The influence of segmentation and personas on the effectiveness of new product development in the railway passenger sector

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ABSTRACT

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In a fast moving and competitive environment, companies are under high pressure to create new products to guarantee satisfied customers, long-term survival and profitability. In order to evolve own products, firms can go into different directions, by including market-oriented approaches or just improve on an industrial level. Thus, this thesis is analyzing whether a market orientation in form of including personas or segments into the new product development has an influence on its effectiveness. Effectiveness is defined as creativity, innovativeness and attractiveness to a goal customer. The whole topic is explored in the railway passenger market in which most companies are nationalized and therefore have no segmentation strategies.

The study shows, that a market-orientation can be beneficial to use resources of a company efficiently to attract the actual users. There is a significant difference in the perceived creativity between developed products without market input on the one hand and the inclusion of personas and segments on the other hand. Creativity is perceived higher for a product design which is not built on market input. Nevertheless, for innovativeness, market-oriented designs are perceived higher than the ones which do not have input about the customer. Attractiveness does not show differences across the designs. Although the variations are not high, a tendency can be seen for all three measures that personas always enrich information of customer segments. Overall, the railway market is evolving and the discussion about the influence of segmentation on satisfaction and product development will have more importance than ever before.

Keywords: segmentation, personas, new product development, railway passenger sector

RESUMO

Título da Dissertação: A influência de segmentação e personas na eficácia do desenvolvimento de novos produtos no setor de transporte ferroviário de passageiros

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Num ambiente competitivo, as empresas estão sob enorme pressão para criar novos produtos para garantir clientes satisfeitos, sobrevivência a longo prazo e lucratividade. Para os seus próprios produtos evoluírem, as empresas podem ir em direções diferentes, incluido abordagens orientadas para o mercado ou apenas melhorar a nível industrial. Desta forma, esta tese propõe-se a analisar se uma orientação de mercado através do uso de personas ou segmentos no desenvolvimento de um novo produto influencia a sua eficácia. A eficácia é definida como criatividade, inovação e atratividade para um cliente objetivo. Este tópico é explorado no mercado de transporte ferroviário de passageiros, no qual a maioria das empresas é nacionalizada e, portanto, não possui estratégias de segmentação.

O estudo mostra que uma orientação de mercado pode ser benéfica para o uso dos recursos de uma empresa de forma eficiente para atrair os usuários reais. Há uma diferença significativa na criatividade percebida entre produtos desenvolvidos sem a entrada do mercado, por um lado, e a inclusão de personas e segmentos, por outro. Criatividade é percebida como mais elevada para um design de produto que não é construído com base numa contribuição do mercado. No entanto, para inovar, os projetos orientados para o mercado são percebidos como mais elevados do que aqueles que não têm informações sobre o cliente. Atratividade não mostra diferenças entre os projetos. Embora as variações não sejam altas, pode-se observar uma tendência para as três medidas em que as personas enriquecem sempre as informações dos segmentos de clientes.

Palavras-chave: segmentação, personas, desenvolvimento de novos produtos, setor de transporte ferroviário de passageiros

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Finally, I must thank my mom who reminds me every day that life shouldn't be about worrying but enjoying every single moment. With this mindset, the months of writing the thesis were a lot of fun!

"Hope is not found in a way out but a way through."
— Robert Frost

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1. INTRODUCTION

1.1. Topic Presentation

Customer satisfaction is one of the main goals of many companies as it is known to increase customer loyalty and therefore success (Homburg & Giering, 2001). In order to reach this, companies must understand their audience (Bolton, 2004). An essential first step is segmenting the market of a company, which finds homogeneous customer groups. Afterwards, personas can be created out of a segment, to enrich these groups with more specific information, like motivations. This helps to identify the ideal customer for the company. Insights about customer needs can be used to specifically address the goal consumer (Miaskiewicz & Kozar, 2011). Thus, segments and personas can make marketing strategies more effective and business decisions easier, because all efforts can be concentrated on attracting the actual customer base of the product. They are different for every company; some can have just one segment whereas others more. It always depends, among other factors, mainly on the variety of products or services that are offered (Romero & Molina, 2015).

Companies are under high pressure to create new products to establish long-term survival and profitability in a competitive environment (Wong & Tong, 2012). The whole process to transform innovative ideas into products is described in the new product development (NPD) (Olson, Walker, & Ruekert, 1995). Firms which are able to create successful NPD follow a customer-oriented approach in order to respond to consumers' specific needs. As the NPD uses many resources of the company and a lot of departments get involved (e.g. marketing & sales), it is helpful to know who the goal-customer is, to use these resources reasonably (Wong & Tong, 2012). The question deriving from this is how much a more customer-oriented design of a product vs. a professional design (not customer-oriented) impacts the effectiveness of NPD. The effectiveness can be measured in terms of creativity, innovativeness and the actual attractiveness to the customer (Chuang, Morgan, & Robson, 2015; Olson et al., 1995).

1.2. Academic and Managerial Relevance

As already pointed out in the previous section, the process of NPD is becoming more important in an environment where new products are being created with fast pace in a competitive market (Wong & Tong, 2012). In order to design a product, which is based on customers' needs, it is essential to examine how segments and personas can have an impact on the effectiveness of NPD. In an academic view it is interesting to see how people involved into the NPD would

change their perception about customers' needs when they just know the segment or get a persona as additional information. Knowing this, it is helpful for companies as they can use their resources more effectively to create successful products.

1.3. Problem Statement, Research Questions and Methodology

The problem this thesis thrives to solve is the question how the usage of segments and personas influences the effectiveness of NPD, meaning: the creativity, innovativeness and the attractiveness for customers. This question will be studied in the railway passenger sector in Europe.

RQ 1: What is customer satisfaction? Which factors are perceived as the most important ones when customers evaluate the product train companies offer? What drives a good customer experience?

This question shows whether a consumer-oriented approach of a company is important in their strategy to keep consumers. This is critical as the thesis analyzes the customer-centric approaches of personas and segments. It is answered in the literature review.

Customers perceive different factors of a product. In the railway market, multiple factors can be named like e.g. the design of the train, the price, etc. (Eboli & Mazzulla, 2015). As this thesis concentrates on the design of the train, it is crucial to see whether consumers actually perceive the design as important when they evaluate their experience. Study 2 shows the answer to this question.

RQ 2: What is NPD? Where is the difference between professional design and market-oriented design in NPD?

There are two ways of proceeding with the NPD in companies (Veryzer & De Mozota, 2005). They are distinguished as market-oriented and professional design.

The question is answered in the literature review and furthermore analyzed in an experiment in which one group designs a train without any information about the market and is compared to two other groups in which one gets segment information and the other one segment plus persona information.

RQ 3: What is a customer-centric approach? Is there a difference in satisfaction between working with segments, personas or no customer input?

As there is evidence that market-orientation is important in the design of products, it is essential to see how extensively companies in the railway passenger sector already apply this approach (Langerak, Hultink, & Robben, 2004). In order to show whether there is a need to change the way train companies proceed with their NPD, a survey asks participants if they are satisfied with the offered products in train transportation.

RQ 4: Is there a difference in the creativity, innovativeness and attractiveness for customers between including just segments or also personas, when the company tries to be more customer-centric in the NPD?

Including segments into product development is a widely used approach, but some companies also use personas which tend to give more detailed information about a segment (Veryzer & De Mozota, 2005). The question is whether including segments and personas makes the NPD more creative, innovative and attractive for customers.

First, this research question is analyzed in the literature review. Afterwards an experiment with three groups (with 2 people each) is conducted. The task is to design a train coach. Attendees are free in choosing the design elements. One group is a control group and just receives a brief introduction. The second group receives a segment description and lastly the third group a segment plus a persona. Through this, different train designs are established. In a third step, a survey is conducted in which participants evaluate the creativity, innovativeness and attractiveness of the designs.

1.4. Scope of Analysis

The thesis concentrates on the passenger railway market looking at NPD in the sense of creating the design of new rolling-stock.

2. LITERATURE REVIEW

2.1. Satisfaction & Loyalty in the Railway Passenger Sector

Satisfaction and loyalty are two phases in the consumers' response on a product or service offering that are widely known to have a connection (Flint, Blocker, & Boutin, 2011). Satisfaction is mostly used as a forecast of future purchases (Kasper, 1988). Therefore, this section aims to clarify the definitions found in literature about satisfaction, loyalty and their connection. Furthermore, it is analyzed which factors are being perceived most important by customers in the railway passenger sector when assessing the product offers of train companies. This helps to show what drives a good customer experience.

2.1.1. Satisfaction

The study about satisfaction goes years back when Oliver and Westbrook (1981) defined it as an assessment of all purchase situations compared to the expectations. It is also argued that customer satisfaction is short-term and connected to the consumption (Oliver, 1981). Later findings show that satisfaction is a consequence of past experience, but is also being updated with every new consumption (Oliver, 1999). It might be though that all experiences are not cumulated proportionally (Boulding et al., 1999; Oliver, 1999). Satisfaction is being updated dynamically so that newest events are added with higher importance, which makes the concept of satisfaction unstable (Suh & Yi, 2006). Additionally, it is suggested that customer satisfaction is multidimensional with dimensions like the product itself, but also durability, technical sophistication, ease of use and the sales process (La Barbera & Mazursky, 2006; Ramsey & Sohi, 1997). Finally, also satisfaction of after sales counts as a dimension (Ostrom & Iacobucci, 1995).

Summarizing, Homburg & Giering (2001) define satisfaction as an outcome of cognitive and affective evaluation, in which personal defined standards are compared to the perceived performance of a supplier. In addition, researchers suggest that the development of satisfaction is connected to the two stages: product and brand. Product is the fundamental and brand the mature and therefore fully developed stage. Nevertheless, it is mostly seen as one concept when analyzing satisfaction (Torres-Moraga, Vásquez-Parraga, & Zamora-González, 2008).

2.1.2. Loyalty

Loyalty can be defined as a concept which is based on repurchase intentions (Oliver, 1999). Due to high competition, companies depend increasingly on repeated business which makes the

discussion about loyalty highly important (Anderson & Sullivan, 2008). Some studies suggest a two-dimensional model in which an attitudinal part (intention) is added to the behavioral view (Chaudhuri & Holbrook, 2001). Attitudinal can be described as a special wish to maintain a relationship with a supplier. The behavioral aspect is a repeated encouragement to buy one product in a category compared to the total amount which was purchased (Yang & Peterson, 2004).

In general, there are different ways that can be defined to measure loyalty. These can be divided into behavioral, attitudinal and composite measurements. The suggested definition for loyalty, that it is a repeated purchase, belongs to the behavioral measurement (Bowen & Chen, 2013). Nevertheless, TePeci (1999) says that such a behavior is not always a psychological commitment. Attitudinal measurements analyze the emotional and psychological attachment towards a brand or product. The devotion of a customer is considered by attitudinal data. The last approach, composite measurement, incorporates parts of the behavioral and attitudinal measurements. The analysis refers to product preferences, tendency to switch brands, latest purchases and total amount of acquirements. The composite measurements allow predictions of loyalty to be more detailed and can therefore be applied in different fields (Bowen & Chen, 2013).

In order to get a clear concept about loyalty, Oliver (1999) suggests to create four stages. The first is the cognitive loyalty which makes customers loyal due to their information on a supplier. The next stage, the affective loyalty, describes a positive position of a consumer towards a brand. The third phase is the conative loyalty that can end in a subconscious action through a deep connection to a company. The last stage is defined as action loyalty in which customers would overcome difficulties to be able to buy a specific product. As it is hard to measure the last phase, researchers mostly use the measurement of conative or behavioral intensions (Yang & Peterson, 2004).

Customer loyalty is one of the major drivers for success (Ambler & Kokkinaki, 1997). Loyal consumers bring significant revenues for the company, but also need less attention. The more loyal a customer he might forgive smaller mistakes made by a firm (Anderson & Mittal, 2000). This can also be translated in an added value for the customer himself, as he needs less resources to find the product of his needs (Yang & Peterson, 2004).

2.1.3. Satisfaction-Loyalty Connection

Mittal, Kumar and Tsiros (1999) disclose that satisfaction has an influence on purchase intentions and therefore on loyalty. This can be explained by the nature of satisfaction being understood as cumulated experiences (Suh & Yi, 2006). Hence, companies have a strong goal to pursue customer satisfaction to create the link to customer loyalty and its added values (Homburg & Giering, 2001). It is known that acquiring new customers is more expensive than retaining them (Slater & Narver, 2000). A commitment by customers can make them less sensitive to price and to phases of poor brand performance (Hess & Story, 2005; Story & Hess, 2010). Nevertheless, it is often said that there is a direct link between satisfaction and loyalty (Flint et al., 2011). An argument is that although all loyal customers are satisfied, it does not mean that all satisfied customers will be loyal (Reichheld, 1993). Furthermore, there are discussions about mediator effects like personal characteristics or switching barriers (Mittal & Kamakura, 2001). Later research found out that the connection between satisfaction and loyalty can be different for specific product categories (Shankar, Smith, & Rangaswamy, 2003).

Products and services are consumed by customers mainly not only to satisfy needs, but also to experience pleasure or fun. There are affective expectations involved through which satisfaction evolves (Srivastava & Kaul, 2016). An experience is a personal circumstance connected to an emotional level and thus build upon the interplay with several stimuli (Grundey, 2008). These stimuli can be found in the various touch points the customer has during its journey with a brand (Srivastava & Kaul, 2016). This is where positive emotions connect positively and negative emotions negatively with satisfaction (Belén del Río-Lanza, Vázquez-Casielles, & Díaz-Martín, 2009). Brands have to offer remarkable experiences to differentiate themselves throughout the competitive environment they are in (Berry, Carbone, & Haeckel, 2002). Therefore, many companies use the customer journey to define which touch points with the customer they can control, and which might be under the influence of other participants (Lemon & Verhoef, 2016).

2.1.4. Customer Experience in the Railway Passenger Market

The passenger railway transport came into an extensive recession phase in the second half of the 20th century in Europe. Reasons were mainly positive developments in road and air transport. Since then, it was a high priority to focus on the rail transport again. (European Commission, 2016). Efforts were mainly focused on changes of ownership to national railway companies (Thompson, 2003). In addition, transportation planners have the goal to create a

more sustainable use of mobility options, through which the railway development gets more attention (Eboli & Mazzulla, 2015). Looking at the modal share, train is mainly used in the long distance operations (Wardman & Tyler, 2000). In this sector, one can see that although national companies are mainly in place, competition is rising. This can be on the one hand positive, as a wider scope of services and price/ quality choices can be found. On the other hand, the usage of railway is constrained by the network which has a maximum capacity and can therefore be a complication for the timetabling process (European Commission, 2016).

Through an increasing demand in train transport, operators have to respond through innovation and technology to the customers' needs. Through the increase in numbers of journeys, kilometers travelled and passengers taking the train and using stations, a negative effect on customer satisfaction can be seen (Oliveira et al., 2017). Looking at the satisfaction of the European railway services, just around 26% say that they are satisfied (European Commission, 2018). Generally, commuters are the mostly satisfied, as they choose the mode of transport for their everyday ride (Chou, Lu, & Chang, 2014).

In order to assess the quality of passenger railway operators and their services, numerous factors have to be looked at. In the corresponding literature there are different key factors defined for the railway market. The satisfaction with specific attributes can then be compared with the overall satisfaction (Eboli & Mazzulla, 2015). Studies on transportation services show that overall quality is one of the main factors to have an impact on loyalty and satisfaction of passengers (Hu & Jen, 2006). Nevertheless, there are several other factors that have to be assessed. One block concerns the interior of the train including comfort, seat inventory and cleanliness of the cars (Chou et al., 2014; Eboli & Mazzulla, 2015; Terabe & Ongprasert, 2006). Logistics like accessibility, interchange, connections, punctuality and reliability build another part (Disney, 2002; Loo & Li, 2017; Rietveld, 2000; Wardman & Tyler, 2000). Moreover, communication through personnel and the distribution of information are perceived as essential (Eboli & Mazzulla, 2015). Technologies like Wi-Fi are likely to be seen inside the train to allow a higher satisfaction of the customer (European Commission, 2018). Finally, the price makes up another major part of building satisfaction (Wardman & Tyler, 2000). The definition of service quality is the consumers' overall image compared to its expectations about offered services (Chou et al., 2014).

Also, in the train industry, companies use the customer journey to define the touch points their customers have with the brand. The main phases can be divided into: pre-purchase, purchase and post-purchase (Lemon & Verhoef, 2016). Passengers can have a spectrum of positive and negative feelings during the train ride. Generally, consumers have positive feelings towards the pre-purchase- and purchase phase, as there are several possibilities to buy tickets on- and offline. The channels must be chosen regarding the characteristics of consumers, as everyone has specific needs. Therefore, just offering one purchasing channel, may interfere with a positive experience. During the waiting time for a train, passengers prefer less crowded train stations. In addition, it is important for them to receive as detailed as possible information about the train ride on their mobile devices before the ride (Oliveira et al., 2017). This may also include instructions about how to get to the right seat if seat reservation is included (Terabe & Ongprasert, 2006). Mostly, travel experience is improved with a seat allocation system, in which customers can choose their seat according to their preferences. Although, passengers prefer to validate their tickets themselves (e.g. through their mobile device), they still value highly if an inspector is physically present to assist if questions arise (Oliveira et al., 2017). The mentioned factors can be described as standard. In addition, there are several non-standard factors that build on perceived hedonic quality. These are aesthetics and design of the product (Cartenì & Henkel, 2017).

2.2. New Product Development: Professional and Market Oriented Design

New product innovations are essential for a company to have advantages over competitors through differentiated products. Just through a combination of authentic features, services and design, customers' needs can be satisfied. Furthermore, innovations may lead to a more positive consumer attitude towards a product, as they might be a hint for new benefits and values (Cui & Wu, 2017). New products explain more than 50 percent of corporate revenues (Han, Kim, & Srivastava, 1998). As it might seem typical for marketing departments to be in the role of NPD, it is essential to include other areas of the firm to ensure that diverse ideas and views are taken into consideration (Beverland, Micheli, & Farrelly, 2016). This can be achieved through a given structure to be followed and aligned with the strategic management (Olson et al., 1995; Salgado & Dekkers, 2018). The relationships in the NPD process can have a high influence on the final result and are therefore crucial for the NPD manager to control (Veryzer & De Mozota, 2005). Moreover, the NPD process is seen as iterative, as early decisions are revised and can be adjusted when new insights are found (Salgado & Dekkers, 2018).

When applying the NPD, companies have two different possible strategies. One of them is known as the *industrial/ professional design*, which is an effective way to position and differentiate products. Usually, it is seen as a service in an organization or a consulting function, but not as a strategic business resource (Veryzer & De Mozota, 2005). Professional design is mostly defined by new technological innovations that find an effective product application. These are not just focused on design, but do also include ergonomics, ease of manufacture, efficient use of materials and the overall performance of a product (Gemser & Leenders, 2001). Gemser & Leenders (2001) furthermore say that it is essential to look at and include industry developments when decisions about budgets in NPD are being made.

Nevertheless, researchers found out that a competitive positioning cannot be realized without looking at customers' needs (Pitt, Watson, Berthon, Wynn, & Zinkhan, 2006; Veryzer & De Mozota, 2005). Through the inclusion of a more *market- and user oriented NPD*, firms can develop better products, but also reduce costs and risks (e.g. product failure) (Fuchs & Schreier, 2011; Langerak et al., 2004). Market orientation means that a business creates value for customers while considering other stakeholders' needs. Furthermore, it defines norms how a firm responds to specific market input (Narver & Slater, 1990).
Prior studies found out that market orientation is positively correlated with new product (Slater & Narver, 1994) and organizational performance (Chuang et al., 2015; Narver & Slater, 1990). That's the reason why companies do relay on market orientation in strategic management (Langerak et al., 2004). As it is still crucial to have the abilities and resources to develop successful NPD activities, market orientation improves innovativeness which enhances product success (Han et al., 1998). Especially with increasing dynamics in technology and product development, it is important to have a market orientation in place to be at the top of innovations (Wren, Souder, & Berkowitz, 2000). Moreover, it is essential that the top management motivates all employees that are involved into the NPD to create a willingness to work market oriented (Wren et al., 2000).

2.3. Customer-Centric Approach: Segmentation and Personas

A *customer-centric approach* can help market-oriented companies to use resources in a sustainable way. This can be achieved by analyzing own resources and pair them with customers' needs (Pires, Stanton, & Stanton, 2011). A difference between administerial and entrepreneurial marketing can be seen, when talking about customer-centric approaches. In the entrepreneurial mode, customers play a significant role in shaping the firms' culture. Whereas,

administerial techniques use an exclusive concept to customer-centric approaches (Morrish, Miles, & Deacon, 2010). Furthermore, customer-centric approaches are known to have a positive impact on customer satisfaction, retention and value (Bolton, 2004).

2.3.1. Segmentation Importance

As consumers are different, companies use *segmentation strategies* to find out about their characteristics like: geography, demographics, firmographics, behavior, decision-making processes, personality, lifestyle, psychographics and many more (Bock & Uncles, 2002). Nevertheless, all these attributes can make it hard to define a segment as it has to be decided which information to include (Wind, 1978). Segments have to be relevant, valid, actionable and homogeneous groups. As not all segments are equally interesting for a business, their market value must be defined. Own objectives have to be compared with the segments aspirations (Pires et al., 2011). In order to evaluate a market, economic and behavioral as well as analytical techniques should be used to identify opportunities (Dickson & Ginter, 1987). A wide known example for a tool is the cluster analysis (Athanassopoulos, 2000). For this, qualitative and quantitative data has to be used (Romero & Molina, 2015). In addition, it is essential to define inside the company whether a product differentiation strategy is in place or planned to be included (Dickson & Ginter, 1987). Connected to this, it is crucial for a firm to not just look at competition, but also prevent cannibalization throughout all products offered by the firm (Moorthy, 2008). Segments will then match firms' resources with the analyzed demand. Finally, they will be able to create tools to serve this external opportunity (Havenga, 2012).

2.3.2. Personas Importance

To visualize segments better, *personas* can be created out of the segments. They represent behavioral and motivational characteristics of the target consumer and are enriched with scenarios how they use the product or service (Veryzer & De Mozota, 2005). A persona serves as a representation of target consumers with common characteristics (Pruitt & Adlin, 2006: p 11). The power of fiction is used to make people in business engage more with the goal customer. Critical is that employees spend a lot of time with the concept of a persona so they are able to understand different nuances like with a real person (Pruit & Grudin, 2003). Initially, personas were used as a tool for software developers but since then other fields like marketing, sales and design started using it as well. The information included, the methods to collect data and the process of using personas alternate between projects. Gathering data can for example be realized through qualitative interviews with users, but also be based on data, demographics

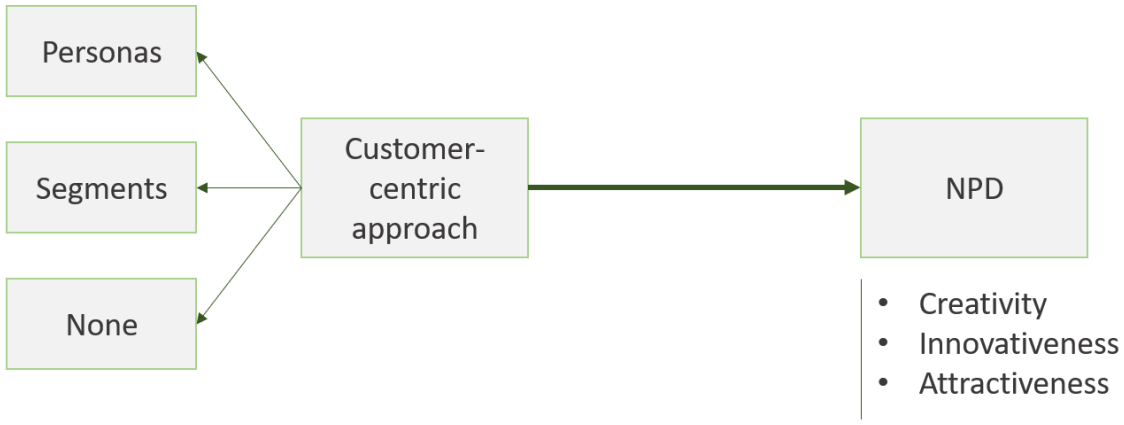
or informal observations (Humphrey, 2017). Personas are furthermore a tool to discuss whether the customer would use a specific feature. This can be of high value when developing a new product (Pruit & Grudin, 2003). Spreadsheets and templates can help to cluster the characteristics of a persona. In addition, scenarios put the persona into life and make it easier to understand for people who work with it. Nevertheless, in the end it is crucial to engage with real people who fit the persona to gain more insights about their needs and believes (Pruit & Grudin, 2003).

2.3.3. Customer-Centric Approaches in the Railway Passenger Sector

In the railway passenger sector, customers can be divided into two blocks due to their activities they perform during a trip (Chou et al., 2014). On the one hand, there are many commuters and commercial travelers that read or work with their mobile devices. On the other hand, leisure trips, like tourism or people visiting friends, are characterized more with socializing or looking outside the window (Chou et al., 2014; Hagen, Bruyn, & Elsen, 2017). Either way, it is essential to define how the customer looks like and which factors are of high importance for him. Products should be designed on the basis of the knowledge about consumers' expectations to guarantee a positive experience and therefore satisfaction (Oliveira et al., 2017). In addition, it is important to understand that the transport industry has changed a lot in recent years from a rather pragmatic use to a more pleasurable experience. Therefore, the scope to analyze customer needs has to increase to show the diversity of customers (Dallen, 2007).

2.4. Conceptual Framework

Figure 1 - Conceptual Framework



The conceptual framework as shown in figure 1, evolves through the literature review and shows the gap which will be analyzed further in this thesis. Hence, the influence of customer-

centric approaches in form of personas, segments and no market input will be evaluated on the effectiveness of NPD measured through creativity, innovativeness and attractiveness.

3. METHODOLOGY

3.2. Research Approach

As discussed in the chapter before, the conceptual framework wants to analyze the influence of segmentation and personas on the effectiveness of NPD. Effectiveness is hereby measured through creativity, innovativeness and the attractiveness for customers.

In order to study those relationships, exploratory and explanatory research were used to answer the research questions that were introduced in the first chapter. Exploratory research was therefore used as a first step to gain insights about the variables. The literature review in the second chapter was the initial stage. Based on that, an experiment was conducted to find out how NPD groups work on the design of a train coach (Vanhamme, 2008). An online survey was then conducted, using as stimuli the outcomes of the first experiment. Explanatory research was used in form of a survey to answer all remaining research questions. This kind of research methodology is useful as it can find causal relationships between variables (Malhotra, 1998).

3.3. Data Collection Instruments

3.3.1. Experiment (Study 1)

Lab experiments offer the main advantage that measurement errors can be minimized. Furthermore, through a moderator, questions can be answered quickly and variables that are normally unobservable can be examined (Jahedi & Méndez, 2014). Participants in a lab tend additionally to be more accurate than online. Also, the dropout is statistically lower in lab experiments. Nevertheless, disadvantages of lab experiments are high administrative costs and a constrained setting (Dandurand, Shultz, & Onishi, 2008).

The experiment followed a three-group design. Each group was composed by two people, working together on a task (creativity task). This study aimed to allow the design of the stimuli that was later used in the quantitative survey. In a similar vein to NPD teams that are mainly constructed with people from different departments (Beverland et al., 2016), also in this experiment people from different specialization areas were used (master students from different MSc programs at Católica-Lisbon).

Participants were invited to join the researcher in a room. Upon arrival, participants were organized in three groups. Each group received different instructions. The first group was a

control group without a treatment. In this case, they were simply told to freely design a train coach.
The second group - *segment* condition- got a description of a consumer segment (see appendix 1).
The third group - *segment and persona* condition- received the segment description as well as an additional persona detail which was developed based on the segment (see appendix 1).

The main goal of the experiment was to see whether groups work differently in product development when they get diverse information. As the thesis thrives to analyze the context of the passenger railway industry, each group was asked to design a train online. They were provided with a special PowerPoint tool (developed by the author) that allowed them to design one coach with several features, like seats, tables, toilets, doors, bistro or vending machines, special areas (e.g. for families), information poster and reserved seats they were able to put into these coaches. Nevertheless, the groups could decide whether they wanted to design just one coach or several ones with different layouts. They were also able to create and add features they were not given in the tool.
Each group was given a time of 30 minutes to fulfill the task. Afterwards, they were given a short survey to answer individually. This survey asked mainly for social demographics (age, gender, country of origin, status of employment and level of education) and the perceived difficulty to design the coach in this experiment. This was measured through a matrix with three items and a 5-point Likert scale going from 1 “Strongly disagree” to 5 “Strongly agree”. The items were: “It was difficult to fulfill the task of the experiment”, “I didn't feel creative enough to design the train” and “I had to put a lot of effort into creating the design of the train”. Measures were also included for train usage and frequency. Participants were first asked how many trips they did in the last 12 months divided into 0 to 100 km and 100 to 500 km. This was measured through the categorization of: “5 or more days”; “2-4 days a week”; “Once a week”; “1-3 times a month” or “Less than once a month”. Afterwards, they were asked what modes of transports they used. Eight items could be chosen including “other”. Regional and high-speed train users were then asked for their frequency of travel. For this, five answer possibilities were given: “5 or more days”; “2-4 days a week”; “Once a week”; “1-3 times a month” or “Less than once a month”. Furthermore, the reason for their travel (commuting, leisure or business trips) was measured for which a 5-point Likert scale was used ranging from 1 representing “Not at all” to 5 “Very frequently”.

3.3.2. Online Quantitative Survey (Study 2)

Online surveys offer the key advantage of having great speed at low cost. A high number of answers can be collected in a short time period as especially online surveys give the participants high flexibility on when to answer (Duffy, Smith, Terhanian, & Bremer, 2018). In addition, technologies can create more visual, flexible and interactive surveys (Taylor, 2018). People also tend to be more honest as there is high anonymity. Nevertheless, online surveys can create selection errors due to the fact that the researchers cannot predict who will participate in the survey. In addition, a missing interviewer can lead to less reliable data as for example questions cannot be clarified during the process (Duffy et al., 2018).

The reason to conduct a survey after the experiment was to facilitate the evaluation of the experiment outcomes. The population used in this study was a convenience-sample.
As described before, the thesis wants to assess whether segmentation and personas have an influence on the creativity, innovativeness and attractiveness for customers during NPD processes. The survey was divided into five sections. The first part asked participants about their train usage and frequency, the second part about their overall satisfaction with their train experience and the third part covers the selection of critical factors that lead to train satisfaction. The fourth section concentrated on the evaluation of the stimuli that was created in Study 1. Therefore, participants of the survey were allocated with one design-outcome of the experiment and had then to evaluate it upon the defined criteria of creativity, innovativeness and attractiveness for customers. The last part of Study 2 asked about socio-demographics of the participants. The measurements were conducted through an online survey designed with Qualtrics (www.qualtrics.com).

Measures for the first part, train usage and frequency, were built on the questions asked in the national rail travel survey in Great Britain (Department for Transport, 2010). Therefore, participants were first asked how many trips they did in the last 12 months divided into 0 to 100 km and 100 to 500 km. This was measured through the categorization of: “5 or more days”; “2-4 days a week”; “Once a week”; “1-3 times a month” or “Less than once a month”. Through the separation of the kilometers, short- and long-distance travelers were separated. Afterwards, they were asked what modes of transports they used. Eight items could be chosen including “other”. Regional and high-speed train users were then asked for their frequency of travel. For this, 5 answer possibilities were given: “5 or more days”; “2-4 days a week”; “Once a week”; “1-3 times a month” or “Less than once a month”. Furthermore, the reason for their travel

(commuting, leisure or business trips) was measured for which a 5-point Likert scale was used ranging from 1 representing “Not at all” to 5 “Very frequently”.

The survey then asked for the satisfaction of train users. McCollough, Berry and Yadav (2000) suggest to ask for satisfaction with a construct of three questions. The first one is how satisfied customers were feeling with their experience using a 5-point Likert scale that ranges from 1 meaning “Extremely dissatisfied” to 5 “Extremely satisfied”. The same scale was used for measuring the overall satisfaction with the train company they have been using. The third question asked how well the service experience met the needs of the participant. This was measured through a 5-point Likert scale going from 1 “Not well at all” to 5 “Extremely well”.

To be able to measure the importance of factors leading to customer satisfaction, ten items were listed which have already been defined in the sector 2.1.4. (interior design, cleanliness, seat inventory, accessibility of train stations, connections and interchanges, punctuality, Wi-Fi, price, personnel and information distribution). Every item had to be evaluated by the importance for the participant with a 5-point Likert scale that ranges from 1 “Not at all important” to 5 “Extremely important”.

In the second part of the survey, participants were randomly exposed to one of the designed coaches from Study 1 and then asked to complete a set of questions that aimed to evaluate the stimuli through three criteria: creativity, innovativeness and attractiveness.

For *creativity*, Im and Workman Jr. (2004) defined the factor with the items of competitive advantage, usefulness and to which extent an outcome is meaningful. The competitive advantage of the shown design was measured through a 5-point Likert scale in which 1 was “terrible” and 5 “excellent”. The usefulness of the chosen attributes in the design were measured through a 5-point Likert scale that ranges from 1 “Not at all useful” and 5 “Extremely useful”. Finally, meaningfulness was assessed through the question to which extent the participant agrees that the product is meaningful. The measurement was again a 5-point Likert scale going from 1 “Strongly disagree” to 5 “Strongly agree” (see appendix 2).

Evaluating the *innovativeness* of the design, a matrix with three items and a 5-point Likert scale was adapted for which 1 indicated “Strongly disagree” and 5 “Strongly agree”. The first item asks whether it would take a long time before the customer understands the full advantage of

the new design (Calantone & Cui, 2006). The second item asks for unique features (Avlonitis & Salavou, 2007), whereas the third for the novelty to the market (Langerak & Hultink, 2006) (see appendix 2).

The block to measure the *attractiveness* for the goal customer was introduced by showing the persona which was also used in Study 1 as a condition for group 3. Participants were then asked to fill out a set of items in a matrix with a 5-point Likert scale for which 1 indicated "Strongly disagree" and 5 "Strongly agree". The first item was that "the customer will be satisfied with the product". This would show that the customer is attracted to a product (Homburg & Giering, 2001). The second item "the customer will recommend this product to their family and friends" refers to the concept of the net promoter score (NPS). The NPS was introduced by Reichheld (2003) and claimed that it can be used as a single summary number to assess customer loyalty. The last item of the attractiveness construct is "the product covers the needs of the customer" and builds on the satisfaction analysis by McCollough, Berry and Yadav (2000) (see appendix 2).

4. RESULT ANALYSIS

4.1. Analysis Study 1

Study 1 was conducted through an experiment with a between subject design of three groups: *control, segment* and *segment or persona.* Furthermore, a survey asked for demographics, train usage and how creative they felt during the experiment.

In total, six participants took part in Study 1, with two people for each group. All participants were in the age between 25 and 33. The *control* group as well as *segment and persona* consisted of one female and one male. The *segment* group had two female participants.

Regarding train usage and level of creativity in creating the train carriage proposal the following table shows the different means.

Table 1 - Means Comparison Study 1

	Control	Segments	Segment and Persona	F-Test (2,3)
Creativity	3.833	4.167	3.667	1.167 (n. sig.)
Train Usage	4	3	4.5	0.412 (n. sig)

Note: * p<.05, ** p <0.01, *** p< .001

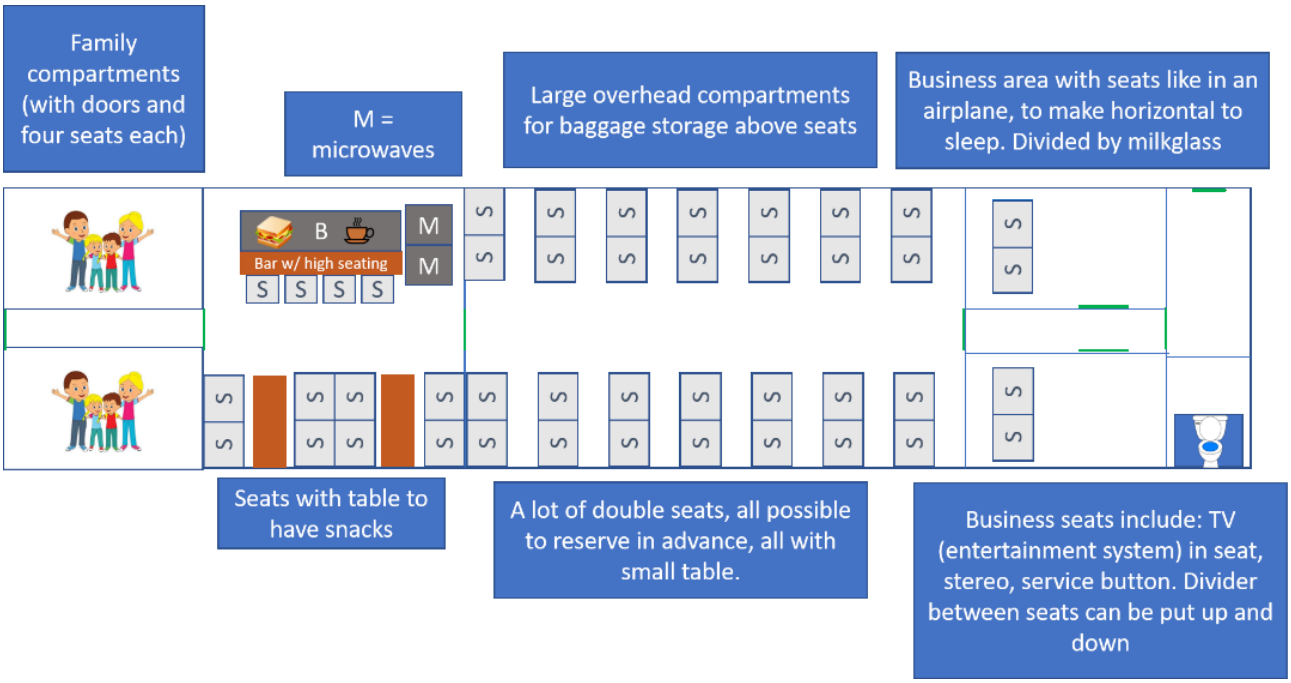
The results show that the second group that was exposed to a *segment* has the highest mean regarding how creative they felt with the task to design a train. It is followed by the *control* group without a condition. The *segment and persona* condition have the lowest mean. The level of *creativity* (as measured by the BDI) did not differ statistically significant for the three different groups (control, segment and segment and personas), $F(2,3) = 1.167$, $p = .422$. Moreover, there was no statistically significant difference in BDI scores for the different levels of *train usage*, $F(2,3) = 0.412$, $p = .695$.

The purpose of the experiment was to build three stimuli for Study 2. Therefore, the three groups were asked to design a train coach. The *control* group had no further input than the task description, the *segment* group was given a description of a segment whereas the *segment and persona* group were asked to build the coach with the information of the segment and a persona.

The results will be shown in the following figures.

The *control* groups' explanations can be seen in the descriptive text of the design in figure 2.

Figure 2 - Design Control Group



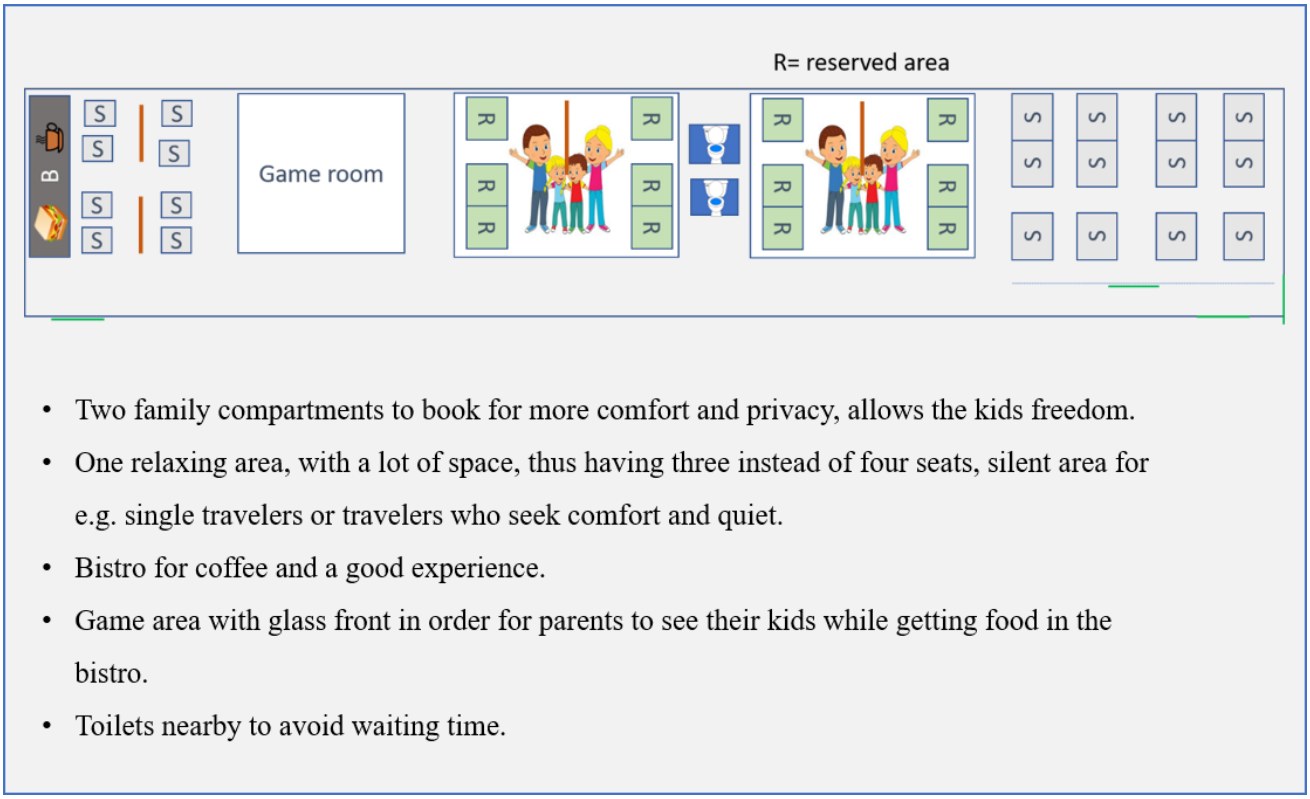
The group s*egment* gave the explanations and designed the train in figure 3.

Figure 3 - Design Segment Group

- They recommend two toilets, separated gender.
- The focus of the train coach is on the playing area which is located in the middle so it can be accessed and surveilled from all sides.
- For the comfort of the passengers, self-service coffee corners are integrated. Self-service is more convenient as less space and people are needed.
- They suggest a microwave, so parents heat up the food for their children or their own if they like to. They want to know what is inside their food, so they prepare it for their journey.
- For the comfort of the parents, magazines should be provided so they can read while their children play.
- As many sockets as possible are included to provide electricity.
- Seats are always for four people with a table in the middle as this is more family friendly.
- There is a storage possibility for larger luggage or strollers.
- Next to the playground for children are huge windows so they can enjoy a great view and are distracted better.
- There should be free WiFi to provide more comfort, especially since there is often no connection during train journeys.

Group 3, *persona and segment*, being exposed to a persona as well as a segment, designed the train in figure 4 due to the named reasons.

Figure 4 - Design Segment and Persona Group



- Two family compartments to book for more comfort and privacy, allows the kids freedom.
- One relaxing area, with a lot of space, thus having three instead of four seats, silent area for e.g. single travelers or travelers who seek comfort and quiet.
- Bistro for coffee and a good experience.
- Game area with glass front in order for parents to see their kids while getting food in the bistro.
- Toilets nearby to avoid waiting time.

4.2. Analysis Study 2

The data was collected in an online survey from the 17th of April 2019 until the 24th of April 2019. It was promoted through social media and forums. In total, 199 participants started the survey from which 155 completed it.

4.2.1. Sample Characterization

The sample consists of 46.5% males and 53.5% females as one can see in figure 5. Most respondents are from Germany (71.6%) followed by the United States of America (4.5%), Portugal (3.9%), Italy and Poland (both 3.2%) (see figure 6).

Figure 5 – Gender

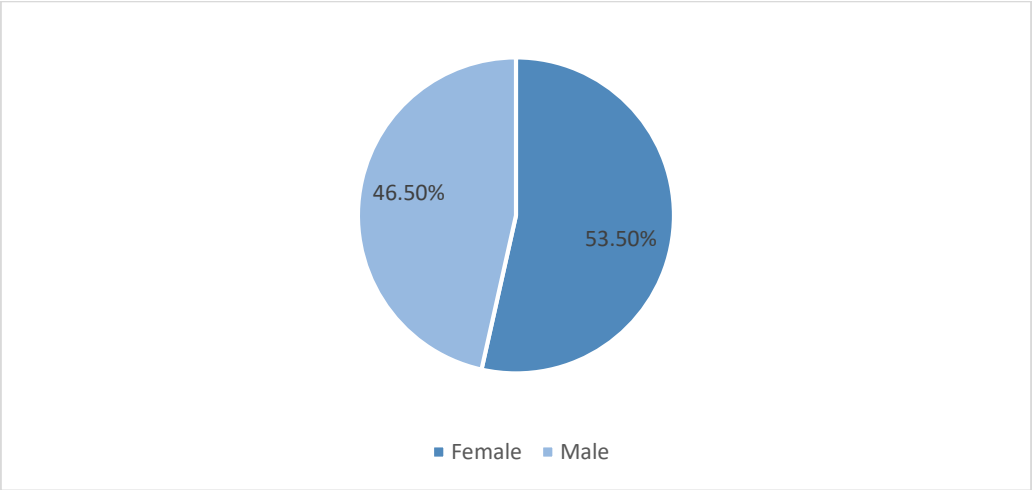
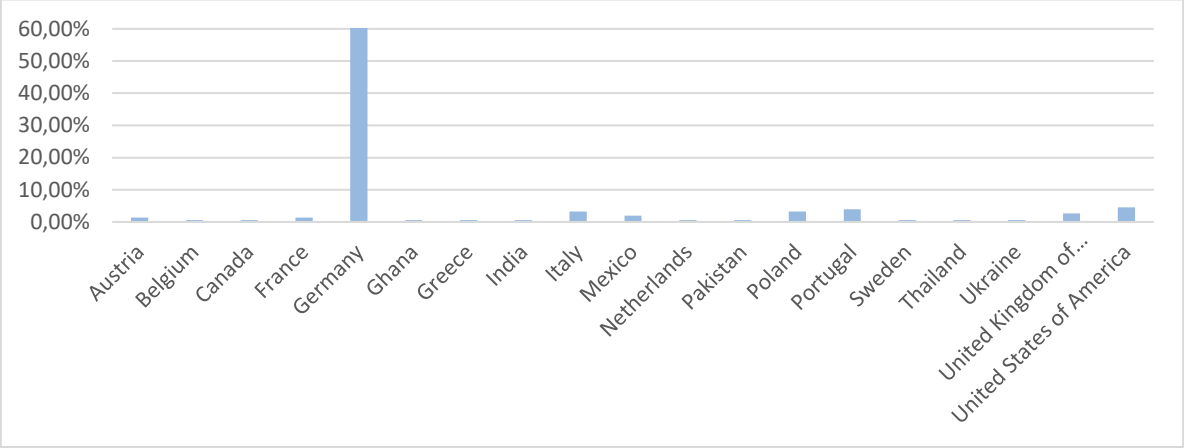
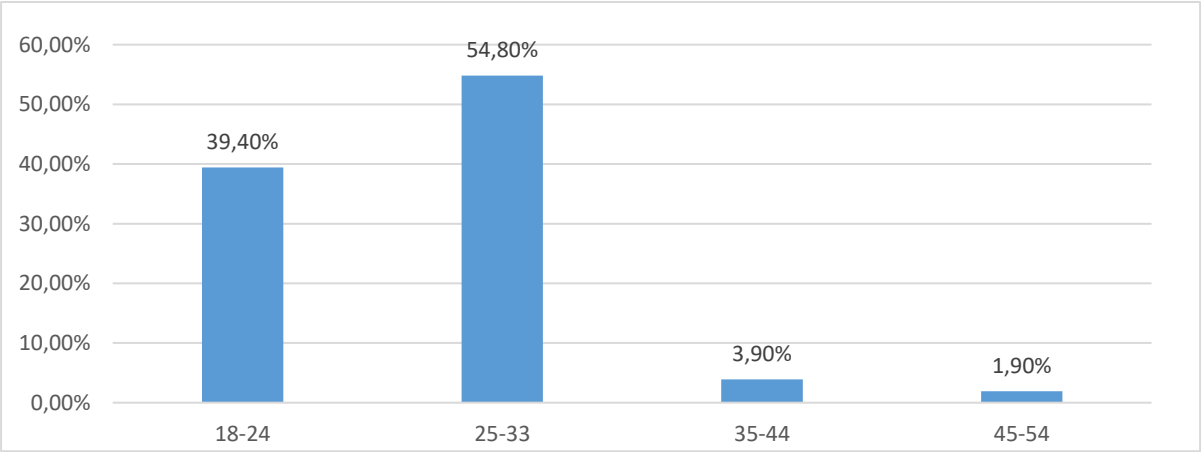


Figure 6 - Countries



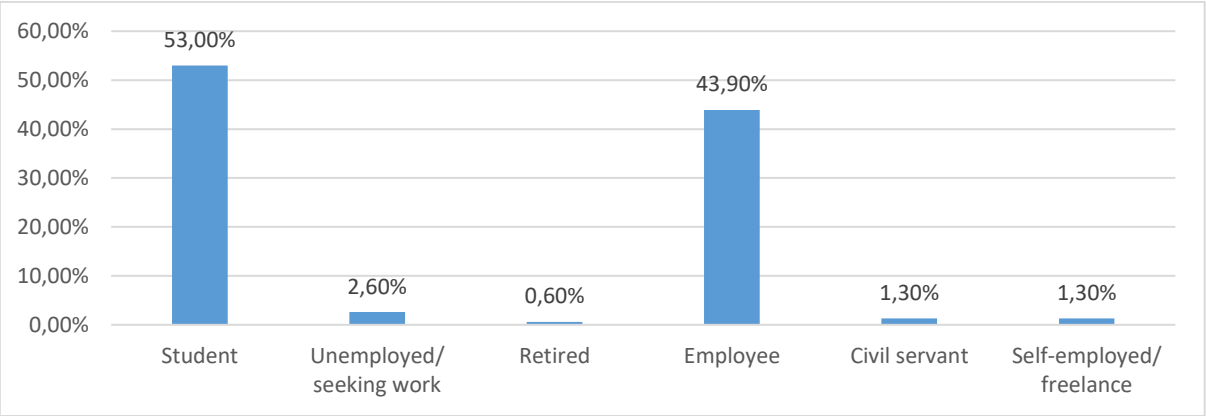
The highest number of participants is in the age group 25-33 followed by 18-24 as one can see in figure 7.

Figure 7 – Age



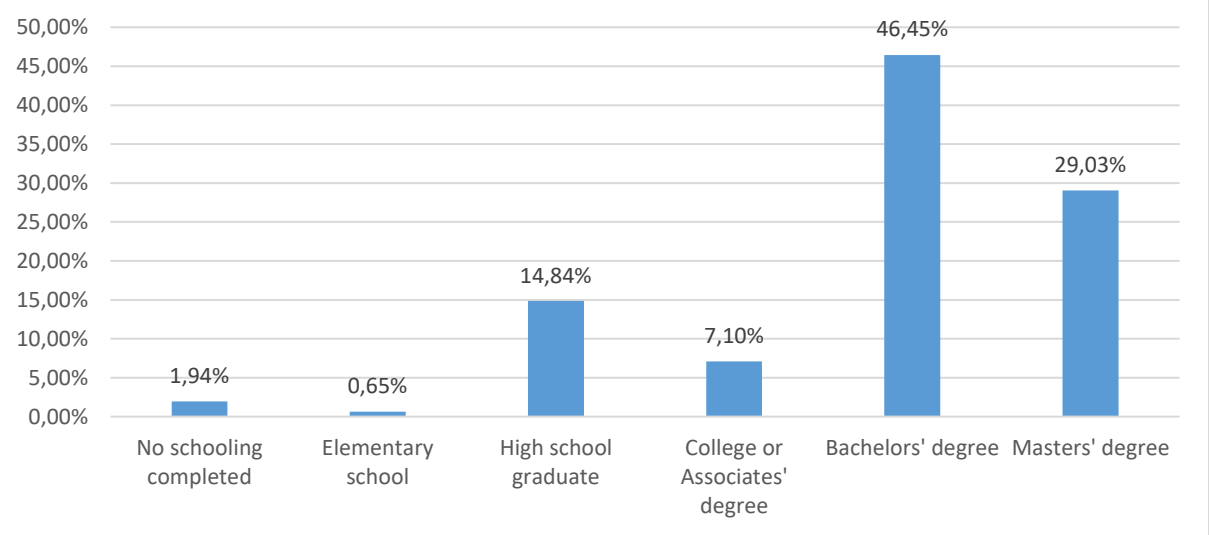
Furthermore, in figure 8, it is shown that 53% were students followed by 43.9% employees.

Figure 8 - Employment Distribution



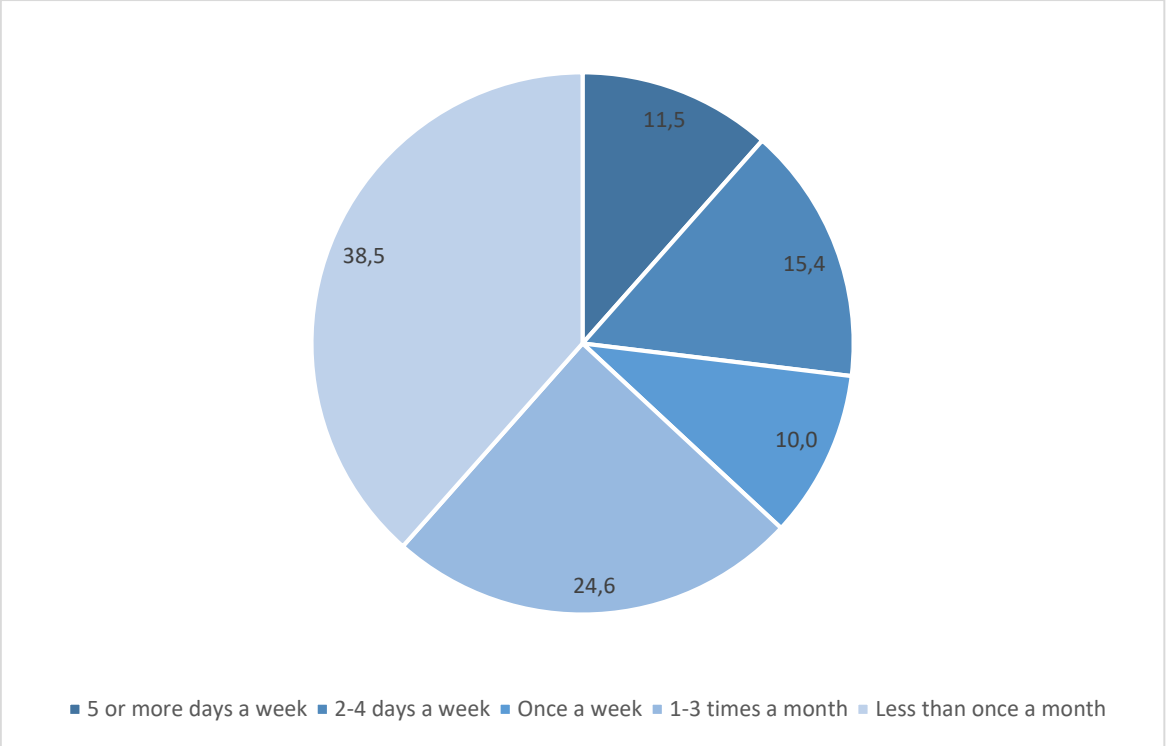
The education distribution is highest for Bachelors' with 46.45%, followed by Masters' with 29.03% and high school graduates with 14.84% as seen in figure 9.

Figure 9 - Education Distribution



In addition, the following figure 10 shows that heavy users (once a week or more) are 36.9% and therefore light users 63.1%.

Figure 10 - Train Usage in %



Lastly 16.13% of all participants are no train users. Consequently, they were excluded from the questions asking about the frequency of train usage and their satisfaction.

4.2.2. Data Screening: Univariate and Multivariate Outliers

In order to analyze the data further, its quality had to be improved first. Therefore, data screening was applied by identifying univariate and multivariate outliers.

The process of analyzing univariate outliers shows whether extreme values are present in the single variables that were included from adopted scales. In order to identify these outliers, all scores have to be converted into standardized Z-scores. Tabachnick and Fidell (2007) suggest to use a significance level of 0.1% and define all Z-scores smaller than -3.29 and larger than 3.29 as outliers. The analysis of the data set shows that six outliers exist. Two of the outliers belong to the NPS variable and therefore the attractiveness to the customer. The others belong

to the key factors of evaluating the train and the items of cleanliness, connections and interchanges, punctuality as well as price. All univariate outliers were deleted.

In addition, a multivariate analysis helps to understand whether participants answered unusual combinations on at least two variables. In order to define these outliers, the Mahalonobis distance was calculated and then compared with the χ^2 for 27 degrees of freedom (number of variables used in the regression). All Mahalonobis distances were higher than the critical value ($\chi^2(27) = 55.476$, $p<0.001$) and therefore it was concluded that there were no multivariate outliers.

4.2.3. Data Reliability

In order to examine the internal consistency of the measurement model, all scales with three or more items were evaluated with the Cronbach's alpha.

As DeVellis (1991) defines the Cronbachs' alpha value below 0.70 as *unacceptable*, the value should be between 0.75 and 0.80 to be considered as *good*. A value between 0.80 and 0.90 is considered as *very good.* In the gathered data of the survey the constructs of satisfaction, creativity and attractiveness have a value over 0.80 and are therefore very good. Innovativeness has a very low value of 0.316. This is the reason why the first item "It could take a long time before the customer would understand the full advantage of the new design" was removed from the construct. This led to a new Cronbach's alpha of 0.723 which is over the threshold of 0.70 and implies a better internal consistency of the construct than before (see table 2).

Table 2 - Reliability Test Study 2

Construct	Items	Cronbach's alpha	Cronbach's alpha if item deleted	Items deleted	Final number of items
Satisfaction	1. Overall, how satisfied or dissatisfied were you with the experience you have had on trains?	0.86	-	-	3
	2. How well does the experience you encounter on a train meet your needs?				
	3. How would you rate your overall satisfaction with the train company you are mainly using?				

Creativity	1. In comparison to the train products you know, how would you evaluate the competitive advantage of the shown design?	0.847	-	-	3
	2. How useful do you think are the chosen attributes of the design you were just presented with?				
	3. In your opinion, to what extent do you agree that the product is meaningful?				
Innovativeness	1. It could take a long time before the customer would understand the full advantage of the new design.	0.316		1	2
	2. The design offers unique features to the customer.		0.723	-	
	3. The product is new to the market.				
Attractiveness	1. The customer will be satisfied with the product.	0.851	-	-	3
	2. The customer will recommend this product to their family and friends.				
	3. The product covers the needs of the customer.				

4.2.4. In-Depth Analysis

After screening the data, the main scales were calculated through their items in order to be used in the further analysis. The in-depth analysis is organized by research questions.

- *RQ 1: What is customer satisfaction? Which factors are perceived as the most important ones when customers evaluate the product train companies offer? What drives a good customer experience?*

To show which factors are perceived as most important, the question "When evaluating your past train experience, to which extent would you rate the importance of the following factors?" has to be analyzed.

Table 3 - Importance of Factors Study 2

Variables	N	Min	Max	Mean	Std. Dev.
Punctuality	130	1	5	4.49	0.673
Cleanliness	130	1	5	4.3	0.711
Connections and Interchanges	130	1	5	4.25	0.8
Price	130	1	5	4.23	0.894
Accessibility of Train Stations	130	1	5	3.82	1.038
Seat Inventory	130	1	5	3.7	0.886
WiFi	130	1	5	3.65	1.12
Information Distribution	130	1	5	3.42	1.026
Interior Design	130	1	5	3.08	0.949
Personnel	130	1	5	2.78	0.996

The means show that the most important factors are punctuality followed by cleanliness and connections & interchanges. Nevertheless, interior design with a mean of 3.08 and seat inventory with a mean of 3.7 are still considered as moderately important to very important.

Furthermore, it was analyzed whether light and heavy train users had different opinions on the importance of factors to evaluate the train product. Participants using the train once a week or more often were considered as heavy users. All people using the train 1-3 times a month or less were considered as light users. Therefore, 48 heavy and 82 light users were counted.

Heavy users are characterized by 56.25% of females. 37.5% are 18 to 24 years old and 60% are 25 to 33 years old. Most of these users are students or employees and have a Bachelors' or Masters' degree.

Light users are 52.44% females. 39.02% are between 18 to 24 years and 53.66% are 25 to 33 years old. Like the heavy users they are also students or employees and have a Bachelors' or Masters' degree.

After running an ANOVA, it was clear that different groups of users did not have significant differences in evaluating factors they use to assess their experience with trains (table 4).

Table 4 - ANOVA Factors across Light and Heavy Users

Variables	Light Users	Heavy Users	T-test
Punctuality	4.44	4.58	1.181 (n. sig.)
Cleanliness	4.30	4.29	-.102 (n. sig.)
Connections and Interchanges	4.23	4.29	.411 (n. sig)
Price	4.33	4.06	-1.653 (n. sig.)
Accessibility of train stations	3.77	3.92	.786 (n. sig)
Seat Inventory	3.61	3.85	1.525 (n. sig.)
WiFi	3.72	3.52	-.976 (n. sig.)
Information Distribution	3.34	3.56	1.188 (n. sig.)
Interior Design	2.96	3.29	1.924 (n. sig.)
Personnel	2.76	2.83	.425 (n. sig.)

Note: * p<.05, ** p <0.01, *** p< .001

- *RQ 2: What is NPD? What is the difference between professional design and market-oriented design in NPD?*

RQ 2 was conceptually answered through the literature review. A further analysis through Study 1 and 2 can be found in the answers to RQ 4.

- RQ 3: What is a customer-centric approach? Is there a difference in satisfaction between working with segments and personas or no customer input?

Literature review showed that people are generally not that satisfied with the train product and service they are experiencing as most train companies do not have specific customer-centric approaches in place (European Commission, 2016, 2018). This study shows that people are between neither satisfied nor dissatisfied and somewhat satisfied with a mean of 3.5026 (see table 5). This concludes that there is still a lot of potential to improve the existing railway offer

Table 5 - Satisfaction T-Test

Variables	Min	Max	Mean
Satisfaction	1.00	5.33	3.503

After running an ANOVA with the independent variable for usage frequency (light and heavy), no significance was found in the different user groups regarding their satisfaction with trains ($F(1,128) = 3.807$, $p = 0.053$) (see table 6).

Table 6 - ANOVA Satisfaction across Light and Heavy Users

Variables	Light Users	Heavy Users	F-test (1, 128)
Satisfaction	3.6134	3.313	3.807 (n. sig.)

Note: * p<.05, ** p <0.01, *** p< .001

Furthermore, looking at the analysis for RQ1 (table 4), especially punctuality, cleanliness, connections and interchanges as well as the price are very important factors for train users. Therefore, when a train company wants to increase the satisfaction of consumers, these are the areas which should be considered first for improvement measures.

- *RQ 4: Is there a difference in the creativity, innovativeness and attractiveness for customers between including just segments or also personas, when the company tries to be more customer-centric in the NPD?*

In order to analyze RQ 4, Study 1 asked participants to design a train coach. There were three groups with different stimuli. The first group did not get any further input than the instructions for the tool to use for the designing process. The second group was given a description of a segment, whereas the third group got the segment and a persona description. The results were then shown in Study 2. Every participant of the study was randomly allocated to one design and had then to answer how creative, innovative and attractive it was perceived.

Looking at the means in the following table 7 for the variables creativity, innovation and attractiveness, one can see that they do not differ much across the three designs that were shown in the survey. It is still interesting to observe that the control group was perceived as more creative than the market-oriented groups. For innovativeness, the segment and persona group was rated slightly higher than the other two. For attractiveness, segment and persona is the higher perceived design, but does not differ much to the others.

The significance analysis in the ANOVA shown in table 7, indicates furthermore that just the means across the three groups for the variable creativity are different.

Table 7 - Analysis on Effectiveness of NPD

Variables	Control	Segment	Segment and Persona	F-test (2, 152)
Creativity	3.708	3.390	3.184	5.914**
Innovativeness	3.510	3.516	3.893	0.203
Attractiveness	3.925	3.887	4.028	0.431

Note: * p <.05, ** p <0.01, *** p < .001

As the null hypothesis of equal variances is not rejected across the groups (see appendix 3), a Tukey HSD post-hoc test was performed. The aim is to show between which groups there is a significant difference.

The test shows that at a significance level of p < 0.01, the groups *control* (3.7075 ± .70262, p=0.002) and *segment and persona (3.1844* ± 0.87313) show a significant difference. All other group combinations did not show any significant outcome.

Another analysis was conducted with an ANOVA taking creativity, innovativeness and attractiveness as dependent variable and the usage frequency (heavy and light) as independent. No significant difference was found between the two groups as one can see in table 8.

Table 8 - ANOVA Effectiveness of NPD across Light and Heavy Users

Variables	Light	Heavy	T-test
Creativity	3.366	3.465	.704 (n. sig.)
Innovativeness	3.573	3.615	.246 (n. sig.)
Attractiveness	3.943	4.000	.423 (n. sig.)

Note: * p<.05, ** p<0.01, *** p< .001

As an extra analysis, an ANCOVA was run with the variables creativity, innovativeness and attractiveness defined as dependent variables. Moreover, the three groups *control*, *segment* and *segment and persona* were established as fixed factors and the user frequency as covariate. The results can be seen in table 9. The only significant difference can be found across the different stimuli groups for the variable creativity. Although there is a slight adjustment of the means through the covariate compared to table 7, the tendency of means stays the same like without the covariate.

Table 9 - ANCOVA Effectiveness of NPD across Stimuli Groups with Covariate of Light and Heavy Users

Variables	Control	Segment	Segment and Persona	Frequency	Stimuli Group
				F-Test	
Creativity	3.727	3.403	3.070	.087	7.593**
Innovativeness	3.577	3.585	3.605	1.013	.001
Attractiveness	3.931	3.893	4.097	.571	1.001

Note: * p<.05, ** p <0.01, *** p< .001

Finally, through the analysis of RQ 4 an answer can be given to RQ 2 (What is NPD? What is the difference between professional design and market-oriented design in NPD?). As the two groups *segment* and *segment and persona* were defined as market-oriented and the *control* group as professional design, this research shows that there is a significant difference between professional and market-oriented design for the variable creativity as the group *segment and persona* and *control* had a significant difference (p=0.002), whereas *segment* and *control* did not. It is additionally surprising that looking at the variable creativity, the control group has the highest mean and therefore the design of the group that did not have any input from the market was perceived as most creative. This can be explained through the limitation, that the experiment had only two participants and the outcome was dependent on them. Nevertheless, it is also possible that the control group had less constraints and was therefore more creative. Furthermore, innovativeness was perceived higher for market-oriented design and for attractiveness no real difference was found between customer-oriented and professional design.

5. CONCLUSIONS

5.1. Summary of Findings

The aim of this thesis is to solve the question how segments and personas influence the effectiveness of NPD measured through creativity, innovativeness and attractiveness in the railway passenger sector.

In order to answer the main question of the thesis, it is essential to understand that customer satisfaction has an influence on purchase intentions and therefore on loyalty (Mittal et al., 1999). Concerning the railway passenger market, customers are not fully satisfied with the product they are using which shows that there is potential for improvement (European Commission, 2016, 2018). Therefore, the most important factors punctuality, cleanliness, connections and interchanges as well as price have to be considered. Nevertheless, to guarantee a good customer experience, railway companies must take the whole customer journey into consideration (Lemon & Verhoef, 2016). The way products are being designed, has a direct influence on the satisfaction of customers. Therefore, NPD plays a significant role for companies (Cui & Wu, 2017). Some firms use professional design, which means that products are being produced efficiently and economically (Veryzer & De Mozota, 2005). Still, market-oriented design is connected to better performance of new products (Fuchs & Schreier, 2011). A customer-centric approach is therefore sustainable as own resources can be paired with customers' needs (Pires et al., 2011). This can be fulfilled by including segments and personas into the NPD, as they represent the goal customer group. Train companies are mainly nationalized and have a rather broad customer base and no segmentation strategy (European Commission, 2016). Nevertheless, the railway industry is evolving into a more pleasurable perceived product and service (Dallen, 2007). That is why segmentation strategies could help to increase satisfaction for customers.

Finally, the question was whether a more customer-centric approach in the design phase of trains would lead to a more effective NPD. The effectiveness was measured through creativity, innovativeness and attractiveness to a certain customer group. Three different scenarios were analyzed: NPD without any market information, NPD with information about the segment and NPD with information about the segment and a persona. Results showed that for innovativeness and attractiveness no significant differences were found, but still the design built on segment and persona were perceived as more positive. For creativity, there is a difference between the group without market information and the group segment and persona. Here it was surprising

that creativity was voted as more creative for the non-market design. Therefore, one can conclude that the analysis of this thesis did not clearly show what previous research suggested that a market-oriented approach brings a more effective NPD. Furthermore, no significant difference could be found between including personas and/ or segments, but it was still observable that personas are enriching segment information.

5.2. Recommendations

Looking at the railway passenger market, it is essential to see that many companies are nationalized and have therefore a very broad customer base. This explains why a market-oriented approach and therefore the use of segmentation and personas are not common in many of these companies. Satisfaction is not very high among passengers which can be explained through the low market-orientation. In addition, the usage of trains is perceived as a more pleasurable experience for customers than ever before. This is the reason why train companies should concentrate on the needs of their customers to be able to keep them for the future.

This thesis showed that despite what literature says, a market-oriented view does not always lead to more creativity as the design without market orientation was perceived as the most creative one. Furthermore, innovativeness and attractiveness to the customer are perceived better when a design was built with help of a segment and persona. Therefore, one can recommend to train companies that market input may limit creativity but increase innovativeness and attractiveness when enriching segments with a persona.

Overall, competition will grow in the next years, as more and more non-national railway companies arise. Therefore, it is going to be more important to analyze the market and see which segments will be served. Through this, a more specific offer can be realized, and the broadness of the current products and services will decrease in time.

5.3. Limitations and Future Research

This thesis provided significant insights for both: academic researches and managers in the field of NPD. Nevertheless, some limitations can be seen in several parts.

The main limitation of this research is the adopted non-probabilistic convenience sampling method, as the sampling method is not representative for the population. Due to this and the relatively small sample size, the results should not be generalized.

In addition, Study 1 was performed by students and not by professionals who are actually working in an NPD environment. Also, just two people per group were involved in the design of one train and the whole study was based on their outcome. Therefore, the outcomes should not be generalized.

Furthermore, the sample characterization of Study 2 shows that mainly people from Germany took part in the survey. In order to have a fair cross-cultural analysis, at least five countries should be compared (De Mooij & Hofstede, 2010). Especially, because this thesis analyses the railway market in whole Europe, it would be interesting to include more countries.

Another limitation is the measurement of the effectiveness of NPD. The use of subjective measures (creativity, innovation and attractiveness) makes the analysis less objective. Therefore, another approach could be used in future research, such as to compare the performance of train companies with and without customer-centric approaches after introducing new products. Additionally, it would be interesting to see whether different stages of the NPD should be treated with distinct inputs from the market, as this thesis just concentrates on NPD overall.

Moreover, adding a qualitative part in form of interviews with railway professionals would add a more specific answer to the question if train companies segment their market and how they proceed with NPD.

Additionally, consumers and customers were used interchangeably. Nevertheless, there can be a difference between the two, as consumers are the ones who consume the goods and customers the ones who buy it. They do not have to be one person.

Overall, it is important to characterize the railway passenger market as a very nationalized market with growing competition. Through a rising number of competitors and therefore new offers on the market, segmentation will become more important in the future as different segments will be served. This is the reason why a study like this should be repeated in the future

APPENDICES

Appendix 1

Table 10 - Stimuli for Study 1

Group	Stimuli
Control	**Introduction:** Dear participant, Thank you for joining me today in the experiment for my Master thesis. You will be working in groups of 2-3 people. **The task is to design a train coach**. In this power point you will find a blank coach design. On the next page, you will find features you can put into this coach. Please do not feel obliged to use these features. You are also encouraged to change the size of the given features. Moreover, you may add features that are not given. Please feel free to add as many things as you can think of (you may also use pictures from google). You are allowed to create more than one coach, if you feel that a train should have different coach layouts. Besides creating the train, I would ask you to add a short description to every item telling why exactly you chose it. You will have 30 minutes to finish the task. Afterwards, you will receive a survey per e-mail, I would like you to fill out.
Segment	**Introduction:** Dear participant, Thank you for joining me today in the experiment for my Master thesis. You will be working in groups of 2-3 people. **The task is to design a train coach.** In this PowerPoint you will find a blank coach design. On the next page, you will find features you can put into this coach. Please do not feel obliged to use these features. You are encouraged to change the size of the given features. Moreover, you may add features that are not given. Please feel free to add as many things as you can think of (you may also use pictures from google). You are allowed to create more than one coach, if you feel that a train should have different coach layouts. Besides creating the train, I would ask you to add a short description to every item telling why exactly you chose it. **To get an idea of the consumer, you will be presented a segment on the next page.**

	Segments are: *an identifiable group of individuals, families, businesses, or organizations, sharing one or more characteristics or needs in an otherwise homogeneous market. Market segments generally respond in a predictable manner to a marketing or promotion offer.* You will have 30 minutes to finish the task. Afterwards, you will receive a survey per e-mail, I would like you to fill out. **Segment:** The segment includes women in an age between 35 and 45. They are married and have an average of two kids. They live in smaller towns. Through a Masters‘ degree, people of the segment earn between 50 and 60 thousand Euros. They are brand loyal and prefer comfort over price.
Segment and Persona	**Introduction:** Dear participant, Thank you for joining me today in the experiment for my Master thesis. You will be working in groups of 2-3 people. **The task is to design a train coach**. In this PowerPoint you will find a blank coach design. On the next page, you will find features you can put into this coach. Please do not feel obliged to use these features. You are encouraged to change the size of the given features. Moreover, you may add features that are not given. Please feel free to add as many things as you can think of (you may also use pictures from google). You are allowed to create more than one coach, if you feel that a train should have different coach layouts. Besides creating the train, I would ask you to add a short description to every item telling why exactly you chose it. **To get an idea of the consumer, you will be presented a segment and a persona on the next pages.** *Segments are an identifiable group of individuals, families, businesses, or organizations, sharing one or more characteristics or needs in an otherwise homogeneous market. Market segments generally respond in a predictable manner to a marketing or promotion offer.* *Personas represent behavioral and motivational characteristics of the target consumer and are enriched with scenarios how they use the product or service* You will have 30 minutes to finish the task.

Afterwards, you will receive a survey per e-mail, I would like you to fill out.

Segment:

The segment includes women in an age between 35 and 45. They are married and have an average of two kids. They live in smaller towns. Through a Masters‘ degree, people of the segment earn between 50 and 60 thousand Euros. They are brand loyal and prefer comfort over price.

Persona:

Appendix 2

Table 11 - Constructs Study 2

Construct	Items	Adopted from
Satisfaction	1. Overall, how satisfied or dissatisfied were you with the experience you have had on trains?	McCollough, Berry & Yadav, 2000
	2. How well does the experience you encounter on a train meet your needs?	
	3. How would you rate your overall satisfaction with the train company you are mainly using?	
Creativity	1. In comparison to the train products you know, how would you evaluate the competitive advantage of the shown design?	Im and Workman Jr., 2004
	2. How useful do you think are the chosen attributes of the design you were just presented with?	
	3. In your opinion, to what extent do you agree that the product is meaningful?	
Innovativeness	1. It could take a long time before the customer would understand the full advantage of the new design.	Calantone & Cui, 2006
	2. The design offers unique features to the customer.	Avlonitis & Salavou, 2007
	3. The product is new to the market.	Langerak & Hultink, 2006
Attractiveness	1. The customer will be satisfied with the product.	Homburg & Giering, 2001
	2. The customer will recommend this product to their family and friends.	Reichheld, 2003
	3. The product covers the needs of the customer.	McCollough, Berry & Yadav, 2000

Appendix 3

Table 12 - Test of Homogeneity of Variances Study 2

	Levene Statistic	df1	df2	Sig.
Based on Mean	2.827	2	152	0.062
Based on Median	2.248	2	152	0.109
Based on Median and with adjusted dj	2.248	2	144.327	0.109
Based on trimmed mean	2.766	2	152	0.066

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