	,080
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Headphone jack	Correlation Coefficient	-,016	-,038	-,085	,000	-,194	,008	,065	,043	1,000	,197*	,155	-,029	-,080	,118	-,097	-,002	-,280**
		Sig. (2-tailed)	,872	,704	,398	1,000	,053	,937	,521	,673	.	,049	,123	,776	,431	,243	,338	,986	,005
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Bluetooth	Correlation Coefficient	,146	,000	,033	,000	,015	,238*	,000	,192	,197*	1,000	-,035	,021	-,008	,025	-,004	,018	,014
		Sig. (2-tailed)	,148	1,000	,743	1,000	,884	,017	1,000	,056	,049	.	,732	,839	,937	,802	,972	,862	,887
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Price	Correlation Coefficient	,201*	,300**	-,078	,082	-,043	-,087	-,070	,117	,155	-,035	1,000	,071	,165	,182	-,012	,060	-,137
		Sig. (2-tailed)	,045	,002	,438	,415	,670	,390	,491	,245	,123	,732	.	,486	,101	,069	,905	,551	,175
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Size	Correlation Coefficient	,165	,000	,058	,000	-,030	,056	,136	,043	-,029	,021	,071	1,000	,016	,378**	-,164	,139	-,029
		Sig. (2-tailed)	,101	1,000	,564	1,000	,766	,583	,176	,673	,776	,839	,486	.	,873	,000	,103	,168	,773
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Robustness (waterproof, crashes, weather)	Correlation Coefficient	,147	,192	,083	,229*	,095	-,206*	,130	,131	-,080	-,008	,165	,016	1,000	,121	,076	,014	,006
		Sig. (2-tailed)	,145	,056	,411	,022	,347	,040	,199	,194	,431	,937	,101	,873	.	,232	,455	,892	,955
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Capacity/RAM	Correlation Coefficient	,124	,165	,124	,000	,115	,069	,225*	,311**	,118	,025	,182	,378**	,121	1,000	,428**	,244*	-,036
		Sig. (2-tailed)	,218	,101	,218	1,000	,255	,497	,024	,002	,243	,802	,069	,000	,232	.	,000	,014	,721
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Processor (heating up)	Correlation Coefficient	,066	,065	,247*	,105	,245*	-,097	,267**	,336**	-,097	-,004	-,012	-,164	,076	,428**	1,000	,120	,242*
		Sig. (2-tailed)	,511	,520	,013	,299	,014	,337	,007	,001	,338	,972	,905	,103	,455	,000	.	,236	,015
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Design (color, form)	Correlation Coefficient	,199*	,067	-,053	,108	,098	,048	,091	,049	-,002	,018	,060	,139	,014	,244*	,120	1,000	-,025
		Sig. (2-tailed)	,047	,507	,598	,284	,333	,639	,366	,630	,986	,862	,551	,168	,892	,014	,236	.	,805
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Weight	Correlation Coefficient	,167	,000	,305**	,226*	,495**	,019	,191	,176	-,280**	,014	-,137	-,029	,006	-,036	,242*	-,025	1,000
		Sig. (2-tailed)	,096	1,000	,002	,024	,000	,848	,057	,080	,005	,887	,175	,773	,955	,721	,015	,805	.
		N	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).