



Smart rings – German consumers’ perception and factors influencing the purchase intention

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Abstract

Title: Smart rings – German consumers’ perception and factors influencing the purchase intention

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Wearables are one of the most growing markets in the consumer electronics industry. The latest key trend shaping the market are smart rings. Nevertheless, little is known about the factors that influence consumers to purchase a smart ring.

Therefore, this dissertation aims to investigate the German consumers’ perception and factors influencing the purchase intention for smart rings. Thus, this research questions are answered: (1) Who is the consumer of smart rings, (2) what are the drivers of, and (3) what are the barriers to purchase intention.

For this purpose, a quantitative study by means of an online survey was conducted. The research framework is based on two well-established technology adaption models, namely Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) and was developed by reviewing previous literature and by conducting ten in-depth interviews.

The results of this thesis indicate that the German smart ring consumer is over 34 years old, holds an academic degree, usually wears rings and has a high income. Furthermore, the results of this study provide empirical evidence that the attitude towards using is the strongest driver for the intention to purchase a smart ring. Moreover, attitude is driven by the hedonic factors perceived enjoyment and design aesthetics as well as the utilitarian factor perceived usefulness. Lastly, the main barrier to purchase intention is consumers’ negative price value perception of smart rings.

Keywords: Smart Rings, Wearables, Purchase Intention

Resumio

Título: Anéis inteligentes - percepção dos consumidores alemães e factores que influenciam a intenção de compra

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Os artigos de consumo são um dos mercados em maior crescimento na indústria da electrónica de consumo. As últimas tendências chave que moldam o mercado são os anéis inteligentes. No entanto, pouco se sabe sobre os factores que influenciam os consumidores na compra de um tal dispositivo.

Por conseguinte, esta dissertação visa investigar a percepção dos consumidores alemães e os factores que influenciam a intenção de compra de anéis inteligentes.

Foi realizado um estudo quantitativo por meio de um inquérito online. O quadro de investigação baseia-se em dois modelos bem estabelecidos de adaptação tecnológica, nomeadamente o TAM e TPB e foi desenvolvido através da revisão de literatura anterior e da realização de dez entrevistas aprofundadas.

Os resultados desta tese indicam que o consumidor alemão de anéis inteligentes tem mais de 34 anos de idade, possui um diploma académico, usa geralmente anéis e tem um rendimento elevado. Além disso, os resultados deste estudo fornecem provas empíricas de que a atitude em relação à utilização é o condutor mais forte para a intenção de comprar um anel inteligente. Além disso, a atitude é impulsionada pelos dois factores hedonistas percepção de prazer e estética de design, bem como pelo factor utilitário percepção de utilidade. Finalmente, a principal barreira à intenção de compra é a percepção negativa do valor do preço dos anéis inteligentes por parte dos consumidores.

Palavras-chave: Anéis Inteligentes, Intenção de Compra

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List of Abbreviations

SR – Smart Ring

WFT – Wrist-worn Fitness Tracker

TAM – Technology Acceptance Model

TPB – Theory of planned behavior

PU – Perceived Usefulness

PEU – Perceived Ease of Use

PE – Perceived Enjoyment

DA – Design Aesthetics

PC – Perceived Comfort

PP – Perceived Privacy

PV – Price Value

AT – Attitude towards using

SN – Subjective Norm

PBC – Perceived Behavioral Control

PI – Purchase Intention

TI – Technology Innovativeness

PSR – Purchased Smart Ring

1. Introduction

1.1 Background

Smartphones, tablets, wearables – The consumer electronics industry experienced substantial growth, increased competition and the introduction of a variety of new products in the past years. Steadily growing and changing consumer expectations require companies more than ever to understand consumers' preferences and purchase intentions, in order to utilize a consumer-centric product development and marketing approach that ensures the long-term competitiveness of companies' innovations.

Smart wearable devices, and especially fitness wearables, are at the forefront of the consumer electronics industry. Following a period of exponential growth during the past years, the global market for smart wearables is expected to reach \$62.96 billion in sales in 2023 (Pal et al., 2018; Statista, 2018). Considering current times, where obesity is a global public health issue and a pandemic facilitates the already growing trend of health-consciousness among consumers the demand for fitness wearables, in particular, is expected to continue prior years' growth and reach more than 230 million shipments worldwide in 2024 (Statista, 2018).

The latest key trend shaping the market is smart rings. These new lighter, smaller and finger-worn devices challenge today's primary types of fitness wearables, wrist-worn fitness trackers and smartwatches, and might become the future of the market (Verdict, 2019). Given the technology's disruptive potential (YahooFinance, 2020), it is vital for companies to understand consumers' perceptions of smart rings and the influencing factors of their purchase intention.

A multitude of researchers investigated consumer's behavioral intention for smartwatches (Choi & Kim, 2016) and fitness trackers (Lunney et al., 2016). However, except for Marinescu's (2018) multi-criteria analysis of a smart ring, no research has been conducted providing insights about smart rings from a consumer perspective. Moreover, the majority of studies in the field of fitness wearables were conducted in Asia (Chuah et al., 2016; K. J. Kim & Shin, 2015; L. H. Wu et al., 2016) and only a small fraction of studies was conducted in Europe (Canhoto & Arp, 2017). The influencing factors and their respective strength on consumers' behavioral intention based on an Asian population might not be applicable to the same extent in a European country due to cultural differences (Hofstede, 2011).

Hence, from an academic perspective, this paper mainly aims to fill the research gap about consumer behavior towards smart rings. Also, it aims to contribute to the currently low number of fitness and health related wearable studies conducted in a European context.

From a managerial perspective, this thesis intends to provide companies with valuable insights to understand consumers' perceptions and purchase intention of smart rings. Thus, this research

also aims to serve as a resource for companies to tailor their product development and marketing activities towards the consumer and thereby increase their purchase intention.

To do so, this study focuses on the German consumer. The German market is considered to be an interesting market for the purpose of this research due to the high population of more than 83 million inhabitants (Statista, 2020) and the high purchase power of the German consumer (Eurostat, 2019). Moreover, this dissertation uses the *Oura ring*, a smart ring for fitness tracking and sleep monitoring as a representative smart ring, as it gained particular public awareness as a health monitoring device in recent news (Business Insider, 2020).

1.2 Research Statement and Research Questions

This thesis aims to understand the German consumers' perception and factors influencing the purchase intention for smart rings. More precisely, this thesis investigates the drivers and barriers of customers' purchase intentions for smart rings and thereby examines who the German customer of a smart ring is.

Hence, the study is focused on answering the following research questions:

RQ1: Who is the German consumer of smart rings?

RQ2: What are the drivers that influence the purchase intention of smart rings?

RQ3: What are the barriers that prevent consumers from purchasing a smart ring?

Although this research could serve as a basis for future researchers investigating other kinds of smart rings, it is important to mention that this research is tailored to smart rings with the purpose of health, sleep and fitness tracking.

1.3 Research approach

In order to answer the research questions, a deductive research approach was chosen. In a deduction, well-developed theories are used to formulate hypotheses which are then tested by gathering and analyzing quantitative data (Saunders et al., 2016).

First, secondary data from the existing relevant literature was collected. Second, the literature findings were validated using interviews. Third, both qualitative methods were used to develop the research framework and to formulate hypotheses. Fourth, the hypotheses were statistically tested using a quantitative method. Finally, the results of the quantitative study were used to answer the research question and conclude about theoretical and managerial implications.

2. Qualitative Research

The following chapter presents an overview of the qualitative research used to develop the underlying research model for smart rings. Furthermore, this section should serve as a theoretical background for the reader. The chapter encompasses an overview of wearable fitness technology. Subsequently, a discussion of previously used models (TAM) and theories (UTAUT & TPB) in wearables research and the development of a theory-based research framework follows. The insights gained from previous literature are further tested with interviews of users and non-users of fitness wearables. Finally, based on the literature and interview findings, hypotheses for each dimension of the research model are formulated.

2.1 Overview of wearable fitness technology

Technologies are considered “wearable technology” when they can be worn on the body and are capable of incorporating information technology, interacting autonomously and processing information on the go (Park et al., 2014). The product category includes a variety of devices, such as smart glasses, smartwatches, fitness trackers or smart jewelry (e.g. smart rings), (Wright & Keith, 2014). Due to their lightweight and possibility of usage while the user is in motion, wearables offer the consumer a convenient way to seamlessly incorporate functional electronics into their daily life (Kalantari, 2017; Wright & Keith, 2014). Despite their advantages and the perception of wearables being the next core products of the consumer electronics industry, their adoption has been slower than expected (Chang et al., 2016; Kalantari, 2017).

Fitness wearables are the most widely adopted and diffused wearables (Kao et al., 2019). The permanent connection to the skin (Rawassizadeh et al., 2015) as “the ultimate sensor” (Park et al., 2014) is one of the underlying reasons for the wide usage in the fitness and health field (Wright & Keith, 2014). Wearable fitness technology incorporates functionalities to track the user’s physical activity (i.e. calories burned, steps taken), monitor the health (i.e. heart rate, temperature) and sleep (i.e. duration, quality). The so-called “self-quantification” offers the user access to more information and a deeper understanding of his or her behavior (Etkin, 2016).

The devices may have a positive influence on the user’s awareness, motivation and self-efficacy (Kinney et al., 2019) which may lead to a change in behavior that helps users to increase their physical activity (Coughlin & Stewart, 2016), and thereby enhance the level of fitness (Sullivan & Lachman, 2017) or support weight-loss (Pourzanjani et al., 2016), to improve their health (Bravata et al., 2007), by preventing cardiovascular diseases (Hickey & Freedson, 2016) or by changing the sleep patterns leading to an improved quality of life (Lee et al., 2016).

Today's primary devices are wrist-worn fitness trackers (WFT) and smartwatches. Fitness trackers are used to monitor sleep and health and to track the fitness performance (Lunney et al., 2016). Wrist-worn fitness trackers display a limited amount of information, such as daily statistics. More detailed analytics can be observed by the user in the connected application. Smartwatches are multi-functionality devices offering features beyond the "classical" WFT, by allowing the user to install thousands of applications (Chuah et al., 2016), with the main purpose of information displaying and communication and hence are rather classified as "infotainment" wearables (Mewara et al., 2016).

Smart rings, the newest product category in the fitness and health wearable segment, have the same purpose as fitness trackers, offer similar functionalities but differ in form and design. The biggest distinction is that the rings do not offer any information displaying on the device itself and are finger-worn. The form and discreet design promise the user to fit more seamlessly into everyday life allowing for comfortable usage in any situation (Marinescu, 2018).

As this study uses the *Oura* ring as a representative, this section focuses specifically on the *Oura* ring's functionalities and characteristics. The *Oura* ring uses infrared LEDs, NTC temperature sensors, an accelerometer, and a gyroscope to measure the data directly from the arteries of the user's finger to produce accurate and reliable sleep and activity data. The insights about the user's resting heart rate, heart rate variability, respiratory rate, body temperature deviation, in-depth sleep data (sleep stages, sleep time, restless movement detection and ideal bedtime guidance), activity levels (intensity, timing and duration), calories burned, steps taken, inactivity time and automatic detection of restful moments are displayed in detail in the related *Oura* app. The ring's battery lasts for 5-7 days and is fully charged in 20 to 80 minutes. The ring is made of water- and scratch-resistant durable titanium. With a width of 7.9mm and a thickness of 2.55mm, the ring has the approximate size of a wedding band. The user can choose between 7 different sizes from a pre-send sizing kit. Depending on the size the ring weights 4 to 6 grams, which is lighter than a conventional ring. The ring is available in four different colors: silver, gold, black, and stealth (Oura, 2020).

2.2 Development of Research Framework

In order to investigate the factors influencing the purchase intention of smart rings in Germany this dissertation utilized a combination of two widely known research frameworks in the area of consumer research, namely TAM and TPB, whereby TAM was extended by the factors Perceived Enjoyment, Design Aesthetics, Perceived Comfort, Price Value and Perceived

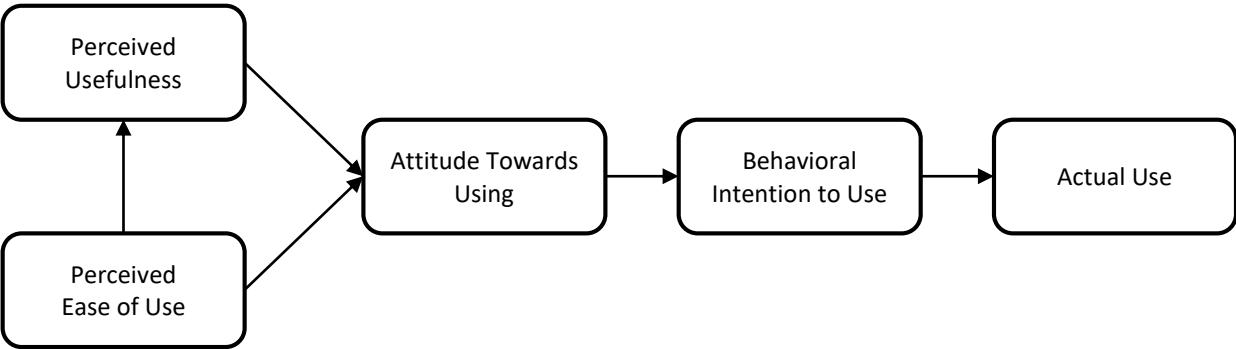
Privacy. Due to the lack of adequate literature on smart rings and the similarity of smart rings to other fitness wearables, the factors influencing the purchase intention of smart rings were derived from the existing literature for smartwatches, fitness trackers and other wearables. Both TAM and TPB, and their respective factors on the purchase intention are discussed in the following section. Moreover, the chapter entails an overview of the interviews used as validation of the theory.

2.2.1 Extended Technology acceptance model (TAM)

Several theories have been developed to explain the usage behavior of consumer technology. However, the most validated and extensively used model to explain the determinants that influence a consumer’s purchase intention is the TAM proposed by Davis (1989).

The model postulates that two key factors, *Perceived Usefulness* (PU) and *Perceived Ease of Use* (PEU), jointly affect a consumer’s *Attitude Towards* (AT) a technology which determines the behavioral intention (e.g. purchase intention). Perceived usefulness is the degree to which a consumer believes that a technology enhances his or her performance in a certain activity. Individuals form a positive attitude towards the technology when they perceive the technology as useful for achieving a certain goal and thus helpful for receiving external rewards (Chuah et al., 2016). Hence, the concept of PU is linked to an individual’s extrinsic motivation and outcome expectancy (Davis, 1989; Venkatesh, 1999). Perceived ease of use is the degree to which a consumer believes using the technology is effortless. PEU is driven by the intuitiveness of the device and an individual’s self-efficacy, that is his or her perceived competence in using the technology (Venkatesh & Davis, 1996). According to the model, when a consumer perceives a new technology as both useful and easy to use, the developed attitude towards the product is positive and the consumer forms a purchase intention (Davis, 1989).

Figure 1 – Technology Acceptance Model (TAM)



Despite its simple structure, the model's robustness and relevance for technology acceptance research have been empirically validated (Venkatesh et al., 2000) and a multitude of researchers have utilized the model in their analysis for smartwatches (K. J. Kim & Shin, 2015), mobile fitness applications (Jang Yul, 2014), smart clothing (Chae, 2009), and fitness wearables (Lunney et al., 2016).

Nevertheless, due to its weakness of solely taking utilitarian factors and neglecting for instance hedonic factors as determinants of an individual's technology acceptance, several scholars suggested to extend the TAM by incorporating external variables like perceived enjoyment (Gu et al., 2016), perceived privacy (Nasir & Yurder, 2015), perceived aesthetics (Jeong et al., 2016) or technology readiness (T. Kim & Chiu, 2019) to improve the model's explanatory power and to apply the model in different technological contexts (Lunney et al., 2016).

Venkatesh addressed several weaknesses and proposed two extensions of the TAM, first, in the UTAUT theory (2003), by incorporating social influences and facilitating conditions, and later in his UTAUT2 theory (2012), by incorporating hedonic motivation, price value and habit. The UTAUT-theories were also used in the context of fitness wearables (Cavdar Aksoy et al., 2020). Nevertheless, both theories lack factors that were considered crucial for the underlying research. The UTAUT theory misses a hedonic dimension, which has been considered as a highly important determinant of a consumer's purchase intention (Venkatesh et al., 2012), and the UTAUT2 neglects the influence of design aesthetics, which has been considered a highly important dimension in the context of smart rings (Best, 2015).

Therefore, this study used an extended TAM with the additional factors Perceived Enjoyment, Design Aesthetics, Price Value and Perceived Privacy, to ensure the applicability and high explanatory power of the research model.

Firstly, the original model was extended by the hedonic factor *Perceived Enjoyment* (PE), which was widely used in previous extended TAM models (Choi & Kim, 2016; Gao et al., 2015). Perceived enjoyment represents an individual's hedonic motivation (Kalantari, 2017) and can be described as the extent to which a user perceives the actual usage of a technology as enjoyable (Davis et al., 1992). Thus, PE is focused on the individual's feelings about performing a behavior rather than the behavioral outcome (Choi & Kim, 2016). The hedonic factor is particularly important as it is linked to intrinsic motivation, which has a stronger influence on an individual's behavior than extrinsic motivation (Kalantari, 2017). While many scholars

validated the impact of hedonic motivation on the purchase intention for various wearables (Gao et al., 2015; L. H. Wu et al., 2016) and some scholars even found that hedonic motivation has the strongest influence on the purchase intention of specific wearables (Kranthi & Asraar Ahmed, 2018), in the context of fitness and health wearables there has been no clear consensus (Kalantari, 2017). While the results of Gao et al. (2015) suggested that perceived enjoyment does have an impact on consumers' purchase intention, other studies, such as Yang Yul (2014) found no such effect.

Secondly, the model was extended by the hedonic aspect *Perceived Aesthetics* (DA) since wearables were also considered to be fashion and lifestyle products (Choi & Kim, 2016; K. J. Kim & Shin, 2015; Krey et al., 2016). Therefore, consumers tend to select wearables according to the perceived attractiveness of the aesthetic attributes such as shape, materials or color and fit with the user's self-identity and their environment (Gemperle et al., 1998). Aesthetic attributes play a crucial role in the decision-making process of consumers as they can trigger emotions (Jeong et al., 2016) and are a means of communication and differentiation to the user's social surroundings (Rauschnabel et al., 2016). A significant effect of perceived aesthetics on purchase intention was found in the context of smartwatches (Jeong et al., 2016) and wearable devices (Yang et al., 2016). For smart rings the fashion aspect was assumed to play an even bigger role compared to other wearables.

Thirdly, the traditional model was expanded by the factor *Perceived Privacy* (PP), as it was suggested to be another crucial determinant for the adoption of new technologies (Lai & Shi, 2015). Perceived privacy refers to a consumer's ability to control the conditions by which their personal information is acquired or used by third parties (Shin, 2010). Consumers that perceive their personal information as not secure might develop privacy anxiety and lack of trust in the device that negatively influences the purchase intention for wearables (Chang et al., 2016). Some scholars even found that privacy concern might be the biggest adoption barrier due to the negative effect on the trust towards a device (Gu et al., 2016). The academic findings were in line with an online survey about wearables that showed privacy is one major adoption barrier (PricewaterhouseCoopers, 2014) and a more general study about digital health tools that demonstrated privacy concerns are the biggest adoption hurdle (Accenture, 2020).

Fourthly, the underlying research model was complemented with a dimension covering a consumer's perception of the cost of smart rings. *Price value* (PV), which is a central element

of Venkatesh's UTAUT2 theory (2012), refers to a consumer's overall utility assessment of a product based on their perception of benefits and costs (Zeithaml, 1988). The factor represents the cognitive tradeoff between the perceived utilitarian and hedonic benefits and the monetary expenditures (Dodds et al., 1991). When the perceived benefits of using a technology surpass its monetary cost, the price value is positive and will hence positively impact a consumer's purchase intention (Venkatesh et al., 2012). Various researchers have found a significant effect of a technology's price value on a consumer's purchase intention in the context of smartwatches (K. J. Kim & Shin, 2015) and wearable devices (Yang et al., 2016). The importance to include a cost perception was further indicated by a research study of wearables that found the price to be the biggest adoption barrier for fitness trackers and smartwatches (PricewaterhouseCoopers, 2014). Another study, in Germany, found that for the German consumer a value-for-money perception is the most influential factor in the purchasing process of a wearable (PricewaterhouseCoopers, 2015).

Lastly, the psychographic user factor *Technology Innovativeness* (TI) was included in the research, which is a classification of an individual's characteristic to accept new innovations. Technology innovativeness is defined as an individual's willingness to try out new technologies (Agarwal & Prasad, 1998). Innovative individuals are characterized as active information seekers (Kalantari, 2017) which helps them to reduce the uncertainty related to an emerging innovation (Rogers, 2003). The moderating role of personal innovativeness on a user's perceived usefulness and ease of use and hence the indirect effect on a consumer's behavioral intention was validated for instance in mobile healthcare (I. L. Wu et al., 2011) mobile fitness applications (Jang Yul, 2014), and wearable devices in general (Chang et al., 2016).

The extended TAM included a variety of factors, combined forming a consumer's attitude towards smart rings which was suggested to be the strongest determinant of behavioral intention towards fitness wearables (Song et al., 2018). The attitude towards a behavior is developed by a person's behavioral beliefs and the subjective assessment of these beliefs (Ajzen, 1991). Behavioral beliefs are formed by certain attributes the consumer associates with the object in question (Ajzen, 1991). In the case of smart rings, the dimensions PU, PEOU, PE, DA, PP and PV represented the underlying dimensions a consumer evaluates to link the behavior in question, i.e. the purchase of the smart ring, to a positive or negative overall valuation and hence a certain attitude towards the technology (Ajzen, 1991).

2.2.2 Theory of planned behavior (TPB)

The extensions of the TAM addressed several weaknesses of the original TAM. Nevertheless, the extended model alone solely included a person's subjective beliefs about the purchase of smart rings and did not take other effects on the consumer's behavior into account. Many researchers had in particular criticized the lack of social influence as a critical shortcoming of the original TAM (Bagozzi, 2007; Benbasat & Barki, 2007) and prior studies demonstrated the significant effect of social influences on a consumer's purchase intention for wearables (L. H. Wu et al., 2016). Thus, in line with Choi and Kim's (2016) suggestion for further research for wearables, the extended TAM was merged with the theory of planned behavior to examine the German consumer's purchase intention for smart rings. Prior research findings that suggested an integration of the TAM with the theory of planned behavior leads to a higher explanatory power of technology acceptance models also contributed to this research approach (Venkatesh et al., 2003; Yi et al., 2006).

The TBP proposed by Ajzen (1985), incorporates the determinants of purchase intentions over which consumers do not have complete control (Ajzen, 1991). The theory postulates that an individual's behavioral intention is determined by the consumer's *attitude towards a behavior* (AT), *subjective norm* (SN) and *perceived behavioral control* (PBC).

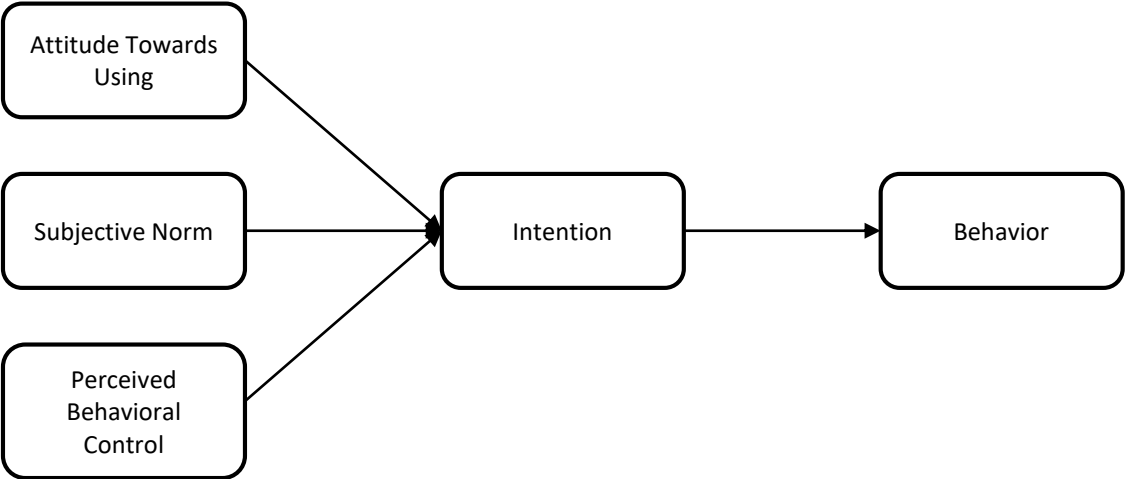
The first determinant, attitude towards behavior, was where the models overlap as both referred to an individual's overall evaluation of performing the behavior (Ajzen, 1991; Davis, 1989).

The second determinant, subjective norm, reflects an individual's normative beliefs, that is, the perception of social influences from a peer group or important individuals on performing the behavior, i.e. the purchase of a smart ring (Ajzen, 1985). In the underlying case, this dimension captured whether an individual perceived social pressure to purchase or not to purchase a smart ring. By including the social effect, in addition to an individual's own beliefs about the behavior, the research approach considered a consumer's beliefs about the external perception of purchasing a smart ring. Previous research for wearables (Yang et al., 2016) and wearable fitness technology (Lunney et al., 2016) demonstrated the relevance of subjective norm for the purchase intention of such devices.

The third determinant, perceived behavioral control is defined as the "perceived ease or difficulty of performing the behavior" (Ajzen, 1991, p.188) and is underpinned by the assumption that a planned or desired behavior will only be carried out if the behavior is under volitional control (Ajzen, 1985, 1991). PBC is an individual's control belief which includes non-motivational factors (e.g. time, money, skills) that facilitate or hinder the execution of behavior (Ajzen, 1991). These beliefs are formed through past experience and anticipated

obstacles (Ajzen, 1991). As mentioned earlier, the cost of a wearable was suggested to be one of the most important adoption barriers (PricewaterhouseCoopers, 2014, 2015). Therefore, control beliefs, especially about the ring’s price, might play an important role in consumer’s decision-making process.

Figure 2 – Theory of Planned Behavior (TPB)



2.2.3 Interviews

In-depth interviews were conducted to gain a deeper understanding of the main drivers and barriers for the purchase intention of smart rings and used to further support the insights from the literature review. In-depth interviews are individual interviews in which the respondents have knowledge about the topic and can provide information about their personal feelings, experiences and perspectives about it (Boyce & Neale, 2006). This method provides more detailed information about a topic compared to quantitative methods (Boyce & Neale, 2006) and allows to investigate topics that are relatively little known among the general population (Boyce & Neale, 2006), such as smart rings.

In total, ten in-depth interviews were conducted, where five of the respondents were users of fitness wearables, two of those smart ring users, and the other five were non-users of any fitness wearable. All respondents were German students in the age between 23 and 26 years, four females and six males. The respondents were selected through convenience sampling considering the lack of resources.

Two different interview scripts were designed, both followed a semi-structured format (see Appendix 3). The first interview was developed for fitness wearables users, in order to

determine the drivers leading to the purchase. The second interview was developed for non-users, in order to deepen the understanding of barriers preventing consumers from purchasing.

2.2.3.1 Interview Findings

Users of fitness wearables:

Firstly, when asked about the major benefits of using their respective wearable, all interviewees referred to the advantages of improving the user's quality of sleep and fitness performance by deepening the user's understanding about his or her behavior and strengthening the user's health consciousness and motivation.

When asked about the main underlying reasons and motivations for the purchase of their wearable, all interviewees pointed out that fitness wearables (e.g. smart rings) are utilitarian products that in the first place are bought due to their functionalities.

The interviewees were also asked about their critical evaluation criteria in the decision-making for their respective device. The majority of factors mentioned were in accordance to the findings in the literature. All participants pointed out that design and price play a predominant role. Further, all interviewees placed a focus on the design due to the high visibility for others.

Three of the users, especially the smart ring users, perceived their wearable also as a fashion accessory. The interviewees concretized that the design of the wearable should be perceived as aesthetic and seamlessly match the user's outfit. Also, the importance of other's perception about the visual appearance of the product was mentioned. The role of social influences was further pointed out as some of the interviewees bought their wearable based on a friend's recommendation.

Furthermore, two additional factors were discovered in the interviews. Some interviewees mentioned the importance of compatibility with other devices such as earphones. All user emphasized the fundamental importance of a devices wearing comfort. While some already considered the perceived comfort in their past purchase decision, all of them stated that a high wearing comfort is the basis for the continuous usage of the device and thus, a crucial determinant in a future purchase decision. (see Appendix 4)

Non-users of fitness wearables:

Firstly, when asked about the main reason for not purchasing a smart ring, the majority of interviewees emphasized the devices' lack of usefulness and criticized the high price of specific devices.

Two of the interviewees mentioned that any form of self-quantification would not be enjoyable and could even decrease the enjoyment for their sport activities or result in an increased stress level. Two female respondents criticized the ring's lack of aesthetics compared to a normal ring. Another non-user highly criticized the lack of personal data security. Although this non-user in general had a good perception of smart rings, the potential misuse of his data outweighs all potential benefits. Three of the non-users also mentioned the wearing comfort and pointed out that they never wear rings and thus cannot imagine wearing a smart ring.

Secondly, when the respondents were asked about potential modification that could motivate them to become a smart ring user, increased usefulness and higher compatibility with other devices were identified as main potential improvements. Several non-users pointed out that the current functionalities regarding sport-related usage are too limited. GPS-signal and communication functions were mentioned as valuable modifications. Also, interconnectivity with earphones and a battery for music were stated as crucial improvement to enable for the listening of music while performing sports. Another, non-user mentioned that gamification in the app could increase the enjoyment of using the ring. (see Appendix 4)

2.2.3.2 Discussion

The majority of the findings from previous literature were validated and thus all factors were considered in the quantitative analysis. Only the factors perceived ease of use and perceived behavioral control were not mentioned from any interviewee. Considering the age of the respondents and the technological capabilities of the “digital natives” it is not surprisingly that for instance the ease-of-use of the ring and the related app were not mentioned.

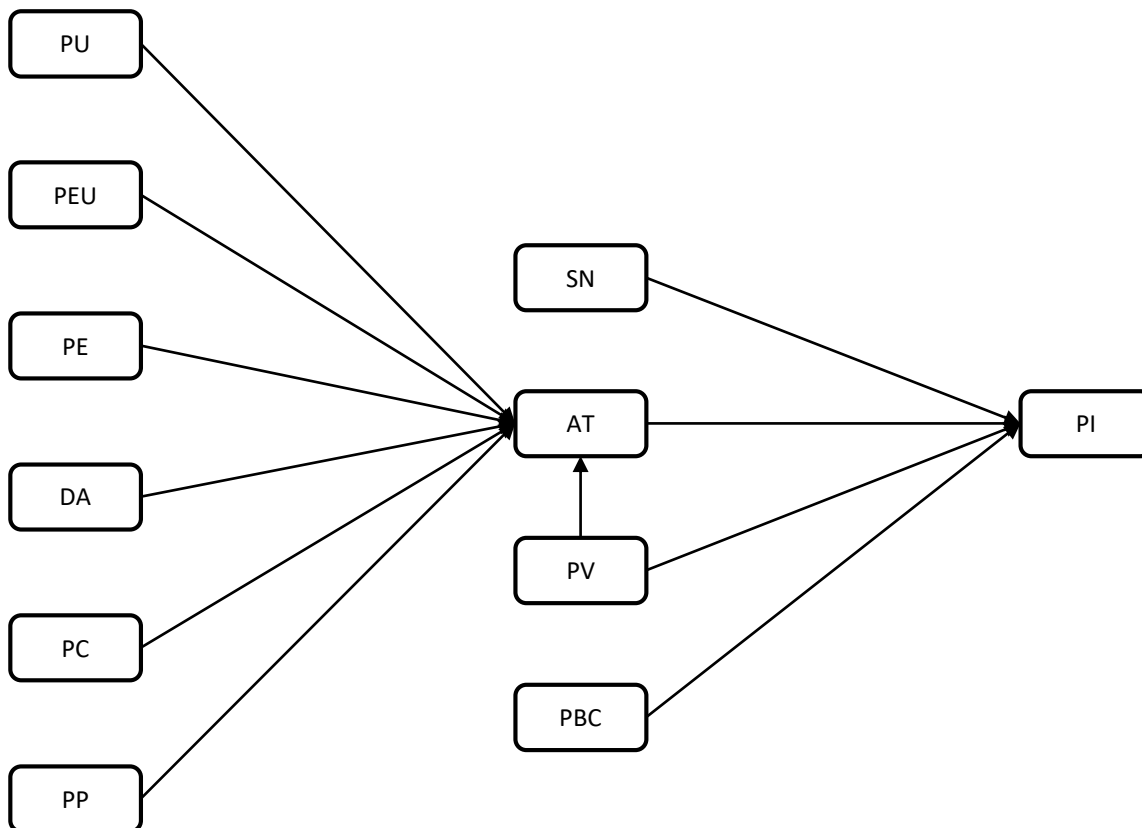
The interviews discovered two additional factors that influenced consumers in their decision-making process. Both factors were used in prior studies about wearables. Compatibility was found significant in the context of wearables in general (Yang et al., 2016), smartwatches (Choi & Kim, 2016; L. H. Wu et al., 2016) and wearable health technology (Nasir & Yurder, 2015). Also, perceived comfort was found significant in wearable fitness tracker (Coorevits & Coenen, 2016) and sport wearables research (Song et al., 2018).

Although both factors were supported from the interviews and literature, only *Perceived Comfort* (PC) was integrated in the underlying research model, due to the importance the user and non-user placed on the wearing comfort of wearables and in order to prevent including too many factors in the research model.

2.2.3 Research Framework and Hypotheses Development

In the following section the research framework is presented, each factor is defined in the context of this study and hypotheses for the respective factors in regard to the research model are formulated.

Figure 3 – Research Framework



2.2.3.1 Perceived Usefulness

Perceived usefulness is one of the underlying utilitarian factors that influence the attitude towards using a smart ring. In the context of this study, PU is defined as the extent to which a person believes that a smart ring enhances his or her fitness/health/sleep performance (Davis, 1989). Drawing on Davis' original TAM, findings in general wearables (Choi & Kim, 2016; Chuah et al., 2016; K. J. Kim & Shin, 2015) and fitness wearables research (Cavdar Aksoy et al., 2020; Song et al., 2018) the author hypothesized that:

H1: Perceived Usefulness positively influences German consumers' attitude towards using smart rings.

2.2.3.2 Perceived Ease of Use

Perceived ease of use is the second utilitarian factor influencing the attitude towards using a technology. In the context of this research, PEU is defined as the degree to which an individual believes using a smart ring and the related application is effortless (Davis, 1989). On the basis of findings in health and fitness technologies research (Jang Yul, 2014; Preusse et al., 2016; I. L. Wu et al., 2011) that demonstrated the positive effect of an easy-to-use perception on a consumer's attitude the author hypothesized that:

H2: Perceived Ease of Use positively influences German consumers' attitude towards using smart rings.

2.2.3.3 Perceived Enjoyment

Perceived Enjoyment is the first additional hedonic factor of the underlying research model. In this study, PE is defined as the extent to which an individual perceives using the smart ring to be enjoyable (Davis et al., 1992). Based on studies about fitness wearables (Gao et al, 2015) and smartwatches (L. H. Wu et al., 2016) that showed the impact of hedonic motivation on consumer's attitude towards wearables it was hypothesized that:

H3: Perceived Enjoyment positively influences German consumers' attitude towards using smart rings.

2.2.3.4 Design Aesthetics

Design Aesthetics is the second hedonic factor included in the research model. Within this study, design aesthetics is defined as the degree to which a person perceives the design of a smart ring as attractive (Hsiao & Chen, 2018). Based on smartwatch (Jeong et al., 2016) and fitness tracker research (Coorevits & Coenen, 2016) the author hypothesized that:

H4: Design Aesthetics positively influences German consumers' attitude towards using smart rings.

2.2.3.5 Perceived Comfort

Perceived comfort incorporates an individual's perception of the comfort of wearing a smart ring. In this paper, perceived comfort is defined as the degree to which an individual perceives the smart ring as comfortable to wear. Based on the interviews and findings in wearable research (Coorevits & Coenen, 2016; Song et al., 2018) it was hypothesized that:

H5: Perceived comfort positively influences German consumers' attitude towards using smart rings.

2.2.3.6 Perceived Privacy

Perceived privacy includes an individual's perception of the potential consequences from third-party usage of a user's private information. In this research, perceived privacy is defined as the extent to which a person perceives him- or herself in control of the extent and conditions by which third-parties make use of the user's personal data (Gu et al., 2016). Based on the significant effect of perceived privacy on attitude in various fitness wearable studies (Chang et al., 2016; Gu et al., 2016) the author hypothesized that:

H6: Perceived Privacy positively influences German consumers' attitude towards using smart rings.

2.2.3.7 Price Value

The price value dimension carries a consumer's perception of the cost. In the context of this thesis, price value is defined as consumer's cognitive tradeoff between perceived benefits of the smart ring and the monetary cost for using (Venkatesh et al., 2012). The price value is positive when perceived benefits exceed cost and vice versa (Venkatesh et al., 2012). Based on the UTAUT2 and findings in wearables (Yang et al., 2016) and smartwatch studies (K. J. Kim & Shin, 2015) it was hypothesized that:

H7a: Price Value positively influences German consumers' attitude towards using smart rings.

Based on the insight from a wearable study performed in Germany (PricewaterhouseCoopers, 2014, 2015), PV was expected to play a superior role for the German consumer. Therefore, PV was expected to also have an effect on PI that is not covered from AT and it was hypothesized that:

H7b: Price Value positively influences German consumers' intention to purchase a smart ring.

2.2.3.8 Attitude Towards Using

In this study, attitude towards using a smart ring is the consequence of the combined evaluation of the individual's subjective beliefs about the previously mentioned factors PU, PEOU, PE, DA, PC, PP and PV. In the context of this study, AT is defined as the degree to which an individual has a favorable or unfavorable evaluation of using a smart ring (Ajzen, 1991). Based

on the TAM, TPB and findings of several researchers in the context of fitness wearables (Cavdar Aksoy et al., 2020; Choi & Kim, 2016; Lunney et al., 2016) that found attitude to be a predictor of the purchase intention, it was hypothesized that:

H8: Attitude towards using positively influences German consumers' intention to purchase smart rings.

2.2.3.8 Subjective Norm

Subjective Norm covers the social influences in the consumer's decision-making process. In the context of this research, SN is defined as the degree to which an individual perceives pressure or not by his or her social peers to purchase a smart ring (Ajzen, 1985). Based on findings of several health and fitness wearable studies (Chang et al., 2016; Jang Yul, 2014; Lunney et al., 2016) the author hypothesized that:

H9: Subjective Norm positively influences German consumers' intention to purchase smart rings.

2.2.3.9 Perceived Behavioral Control

Perceived behavioral control includes the perception of obstacles and facilitating condition in carrying out the behavior. In the context of this thesis, PBC is defined as perceived ease of purchasing and using smart rings (Ajzen, 1991). Based on the positive influence of PBC on the purchase intention of wearable devices (Turhan, 2013; I. L. Wu et al., 2011) it was hypothesized that:

H10: Perceived Behavioral Control positively influences German consumers' intention to purchase smart rings.

2.2.3.9 Behavioral / Purchase Intention (PI)

Behavioral intention refers to an individual's subjective probability of performing a behavior in question, i.e. the purchase of a smart ring (Ajzen, 1991). The intention is closely linked to the individual's motivation to perform the behavior and serves as an indicator of an individual's readiness to perform the behavior (Ajzen, 1991). Behavioral intention has been considered to be a meaningful predictor of actual behavior (Mao & Palvia, 2006).

In the underlying research framework, the purchase intention is defined as an individual's likelihood to purchase a smart ring (Ajzen, 1991). Based on the literature and interviews it was hypothesized that consumers form a purchase intention if the perceived utilitarian and hedonic

values exceed the costs of acquiring and the effort of using them (Venkatesh et al., 2012). Moreover, it was hypothesized that the more favorable the attitude (AT), price value perception (PV) and subjective norm (SN) and greater the perceived behavioral control (PBC), the stronger is an individual's intention to purchase a smart ring.

Table 1 – Hypotheses Overview

Hypotheses		Literature	Interview
H1:	PU $\xrightarrow{+}$ AT	x	x
H2:	PEU $\xrightarrow{+}$ AT	x	
H3:	PE $\xrightarrow{+}$ AT	x	x
H4:	DA $\xrightarrow{+}$ AT	x	x
H5:	PC $\xrightarrow{+}$ AT	x	x
H6:	PP $\xrightarrow{+}$ AT	x	x
H7a:	PV $\xrightarrow{+}$ AT	x	x
H7b:	PV $\xrightarrow{+}$ PI	x	x
H8:	AT $\xrightarrow{+}$ PI	x	x
H9:	SN $\xrightarrow{+}$ PI	x	x
H10:	PBC $\xrightarrow{+}$ PI	x	

3. Methodology

In the following section the type, data collection, design and analysis of the quantitative research method are explained.

3.1 Research Method

For quantitative analysis, an online survey was conducted to statistically examine the German consumers' perception towards smart rings, investigate the drivers and barriers of the purchase intention and draw a customer profile. For the researcher, surveys allow to include a great variety of questions to gather standardized quantitative data that can be easily compared (Evans & Mathur, 2005; Saunders et al., 2016). Furthermore, surveys enable researchers to easily obtain a large number of responses while being in control of the sampling and sample size (Evans & Mathur, 2005).

3.2 Data Collection

For the collection of quantitative data, a self-administrated questionnaire was designed. A self-administered questionnaire is a survey in which respondents autonomously read and answer the question without the presence of the researcher (Babin & Zikmund, 2016).

For the distribution, a non-probability snowball sampling approach, via WhatsApp and different social media platforms such as LinkedIn, Facebook and Instagram, was chosen, in order to obtain a big sample. In this technique, initial respondents are selected by the author in which then further distribute the survey (Babin & Zikmund, 2016). More precisely, the survey was distributed to German family and friends which then forwarded the survey to their acquaintances. Furthermore, via different social-media platforms, especially Facebook, the survey was posted in specific groups such as "Oura Ring - The Science of Sleep, Health-Tracking and Recovery" (7.000 members), to collect more data of smart ring and wearable user. Finally, the survey exchange platform Surveycircle was used to generate more responses. Moreover, on this platform certain criteria (e.g. age, gender, or occupation) could be specified in order to increase the sample's representativeness for the German population.

3.3 Survey Design

The survey was developed under the research platform Qualtrics and structured according to findings of the reviewed literature and had a total of 5 sections that contained 23 questions.

The first section included a short welcome message explaining the broad context and purpose of the study as well as the option of choosing between an English and German survey version. The second part consisted of a screening question about the participants' nationality and residency as the underlying research was tailored to the German market. Also, in this section respondents were asked about their familiarity with smart rings and ownership of a fitness wearable in order to separate them into users and non-users. The third section comprised an introduction of the Oura Ring including, for instance, information about the functionalities or pictures of the ring especially for those participants that were not familiar with smart rings or the Oura Ring in specific. For participants that were seeking more information, the section included a link to the Oura website. The fourth section included the main questions related to the respondents' perception of the discovered factors and purchase intention. The main block was structured into several sub-blocks so that each dimension was answered separately. Finally, the last section was related to socio-demographic questions regarding the respondents' age, gender, education, occupation and monthly income.

3.3.1 Measurement of scales

For the majority of questions, the measurements and scales were based on and slightly adapted from existing literature. Except for the screening and socio-demographic questions, all items were measured on a 5-point Likert scale ranging from "1 = strongly disagree" to "5 = strongly agree". By using previously validated questions and scales the author ensured the reliability and validity of the measurements used.

Reliability indicates a measure's internal consistency (Babin & Zikmund, 2016). A measure is considered to be reliable when different items measuring the same concept lead to the same result (Babin & Zikmund, 2016). Therefore, three to five previously validated questions, that only deviate slightly from each other, were provided for each dimension (see Table 2). The internal consistency of the items was tested by calculating Cronbach's alpha scores (see 4.3 Reliability Analysis).

Validity refers to the degree to which a measure truthfully represents what it intends to measure (Babin & Zikmund, 2016). A measure is regarded as valid when it possesses face validity, thus, when professionals agree that the applied items reflect the concept that is measured (Babin & Zikmund, 2016). Due to each item's application in prior studies on similar topics, it can be argued that the used measurements possessed face validity.

Table 2 – Measurement Items

Construct	Item	Source
PU	PU1: In general, I believe that smart rings are useful.	Davis (1989) Yang et al. (2016)
	PU2: Using a smart ring would help me to accomplish a goal.	
	PU3: Using a smart ring would improve my general health.	
	PU4: Using a smart ring would improve the quality of my sleep.	
	PU5: Using a smart ring would improve my sport/fitness performance.	
PEU	PEU1: I believe that smart rings and the related app are easy to use.	Davis (1989); Wu et al. (2016)
	PEU2: Learning to use smart rings and the related app would be simple for me.	
	PEU3: Using smart rings and the related app are self-explanatory.	
PE	PE1: I would enjoy using a smart ring.	Wu et al (2016); Yang et al. (2016)
	PE2: Wearing a smart ring would make me happy.	
	PE3: The use of a smart ring would make me feel good.	
	PE4: I would enjoy gathering data about myself.	
DA	DA1: The overall design of smart rings is attractive.	Hsiao & Chen (2018)
	DA2: The form of smart rings is attractive.	
	DA3: The colours of smart rings are attractive.	
	DA4: The materials of smart rings are attractive.	
PC	PC1: In general, I believe smart rings are comfortable to wear.	Chang et al (2016); Song et al. (2018)
	PC2: Wearing a smart ring would feel pleasant.	
	PC3: I would feel comfortable wearing a smart ring 24/7.	
PP	PP1: I am confident that I know all the parties who collect information I provide during the use of a smart ring.	Chang et al. (2016)
	PP2: I am aware of the exact nature of information that will be collected during the use of a smart ring.	
	PP3: I am not concerned that the information I submit on the smart ring are misused.	
PV	PV1: Smart rings are reasonably priced.	Venkatesh et al. (2012)
	PV2: Smart rings offer a good value for the money.	
	PV3: At the current price, smart rings provide a good value.	
TI	TI1: I am usually one of the first among my peers that seeks information about new technologies.	Chang et al. (2016)
	TI2: I am usually one of the first among my peers that tries out new technologies	
AT	AT1: I believe that using smart rings would be a positive decision.	Hsiao & Chen (2018)
	AT2: I like the idea of using a smart ring.	
	AT3: I have a positive attitude towards smart rings.	
SN	SN1: People who influence me think that I should use a smart ring.	Chang et al. (2016); Aksoy (2020)
	SN2: People who are important to me support the usage of a smart ring.	
	SN3: People whose opinion I value prefer that I use a smart ring.	
PBC	PBC1: I would be able to use smart rings.	Wu et al (2011); Turhan (2013)
	PBC2: I have the money to buy a smart ring.	
	PBC3: I have the resources, knowledge and ability to use a smart ring.	
PI	PI1: I intend to purchase a smart ring in the near future.	Venkatesh et al. (2012)
	PI2: I predict that I will pay for a smart ring in the near future.	
	PI3: I am likely to buy a smart ring in the near future.	

3.4 Data Analysis

The data was coded and analyzed with IBM SPSS Statistics 26. The variables used in this research were dichotomous, nominal and ordinal (Saunders et al., 2016). In total, five different tests were conducted to analyze the data. First, a factor analysis was used to create composite variables that facilitated the data analysis for hypotheses testing. Secondly, a reliability analysis by means of Cronbach's alpha was carried out to ensure the measurements' internal consistency and reliability (Pallant, 2016). Thirdly, descriptive statistics were analyzed to examine consumers' perception of smart rings and to identify important characteristics for each of the applied items. Fourthly, a Pearson correlation analysis was used to test for significant correlations between variables. The results were used as indicators of the direction and strength of the relationships. Finally, multiple regression analysis was performed to test the hypotheses by exploring the predictive ability of each independent factor on the dependent variables AT and PI. Multiple regression analysis was conducted to obtain a more detailed exploration of the interrelationships among the respective variables. Furthermore, it allows to explore multiple relationships between variables at the same time and to determine which independent variable makes the strongest contribution to the explanation of a dependent variable and whether this contribution is significant (Pallant, 2016).

4. Results

In the following section, the empirical findings of this thesis are presented. Firstly, the sample's characteristics are described. Secondly, factor analysis and reliability analysis are demonstrated. Thirdly, descriptive statistics are presented. Finally, all hypotheses are tested using correlation and multiple regression analysis.

4.1 General Sample Characteristics

During the data collection, a total of 342 respondents were collected of which 312 respondents concluded answering the complete survey, resulting in a response rate of 92%. From those 312, 22 respondents were considered not valid for the sample either because they were not German or failed the dummy test, indicating a low attention during their response. Thus, the total valid sample consisted of 290 responses.

The sample consisted of 56% female and 44% male respondents. The biggest share of respondents was 25-34 years old (41%), followed by those between 18 and 24 years (35%). Regarding the level of education, the majority had a bachelor's degree (44%), followed by 26% with a master's degree. The majority of respondents were students (55%), followed by 33% that were employed. Regarding the monthly income, the majority had less than 1.000€ (35%), followed by 22% with an income of 1.000€-2000€, 14% with an income of 2.000€-3.000€ and 8% with an income of more than 3.000€.

Although, the sample consisted of a high share of wearable owners, 11% already owned a smart ring and 29% owned another fitness wearable, only 33% were already familiar with smart rings. Furthermore, the majority of participants did not consider themselves as someone seeking information early (69.0%) or trying out new technologies (68.3%). However, the majority believed a health-conscious lifestyle is important (86.4%) and considered themselves as someone living health-conscious (77.6%).

4.2. Factor Analysis

A principal component analysis (PCA) was used to generate the 12 composite variables by aggregating the 39 measurement items. Prior to conducting the PCA, the data set's suitability for factor analysis was examined.

The sample size of a data set should at least have 150 cases to be suitable for factor analysis (Pallant, 2016). This criterium was met, as the sample size had 290 cases. Moreover, the correlation coefficients of the items that were aggregated should be above 0.3 (Field, 2009).

Furthermore, the Bartlett's test of sphericity, which indicates whether or not the variables are related, should be statistically significant at the 0.05 level (Pallant, 2016). For the Kaiser-Meyer-Olkin (KMO) values, which indicates the sampling adequacy (Field, 2009), it is suggested to only accept values of 0.5 or higher, where values from 0.6 to 0.7 are considered mediocre, between 0.7 and 0.8 are considered good, from 0.8 to 0.9 are considered great and above 0.9 are considered excellent (Kaiser, 1974).

Based on those criteria, the underlying data was considered adequate for factor analysis as the correlation coefficients of all items, aggregated into one composite variable, were above 0.3, the Bartlett's test of sphericity was statistically significant for all composite variables (Sig.<0.001) and the majority of KMO values was considered good or great. Only the four variables TI, HC, PP and PBC were considered mediocre.

Table 3 – Exploratory Factor Analysis

Composite Variable	Correlation Coefficients >0.3	KMO	Total Variance Explained (%)	Bartlett's Test of Sphericity (Sig.)
Technology Innovativeness		0.500	94.515	0.000
Perceived Usefulness		0.847	63.154	0.000
Perceived Ease of Use		0.708	71.848	0.000
Perceived Enjoyment		0.836	77.528	0.000
Design Aesthetics		0.738	74.139	0.000
Perceived Comfort		0.701	77.992	0.000
Perceived Privacy		0.647	66.976	0.000
Price Value		0.727	85.401	0.000
Attitude towards using		0.753	87.730	0.000
Subjective Norm		0.731	81.303	0.000
Perceived Behavioral Control		0.615	63.268	0.000
Purchase Intention		0.768	94.245	0.000

4.3. Reliability Analysis

The reliability of each composite variable was tested by calculating Cronbach's Alpha scores. For Cronbach's Alpha values, measures are considered to have fair reliability with scores of at least 0.6, good reliability with scores of at least 0.7 and excellent reliability with scores above 0.9 (Babin & Zikmund, 2016). Therefore, almost all variables were considered to have either a good or excellent reliability. The only exception is PBC, which was considered to have fair reliability, yet was retained for the analysis (see Table 4).

Table 4 – Reliability of Constructs

Dimension	Cronbach's α	Number of Items	Aggregated Items
Technology Innovativeness	0.942	2	TI1&2
Perceived Usefulness	0.849	5	PU1-5
Perceived Ease of Use	0.803	3	PEU1-3
Perceived Enjoyment	0.902	4	PE1-4
Design Aesthetics	0.883	4	DA1-4
Perceived Comfort	0.845	3	PC1-3
Perceived Privacy	0.746	3	PP1-3
Price Value	0.914	3	PV1-3
Attitude towards using	0.929	3	AT1-3
Subjective Norm	0.883	3	SN1-3
Perceived Behavioral Control	0.671	3	PBC1-3
Purchase Intention	0.969	3	PI1-3

4.4. Descriptive Statistics

In this section, a descriptive statistics analysis was conducted to examine means, standard deviation and missing values. The means were used to examine the sample's perception of each dimension. None of the 290 valid cases had missing values. The SDs were spread around a 1.0 value on a 5-point Likert scale (1=Strongly disagree...5=Strongly agree).

In addition, an analysis of mean differences among groups was performed to test for statistically significant differences in perception. More detailed frequencies and descriptive statistics for different groups are displayed in Appendix 5 & 6.

The majority of means of PU were above 3, only for PU4 the mean was above 3. These results indicate that the respondents tend to perceive smart rings as useful. However, the respondents tend to perceive the ring as not useful for their sleep (see Table 5).

Table 5 – Perceived Usefulness

	PU1	PU2	PU3	PU4	PU5	Total
Mean	3.77	3.39	3.33	2.89	3.28	3.33
Std. Deviation	0.896	1.070	1.019	1.152	1.002	0.814

The means of all PEU items were significantly above 3 (see Table 6). Furthermore, only 2.4% for PEU1&2 and 5.2% for PEU3 of the respondents believed that smart rings are not easy-to-use (see Appendix 5). The results show that the sample perceives smart rings as easy-to-use.

Table 6 – Perceived Ease of Use

	PEU1	PEU2	PEU3	Total
Mean	4.10	4.37	3.90	4.12
Std. Deviation	0.754	0.753	0.826	0.659

The means of PE1-3 were found closely to 3, only PE4 was clearly above 3. This indicates that participants neither perceive wearing or using a smart ring enjoyable, but the majority (73.4%) would enjoy to gather data about themselves.

Table 7 – Perceived Enjoyment

	PE1	PE2	PE3	PE4	Total
Mean	3.00	2.95	2.81	3.76	3.13
Std. Deviation	1.191	1.123	1.129	1.098	0.999

The means of DA were all considerably above 3, which suggests that the participants tend to perceive the smart ring as attractive (see Table 8).

Table 8 – Design Aesthetics

	DA1	DA2	DA3	DA4	Total
Mean	3.47	3.52	3.76	3.66	3.60
Std. Deviation	1.088	1.009	0.939	0.940	0.856

The means of PC were all relatively close to 3. The results indicate that smart rings are perceived as slightly comfortable but not comfortable enough to wear them 24/7 (see Table 9).

Table 9 – Perceived Comfort

	PC1	PC2	PC3	Total
Mean	3.38	3.12	2.73	3.07
Std. Deviation	0.949	0.951	1.212	0.913

The means of PP are all considerably below 3, which suggest that the sample perceives not being aware and in control of the extent of information available for third parties (see Table 10). Nevertheless, the mean of PP3 indicates that there is only a slight tendency towards a perception of information misuse.

Table 10 – Perceived Privacy

	PP1	PP2	PP3	Total
Mean	2.29	2.53	2.68	2.50
Std. Deviation	1.077	1.104	1.192	0.916

The means of PV were significantly below 3. While approximately 50% of the participants perceived the smart ring as being a bad value-for-money (PV1&2), even 73.8% perceived the rings as not reasonably priced. These results indicate a negative price value perception (see Table 11).

Table 11 – Price Value

	PV1	PV2	PV3	Total
Mean	2.10	2.55	2.57	2.40
Std. Deviation	1.024	1.106	1.074	0.987

On average, the means for AT were slightly above 3. While for item 1 the respondents, on average, were indecisive (34.1% abstained), for items 2 and 3 more than 50% had a positive attitude. This indicates a slightly positive attitude towards smart rings (see Table 12).

Table 12 – Attitude

	AT1	AT2	AT3	Total
Mean	3.18	3.20	3.23	3.20
Std. Deviation	1.062	1.250	1.188	1.094

The means of SN were found considerably below 3. The results demonstrate that the participants feel either no support or even a negative influence of their social environment to use a smart ring.

Table 13 – Subjective Norm

	SN1	SN2	SN3	Total
Mean	2.09	2.36	2.13	2.19
Std. Deviation	0.946	1.040	0.944	0.880

The means of PBC indicate that participants on average perceived themselves as being in control to carry out the behavior in question (see Table 14). Nonetheless, 20.3% of the sample indicated that they would not have enough monetary resources to purchase a smart ring.

Table 14 – Perceived Behavioral Control

	PBC1	PBC2	PBC3	Total
Mean	4.22	3.64	4.19	4.01
Std. Deviation	0.836	1.163	0.793	0.734

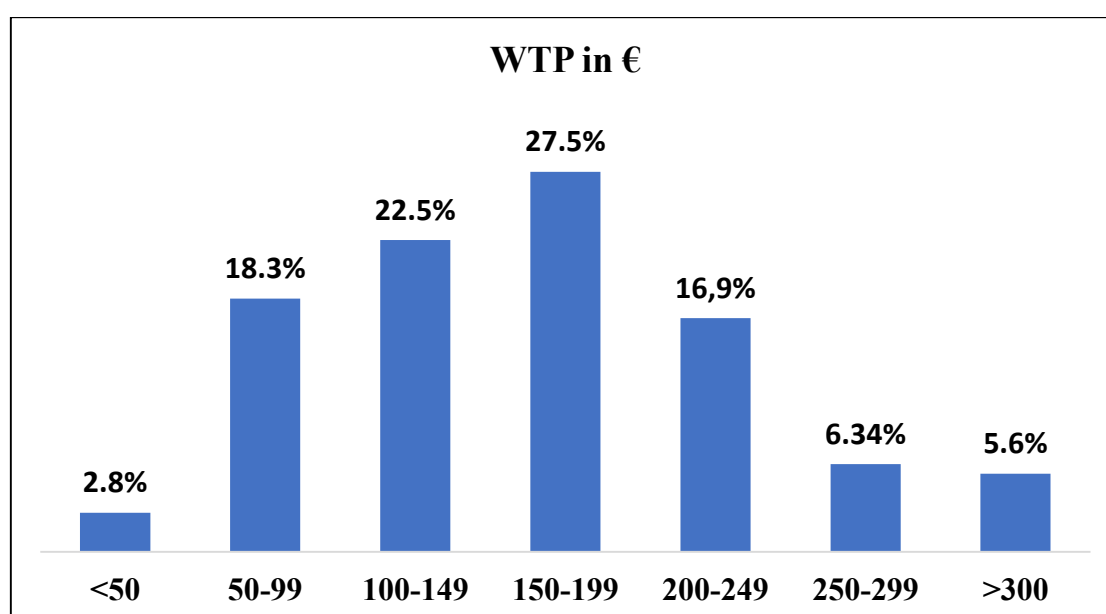
Finally, the means of PI demonstrated a relatively low purchase intention for the smart ring. In total, 13.8% of the participants indicated an intention to purchase in the near future (see Appendix 5)

Table 15 – Purchase Intention

	PI1	PI2	PI3	Total
Mean	1.94	1.98	2.00	1.97
Std. Deviation	1.017	1.105	1.105	1.045

Based on the insights from the interviews, it was already assumed that especially the price of smart rings might constitute a barrier for the intention to purchase a smart ring. Therefore, the participants were also asked whether they would intend to purchase for a lower price. With 54.8%, the majority of participants indicated that they have an intention to purchase the ring at a lower price. The participants were also asked for their willingness-to-pay. While 159 participants stated to purchase for a lower price, 142 also indicated their willingness-to-pay (mean: 147€) (see Figure 4).

Figure 4 – Willingness-to-pay for a smart ring



4.5.1 Analysis of mean differences among groups

Independent t-tests and ANOVAs were conducted to test for significant differences in the perception of the dimensions between groups. The analysis revealed several statistically significant differences of means between sub-groups of the sample.

For the sub-groups of gender and occupation, no mean difference for the three dependent variables was observed. As both variables age and education had too few cases for an ANOVA, both were recoded into two sub-groups. Age was aggregated into the sub-groups: younger than 34 years and older than 34 years. Education was recoded into a sub-group with an academic degree and one without. Statistically significant higher means for PI and PSR (purchased smart ring) in the older age group were identified. The t-test for education showed statistically higher means for PSR in the group with an academic background. Furthermore, the means for AT and PI were statistically higher for participants that were familiar with the concept of smart rings prior to the investigation. The independent t-test between users of any fitness wearable and non-users showed significantly higher means for both AT and PI.

Also, the comparison of smart ring user and non-user resulted in significantly higher means for those that already owned a smart ring for both AT and PI. PI was also found significantly higher for those regularly using rings compared to those not wearing rings on a regular basis. In addition, the ANOVA for the different levels of income demonstrated significant higher means of AT, PI and PSR for participants with an income higher than 5.000€ compared to those with incomes up to 3.000€. Even though not statistically significant, the mean of PSR is always bigger the higher the income level, with the exemption of the income level 4.000-5.000€.

Table 16 – Significance level of differences among groups

Test:	Independent t-test							ANOVA	
Group:	Gender	Age	Education	Usage of wearables	Usage of SR	Familiarity with SR	Usage of rings	Occupation	Income
AT	0.476	0.284	0.176	0.000	0.000	0.000	0.17	0.199	0.000
PI	0.219	0.008	0.128	0.000	0.000	0.000	0.002	0.202	0.000
PSR	0.742	0.000	0.048	-	-	-	0.014	-	0.000

Also, for the same groups, t-test and ANOVA analyses were performed to examine the differences of means for the independent variables (PU-PV, SN and PBC) of the underlying research model, which was mainly used to better understand the mean differences of AT and PI among different groups and as indication for potential variables that needed to be controlled for in the multiple regression analysis (see Appendix 7).

The test revealed that male participants had significantly higher PBC and could be more characterized as “technology-innovators”. The age analysis showed that older participants significantly had a lower PEU, but perceived the smart ring as more attractive and comfortable compared to the younger group. Also, older participants had significantly higher PV and SN. Taking into account the educational background, one could observe that participants with an academic degree perceived the smart ring significantly more useful and easier to use compared to those without an academic degree.

The ANOVA with income for all variables demonstrated various significant differences, especially between the highest income group and other income classes. For participants with a reported income above 5,000 €, higher means across all variables were reported. For PV, one could observe a general tendency towards a higher PV mean, the more a participant earned. The highest income group had significantly higher means in comparison with other groups, with the exemption of the second highest income class. The insight for these groups and their potential moderating role was further analyzed in the regression analysis.

As the differences between the sub-groups, user/non-user of smart rings and familiar/non-familiar with smart rings, were significant for almost all variables of the model, additional correlation and regression analyses as robustness-check for the hypotheses were performed.

4.6. Hypotheses Testing

In order to test the hypotheses and examine the relationship of the independent and dependent variables, correlation analysis and multiple linear regression analysis was conducted. As main indicator the sub-sample that never bought a smart ring, so the potential adopters, was tested. Several tests for the total sample and specific sub-samples, based on the insight of section 4.5.1, were used as robustness check.

4.6.1 Correlation Analysis

First, the correlation of the independent variables PU, PEU, PE, DA, PC, PP and PV with the attitude towards using smart ring was tested. Subsequently, the correlation of the variables AT, SN, PBC and PV with the purchase intention for smart rings was examined. In both analyses, Pearson Correlations were used.

The correlation coefficients indicate the strength of a relationship between two variables. If the Pearson Correlation is greater than 0, the relationship is positive and vice versa. Moreover,

correlations from 0.1 to 0.29 are considered small, correlations from 0.3-0.49 medium, and correlations above 0.5 as large (Pallant, 2016).

Table 16 – Correlation with Attitude

		PU	PEU	PE	DA	PC	PP	PV
AT	Pearson Correlation	0.709	0.254	0.817	0.441	0.623	0.419	0.415
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000
	N	258	258	258	258	258	258	258

The factors PU, PE and PC had a strong positive correlation with AT. While DA, PP and PV showed a positive correlation with medium strength with AT, only for PEU a small positive correlation with AT was found. All correlations were significant at the 0.01 level. Thus, the results of the Pearson Correlation analysis for attitude, supported the hypotheses H1 and H3-H7a. H2 was only partially supported. The results indicate that high levels of AT are associated with high levels of PU, PE, DA, PC, PP and PV.

Table 17 – Correlation with Purchase Intention

		AT	SN	PBC	PV
PI	Pearson Correlation	0.658	0.479	0.170	0.484
	Sig. (2-tailed)	.000	.000	.000	.000
	N	258	258	258	258

AT was found to have a strong positive correlation with PI. SN and PV showed a significant positive correlation with medium strength with AT. Only PBC was found to have a small positive correlation. All correlations were significant. Hence, based on the Pearson Correlation analysis for purchase intention, the hypotheses H7b, H8 and H9 were supported, while H10 was only partially supported. The results indicate that high levels of PI are associated with high levels of AT, SN, and PV.

In addition, to test the robustness of the observed correlation the total sample, users of smart rings, participants familiar with smart rings and those that were unfamiliar were analyzed separately. The total sample showed very similar correlations of the independent variables with AT and PI, only PP and PEU had slightly stronger correlations with AT and SN and PBC slightly stronger correlations with PI, compared to the sample of non-users. Also, for the other groups, similar correlations were obtained. Therefore, the results of the correlation analysis were considered robust to different sub-samples. The detailed robustness checks for different groups and correlation matrices of all variables are displayed in Appendix 8-10.

4.6.2 Multiple Linear Regression

Prior to the analysis of the regression models for AT and PI, several assumptions were tested. Firstly, in order to generalize the result of a regression the sample size needs to meet the criteria: $N > 50 + 8m$, where m is the number of independent variables (Pallant, 2016). The sample for non-users of smart rings met this requirement for both regression models. Secondly, the distribution of scores was tested for outliers, normality, linearity, homoscedasticity and independence of residuals and no significant violations found (see Appendix 11 & 12). Thirdly, the variables were tested for singularity and multicollinearity. As no variable was a combination of other independent variables and the correlation coefficients between the independent variables was below 0.9, neither singularity or multicollinearity were detected (Pallant, 2016). Also, the Variance Inflation Factor (VIF) and the collinearity tolerance did not indicate any multicollinearity issues (see Table 19). Therefore, all variables were used for multiple regression analysis. In addition to the factors that were expected to be significant predictors of the dependent variables, in both models several control variables, based on the insights gained from in section 4.5.1, were tested, only those with significant effects were retained.

The first multiple linear regression explored the relationship of PU, PEU, PE, DA, PC, PP and PV with AT. The R-Square of 0.747 indicates that the factors explain 75% of the variance in AT, which can be considered as an accurate prediction (Pallant, 2016).

Table 18 – R-square Multiple Linear Regression 1

Model 1	
Dependent Variable	R square
Attitude	0.747

Table 19 – Beta Coefficients and Significance of predictors for AT

Predictors	Standardized Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.082		
Perceived Usefulness	0.232	0.000	0.467	2.140
Perceived Ease of Use	-0.055	0.114	0.852	1.174
Perceived Enjoyment	0.527	0.000	0.380	2.631
Design Aesthetics	0.098	0.009	0.729	1.372
Perceived Comfort	0.062	0.171	0.492	2.032
Perceived Privacy	0.066	0.067	0.796	1.257
Price Value	0.086	0.016	0.803	1.245
Familiar with SR	0.090	0.007	0.936	1.069

The analysis of the standardized Beta coefficients, which indicate the relative strength of each predictor, showed that all independent variables, with the exemption of PEU, made a positive contribution to AT. The significance level of the factors indicated that for non-users of smart rings the factors PU, PE, DA and PV made a statistically significant unique contribution to explaining AT. PE was found to have the strongest unique contribution to AT, followed by PU. The results indicate that the better consumers' perception of smart rings usefulness, enjoyment, aesthetics and price value, the more favorable is the attitude towards smart rings.

In addition, the significant contribution of the control variable "familiar with SR", indicate that the attitude is significantly higher for those consumers being familiar with smart rings (see Table 19).

The second multiple linear regression examined the relationship of PV, AT, SN and PBC with PI. The R-Square of 0.559 indicate that the factors explain 56% of the variance in PI, which is considered as a high value for consumer behavior (Hair et al., 2017)

Table 20 – R-square Multiple Linear Regression 2

Model 2	
Dependent Variable	R square
Purchase Intention	0.559

Table 21 – Beta Coefficients and Significance of predictors for PI

Predictors	Standardized Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.018		
Price Value	0.201	0.000	0.739	1.353
Attitude	0.428	0.000	0.659	1.518
Subjective Norm	0.156	0.002	0.739	1.353
Perceived Behavioral Control	0.031	0.490	0.898	1.114
Technology Innovativeness	0.097	0.039	0.807	1.238
Familiar with SR	0.124	0.006	0.885	1.130
Income over 4000€	0.107	0.017	0.884	1.131

The analysis of the standardized Beta coefficients showed that all independent variables had a positive contribution on PI. The significance level of each factor demonstrates that for non-users of smart rings the factors PV, AT and SN have a statistically significant unique contribution to explaining PI. AT was found to have the strongest unique contribution, followed by PV. The results indicate that the more favorable consumers' attitude, price value perception

and subjective norm the higher is the purchase intention and hence, the likelihood to purchase a smart ring.

In addition, the significant contributions of the control variables “Technology Innovativeness”, “Familiar with SR” and “Income over 4000€” indicate that technology innovativeness, high income and familiarity with smart rings also lead to a higher PI (see Table 21).

In order to test the robustness of the factor’s significance, regressions were also performed for the total sample and the sub-sample of participants being familiar/unfamiliar with smart rings. The comparison with the total sample showed that the model was robust to different samples and the same factors made significant contributions on AT and PI. For the total sample, the factor PP also made a significant contribution on AT. The robustness checks are displayed in detail in Appendix 13-15.

Figure 5 – Research Framework Results

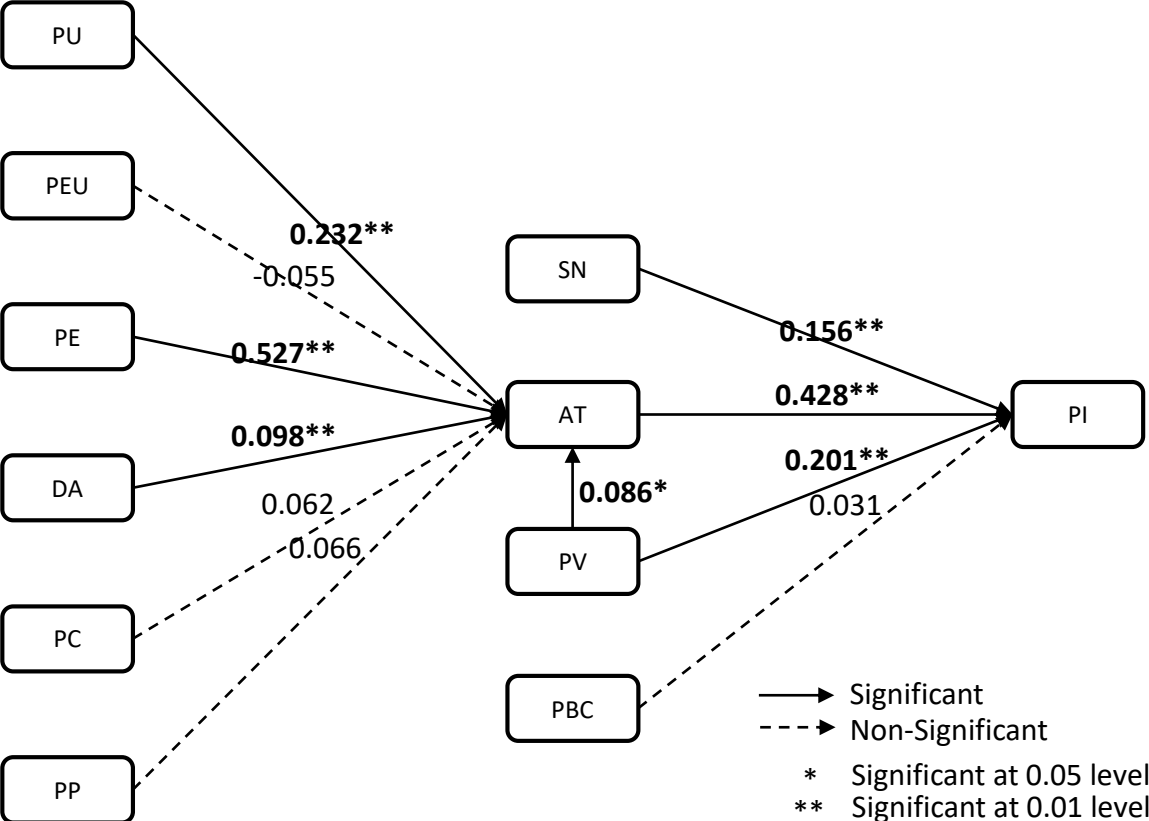


Table 22 – Summary of Hypotheses Testing

Hypotheses		Supported	Strength of Correlation
H1:	PU $\xrightarrow{+}$ AT		Large
H2:	PEU $\xrightarrow{+}$ AT	-	Small
H3:	PE $\xrightarrow{+}$ AT		Large
H4:	DA $\xrightarrow{+}$ AT		Medium
H5:	PC $\xrightarrow{+}$ AT		Medium
H6:	PP $\xrightarrow{+}$ AT	partially	Medium
H7a:	PV $\xrightarrow{+}$ AT		Medium
H7b:	PV $\xrightarrow{+}$ PI		Large
H8:	AT $\xrightarrow{+}$ PI		Medium
H9:	SN $\xrightarrow{+}$ PI	-	Small
H10:	PBC $\xrightarrow{+}$ PI	-	Large

5. Conclusion

The following chapter presents the conclusion of the research findings. First, the empirical findings in regard to the research questions are discussed. Subsequently, theoretical and managerial implications are derived. Thereafter, the limitations of the research are discussed. Finally, recommendations for further research are suggested.

5.1 Discussion of Research Question

RQ1: The German consumer of smart rings

To deduct a consumer profile of the actual smart ring customers, only respondents that already owned a smart ring are considered. The age of the consumers ranged from 18 to over 65 years. The biggest share of customers belonged to the age group 25 to 34 years (28,1%), followed by 21,9% of the participants in the age of 45-54 years and 55-64 years, respectively. The majority held a bachelor or master degree (84,4%) and was either employed or self-employed (71,9%). All smart ring customers at least had a monthly salary of 1,000€. With 34%, the biggest share of smart ring customers had a monthly income of more than 5.000€ (34,4%).

Based on this research one cannot conclude something about the gender or occupation of the actual German smart ring customer. However, based on the analysis of mean differences among groups, one can conclude that the German smart ring consumer is over 34 years old, holds an academic degree, usually wears rings and has a high income. Furthermore, the German smart ring consumer can be characterized as a technologically innovative person that in particular enjoys gathering data about him- or herself (see Appendix 6).

These insights are in line with the consumer profile one could draw of the German purchase interested consumer. Based on the analysis of mean differences among groups, one can also conclude that the purchase interested German consumer is over 34 years, usually wears rings and has a high income.

RQ2 & RQ3: The drivers of and barriers to consumers' purchase intention

In order to draw conclusions about the German consumers' drivers of and barriers to purchase intention, the insights from the correlation and regression analysis about the significant predictors of purchase intention were combined with the insights from the descriptive statistics and the analysis of mean differences about the German consumers' perception of each factor. Significant factors that were perceived positive are considered drivers. Significant factors that were perceived negative are considered barriers.

Based on the results, it can be concluded that the biggest driver of the German consumer's purchase intention is a positive attitude towards using a smart ring, which is in line with other fitness wearable research (Song et al., 2018). AT is the strongest predictor of purchase intention and one can conclude that the German consumer tends to have a positive attitude towards using a smart ring. The German consumer's attitude towards smart rings is mainly driven by hedonic factors, especially the perceived enjoyment, but also the perceived aesthetics. The importance of hedonic motivation is in line with other fitness wearable research (Gao et al., 2015).

Based on this research, the utilitarian factor perceived usefulness is the second strongest driver of the German consumers' attitude. Considering the results of the multiple regression analysis, a person's technology innovativeness and a high income can also be considered as additional subordinate drivers of the German consumers' purchase intention for smart rings.

The majority of significant influencing factors are rather considered as barriers to consumers' purchase intention, which also explains the relatively low purchase intention of 13.8% among the German consumer.

Based on the results, one can infer that the biggest barrier of purchase intention for the German consumer is the current price, or more precisely the negative price value perception. Based on the regression analysis, PV is the second strongest predictor of the purchase intention and it can be concluded that the German consumer does not value the perceived benefits of the innovation high enough for the current price. Furthermore, the insight that the German consumer would

have a tremendously higher purchase intention (54.8%), if the ring were sold at a lower price, indicates that the price is a sizeable barrier to form a purchase intention in the German market. This insight is in line with another wearable study in Germany that found price as biggest barrier to consumers' purchase intention (PricewaterhouseCoopers, 2014).

The second biggest barrier for purchase for the German consumers is the missing familiarity with and awareness of smart rings. Only 33.1% of the consumers knew what a smart ring is. Taking into consideration that consumers that were unfamiliar with the concept smart ring perceived almost all dimensions worse compared to those that were already familiar (see Appendix 6), one can infer a knowledge and information problem among the German consumer about smart rings prevails.

Another barrier, that seems to be closely connected with the familiarity issue, is the rather negative subjective norm. The German consumers tend to perceive either a negative or no influence at all of their social peers on their intention for a smart ring, which might be explained by a general low awareness-level and thus, a limited potential for positive social influences.

Furthermore, based on the results, it can be concluded that the rather negatively perceived privacy of the German consumers is another barrier to develop an intention to purchase a smart ring, which is in line with other research for wearables (Chang et al., 2016).

5.2 Theoretical Implications

A multitude of research investigated the behavioral intention of consumers for smartwatches, fitness trackers and other wearable devices. Nonetheless, the majority of research has focused on an Asian population and almost no studies investigated a European market. Furthermore, to the author's best knowledge there are no existing studies examining the German consumer's purchase intention for smart rings. Therefore, this study successfully filled the research gap of consumer behavior for smart rings and contributed to the low number of studies regarding fitness/health wearables in a European context.

By applying a combination of an extended TAM and TPB, both models' applicability in the context of smart rings, as well as the influence of several factors on the purchase intention for smart rings, are validated. The results of this research demonstrate that attitude towards smart rings is the strongest antecedent of purchase intention for smart rings in the German market. Moreover, the results show that the German consumers' attitude towards smart rings is

influenced by hedonic (PE & DA) and utilitarian factors (PU) and the price value perception, of which PE has the strongest influence. Thus, this dissertation also gives more evidence and underlines the importance of hedonic factors on the behavioral intention for fitness wearables. Furthermore, this dissertation indicates that price value, subjective norm and technology innovativeness influence the intention to purchase a smart ring.

5.3 Managerial Implications

Also, from a managerial perspective, this study provides several implications for current and future smart ring companies.

First of all, based on the low familiarity and awareness of smart rings in the German market, the author, in general, suggests investments in advertising to increase the awareness and knowledge of consumers about smart rings. Consumers that knew about the product had significantly better perceptions and higher intentions to purchase. Currently, only a small fraction of German consumers knows about the innovation. Thus, a big share of the potential consumer is left out due to a limited awareness of and familiarity with the product.

More specifically, based on this research, the author suggests that companies should tailor both their product development and marketing activities towards improvements of consumers' attitude towards smart ring and perceived value of the product in order to raise the purchase intention at the current price level. Therefore, companies should consider both utilitarian-driven as well as hedonic-driven strategies and take into consideration the technology and fashion aspect of the product.

In order to raise consumers PU, companies should consider to include specific functions such as GPS or a connection to earphones (see Appendix 3) in their product and promote the usefulness of their smart rings in advertising campaigns. The relatively poor perception of smart ring's usefulness for sleep optimization, especially for those that were not familiar with the product, might be a valuable insight for potential campaigns.

Nevertheless, based on the high influence of PE and DA, the author suggests that companies focus their strategy towards the enjoyment of the consumer. A customizable design could for instance improve the perceived attractiveness of the individual. For PE, the author would further suggest tailoring the advertising towards an enjoyment about the gathering of data about oneself and in the product development process consider tools such as gamification for a high perceived enjoyment with the related app.

Moreover, the author suggests to target consumers over 34 years with an academic degree and a high-income.

5.4 Limitations

The academic study carried out in this master thesis also comprises several limitations that need to be taking into consideration. First of all, as the research was tailored to the German consumer, the results and conclusions drawn only apply to the German market.

Furthermore, due to the time and financial constraints the author was facing, there are several limitations concerning the sample that need to be mentioned. Especially, the age distribution in the sample does not reflect the German population and a generalization issue could exist. The findings could be biased towards the younger participants. As younger consumers, in general, tend to prefer new technologies and have fewer issues using them, for instance, the factors PBC and PE might have a stronger influence on PI and AT in a more representative sample. In addition, the survey sample was not evenly distributed between user and non-user of smart rings. Taking into consideration only 32 users to draw the consumer profile creates potential results biases. Also, both the convenience sampling for the interviews as well as the snowball sampling used for the survey create potential biases due to the potential similarity of the selected respondents (Babin & Zikmund, 2016).

Furthermore, the vast majority of participants were unfamiliar with smart rings until answering the survey. Although, all important information, based on the author's prior research, were displayed in the survey, this can influence the results as participants are asked to indicate their perception and intention without reflection or further investigation about the topic. Hence, a tendency towards choosing a neutral answer exists, which could have affected the outcomes of this study.

5.5 Future Research

The research carried out in this study offers several possibilities for further research. Building on the limitations of this dissertation, future scholars should apply a similar study in different settings, for instance, other countries to examine geographical or cultural differences. Future researchers could also replicate the study in Germany, but with a more representative sample to further test the robustness of results.

In addition, future researchers should extend the research framework by other dimensions such as trust or compatibility to deepen the understanding of the factors influencing the purchase intention of smart rings in Germany. Building on Roger's (2003) suggestion that innovation

should also be perceived better than their alternatives to be adopted by consumers, future research should investigate the perception of smart rings compared to other fitness wearables. Finally, other kinds of smart rings with different purposes such as voice assistance or contactless payment should be investigated to further determine the full potential of smart rings from a customer perspective.

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Appendix

Appendix 1: Article Search using Google Scholar

Smart Ring	Wearables
“Smart ring”	“Wearables ring”
“Smart ring factors”	“Wearables factors”
“Smart ring influencing factors”	“Wearables influencing factors”
“Smart ring intention”	“Wearables intention”
“Smart ring purchase”	“Wearables purchase”
“Smart ring adoption”	“Wearables adoption”
“Smart ring use”	“Wearables use”
“Smart ring purchase intention”	“Wearables purchase intention”
“Smart ring adoption intention”	“Wearables adoption intention”
“Smart ring use intention”	“Wearables use intention”
“Smart ring influencing factors purchase intention”	“Wearables influencing factors purchase intention”
“Smart ring Germany”	“Wearables Germany”
“Smart Ring factors Germany”	“Wearables factors Germany”
“Smart ring purchase Germany”	“Wearables purchase Germany”
“Smart ring influencing factors Germany”	“Wearables influencing factors Germany”
“Smart ring purchase intention Germany”	“Wearables purchase intention Germany”
Fitness Tracker	Smartwatches
“Fitness Tracker”	“Smartwatches”
“Fitness Tracker factors”	“Smartwatches factors”
“Fitness Tracker influencing factors”	“Smartwatches influencing factors”
“Fitness Tracker intention”	“Smartwatches intention”
“Fitness Tracker purchase”	“Smartwatches purchase”
“Fitness Tracker adoption”	“Smartwatches adoption”
“Fitness Tracker use”	“Smartwatches use”
“Fitness Tracker purchase intention”	“Smartwatches purchase intention”
“Fitness Tracker adoption intention”	“Smartwatches adoption intention”
“Smart ring use intention”	“Smartwatches use intention”
“Fitness Tracker influencing factors purchase intention”	“Smartwatches influencing factors purchase intention”
“Fitness Tracker Germany”	“Smartwatches Germany”
“Fitness Tracker factors Germany”	“Smartwatches factors Germany”
“Fitness Tracker purchase Germany”	“Smartwatches purchase Germany”
“Fitness Tracker influencing factors Germany”	“Smartwatches influencing factors Germany”
“Fitness Tracker purchase intention Germany”	“Smartwatches purchase intention Germany”

Appendix 2: Online Survey

Start of Block: Introduction

Intro This survey is being conducted for the purpose of a master thesis regarding consumers' perception of smart rings.

The survey is expected to take about **7 minutes** to complete. **Please select your preferred language for the survey: English or German.** Your participation is entirely voluntary. The survey is anonymous, and data collected strictly confidential and will only be used for the purpose of the thesis.

Your response to this survey is relevant and very useful for the study! It is important that you answer truthfully. If you have any questions or feedback about the survey please do not hesitate to contact me by email: 152119181@alunos.lisboa.ucp.pt

Every participant holds the chance to win a 50€ Amazon voucher in the end of the survey!

Thank you in advance for the participation!

Stay safe & healthy,
Jan Boge

Start of Block: Screening Question

Q1 What is your nationality?

- German (1)
- Other (2) _____

Q2 Do you live in Germany?

- Yes (1)
- I intend to move to Germany soon. (2)
- No (3)

Q3 Do you know what a smart ring is?

- Yes (1)
- No (2)

Q4 Do you in general wear rings?

- Yes (1)
- No (2)

Q5 Do you own a fitness wearable?

- Smart Ring (1)
- Wrist-worn fitness tracker (2)
- Other fitness tracker (3)
- Smart watch (4)
- No (5)

Start of Block: Influencing Factors

In the context of this study, the Oura Ring will be investigated. The Oura Ring is a finger-worn health and fitness wearable. With different sensors measuring data directly from the user's finger, the ring produces highly accurate and reliable data about the user's general health, sleep, and activity.

The ring measures the user's heart rate, respiratory rate, body temperature deviation, in-depth sleep data (sleep stages, sleep time, restless movement detection, ideal bedtime guidance, sleep quality score), activity data (intensity, timing, and duration), calories burned, steps taken, inactivity time and detection of restful moments.

The user can obtain all the data in the Oura App, compatible with Android and iOS. The ring is made of water- and scratch-resistant durable titanium. The ring has a width of 7.9mm and a thickness of 2.55mm, which is the approximate size of a wedding band. The ring weighs 4 to 6 grams (depending on the ring size), which is lighter than a conventional ring. The battery holds for 7 days and is fully charged in 20-80 minutes. The ring is available in 7 different sizes, the user can choose from a pre-send sizing kit. The ring is available in four different colors: silver, gold, black, and stealth.

The Oura Ring:



The Oura App:



In the following when asked about a smart ring, please think of the Oura Ring. In case you want further information about the ring, please visit: <https://ouraring.com/meet-oura>

Q6 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
In general, I believe that smart rings are useful. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a smart ring would help me to accomplish a goal. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a smart ring would improve my general health. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a smart ring would improve the quality of my sleep. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using a smart ring would improve my sport/fitness performance. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I believe that smart rings and the related app are easy to use. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning to use smart rings and the related app would be simple for me. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using smart rings and the related app are self-explanatory. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I would enjoy using a smart ring. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wearing a smart ring would make me happy. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The use of a smart ring would make me feel good. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would enjoy gathering data about myself. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
The overall design of smart rings is attractive. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The form of smart rings is attractive. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The colours of smart rings are attractive. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The materials of smart rings are attractive. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q10 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
In general, I believe smart rings are comfortable to wear. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wearing a smart ring would feel pleasant. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel comfortable wearing a smart ring 24/7. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q11 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I am confident that I know all the parties who collect information I provide during the use of a smart ring. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am aware of the exact nature of information that will be collected during the use of a smart ring. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please select the option strongly disagree. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not concerned that the information I submit on the smart ring are misused. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 Please indicate your level of agreement with the following sentences regarding the price of smart rings given that the price of the Oura Ring is 314€:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Smart rings are reasonably priced. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smart rings offer a good value for the money. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At the current price, smart rings provide a good value. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I believe that using smart rings would be a positive decision. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like the idea of using a smart ring. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a positive attitude towards smart rings. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
People who influence me think that I should use a smart ring. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People who are important to me support the usage of a smart ring. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People whose opinion I value prefer that I use a smart ring. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I would be able to use smart rings. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the money to buy a smart ring. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the resources, knowledge and ability to use a smart ring. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 Please indicate your level of agreement with the following sentences regarding smart rings:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I intend to purchase a smart ring in the near future. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I predict that I will pay for a smart ring in the near future. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am likely to buy a smart ring in the near future. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 Would you intend to buy a smart ring for a cheaper price?

Yes, I would be willing to pay (1)

No (2)

Q18 Please indicate your level of agreement with the following sentences about yourself:

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I am usually one of the first among my peers that seeks information about new technologies. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am usually one of the first among my peers that tries out new technologies. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A health-conscious lifestyle is important to me. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I live health-consciously. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Start of Block: Socio-demographics

Q19 What is your gender?

- Male (1)
- Female (2)
- Non-binary (3)
- Prefer not to say (4)

Q20 How old are you?

- Under 18 (1)
- 18 - 24 (2)
- 25 - 34 (3)
- 35 - 44 (4)
- 45 - 54 (5)
- 55 - 64 (6)
- Over 65 (7)

Q21 What is your occupation?

- Employed (1)
- Self-employed (2)
- Student (3)
- Unemployed (4)
- Other (5)

Q22 What is your highest education?

- Less than high school (1)
- High school degree (2)
- Professional degree (3)
- Bachelor's degree (4)
- Master's degree (5)
- Doctoral degree (6)
- Other (7)

Q23 What is your monthly salary ?

- Less than €1,000 (1)
- €1,000 - €2000 (2)
- €2,000 - €3,000 (3)
- €3,000 - €4,000 (4)
- €4,000 - €5,000 (5)
- More than €5,000 (6)
- Prefer not to say (7)

Appendix 3: Interview Script

Hello, my name is Jan Boge, and I am a second-year student from Católica Lisbon School, taking a master's degree in Management with specialization in strategic marketing. My dissertation aims to study consumer's perception and factors influencing the purchase intentions for smart rings. The present interview is one of the investigation instruments used in the dissertation, and I would kindly ask you to answer truthfully and develop your answers as much as you can. Before starting, I would like to add that there are no right or wrong answers, and your identity will not be disclosed. Thank you very much!

Information for those being unfamiliar about Smart rings additional information was given:

Smart rings, the newest product category in the fitness wearable segment, have the same purpose as fitness trackers, offer similar functionalities but differ in form and design. The largest distinction is that the rings do not offer any information displaying on the device itself and are finger-worn. The form and discreet design promise the user to fit more seamlessly into the everyday life allowing to be comfortably worn and used in any situation. The Oura ring, for instance, uses sensors to measure the data directly from the arteries of the user's finger to produce accurate and reliable sleep and activity data. The insights about the user's resting heart rate, heart rate variability, respiratory rate, body temperature deviation, in-depth sleep data (sleep stages, sleep time, restless movement detection and ideal bedtime guidance), activity levels (intensity, timing and duration), calories burned, steps taken, inactivity time and automatic detection of restful moments are directly send to the Oura app, the Apple Health or Google Fit app.

(In Addition, interviewees were shown a picture of the Oura Ring)

For wearable users:

- 1) Have you ever bought a fitness wearable? If so, could you please specify which kind of wearable?
- 2) What type of a product is your wearable/smart ring for you?
- 3) What type of benefits does your wearable offer?
- 4) What was your main motivations/underlying reason to purchase a fitness wearable?
- 5) How did your decision-making process look like? What are the main factors you evaluated in your decision-making process?

For non-user:

- 1) Have you ever bought a fitness wearable? If so, could you please specify which kind of wearable?
- 2) What are the main barriers, for you to not purchase a fitness wearable?
- 3) Did you ever thought about purchasing a fitness wearable or smart ring in particular? How did your decision-making process look like? What are the main factors you evaluated in your decision-making process? Why did you decide not to purchase?
- 4) Do you believe the price is adequate taking into account the benefits you perceive from buying such a device? So, in your perception are the prices reasonable?
- 5) What could motivate you to purchase a fitness wearable/the smart ring? What kind of modifications would be desirable for you?

Appendix 4: Interviewees' Main Statements

User:

Question	Statements
2	“For me personally, the smart ring is a technology product. But as it is a ring that is visible to others the smart ring clearly has a fashion aspect.”
3	“Fitness wearables in general are a great way for short and long-term monitoring. I can easily check the process I made. For instance, how is my resting pulse. Was I able to achieve my goals? In general, I think they are very useful for fitness optimization and also to keep up your general motivation.”
	“The Oura ring helped to be aware of my daily activity. But what really still impresses me the most are the sleep functionalities. I started to understand a bit more about how I sleep and how I can work towards a better sleep. I really feel that I sleep and feel better than before.”
	“I think it is just great that you can gather different kind of data about yourself during the day without really noticing that it is happening.”
4	“My main motivation was to better understand my fitness workout.”
	“Actually, a friend of mine recommended me the Oura Ring. He talked a lot about the sleep tracking functionalities. I already owned another fitness tracker that I use for my sports tracking but I got interested in the functionalities for sleep tracking.”
5	“The functionalities were the most important for me. Then what does it cost? The price should be in proportion to the performance that is offered to me. In addition, data protection has become very important to me, it was very important that my data is stored with a company I can trust.”
	“Functionality is the most important criteria, so both what can I do with the device but also how long does the battery last, for example. Then of course, the design, because I wear the device mostly visible to others. The device should also fit my style. Since I wear my fitness tracker every day for me it is also really important that the device offers me a certain wearing comfort. In general, of course, the price should not be too high.“
	“I chose my Apple watch amongst other reason due to the possibility of connections with my other Apple product. I can easily connect the watch with my earphones and listen to music while going to the gym or going for a run.”

Non-user:

Question	Statements
2	“Even though I like the functionalities, for me all wearables are ugly. They just don't really go with the rest of my outfit.”
	“To be honest, neither a fitness tracker nor a smart ring would really help me. I can't imagine it being of any use for my sport or even sleep. These products do nothing that I cannot do without them, But I can imagine for many others the devices can improve the motivation or give someone a understanding of one's own activity or sleep. “
	“Probably for many others, these devices can be a super useful tool when they perform any sports but I rather enjoy the occasions I do sports. Such a device would probably stress me out or pressure me into doing more or doing things differently. I would not really enjoy to gather such data about myself, I think I would lose any fun related to sports.”
3	“Yes, actually I thought about purchasing a Smart Ring. I really like the functionalities as I try to live as healthy as possible. I think a smart ring and also other similar wearables can be really useful. But I am pretty concerned about data privacy in general. I do not really like the trend of more and more data of each of us stored somewhere. I mean I do not really know if really something is done with the data or if something will be done, but in general I try to minimize the data companies have from me. I mean who really knows what is done with all the health data such wearables gather. So, I don't really trust the companies behind those devices”
	“Yes, I was thinking about an Apple watch, but I do not want to spend so much on something I do no really need. I think the prices for most of the wearables are still too high. There are a couple of fitness trackers, that are reasonably priced but most of the different fitness wearable in my perception are way overpriced for what they deliver. On the other side, for most of the cheaper fitness trackers I do not really like the design. The smart ring actually sounds quite interesting, I like the design. But the ring is too expensive and I normally do not wear rings, so I am not so sure that it would feel comfortable to wear it. But I could imagine to try one for a way lower price”

5	“I think if the smart ring had all the fitness tracker features such as GPS-Signal or maybe even a possibility for communication such as an emergency call or something like that I would be more interested. Currently, thereing does not provide enough value, especially when I compare it to others wearables.”
	“For me clearly connectivity with other devices is missing. I would for instance like to connect the smart ring with my earphones and have a little battery to save some music on the ring, so that I can listen to music while running. Without that I would still need my smartphone.”

Appendix 5: Frequency Tables/Percentage Distribution

Perceived Usefulness	PU1	PU2	PU3	PU4	PU5
Strongly disagree	2.4	6.2	5.5	11.4	5.5
Disagree	7.2	16.2	15.2	29.0	17.9
Neither agree nor disagree	18.3	20.7	29.0	27.6	25.5
Agree	55.5	46.6	41.4	23.1	45.5
Strongly agree	16.6	10.3	9.0	9.0	5.5
Total	100.0	100.0	100.0	100.0	100.0

Perceived Ease of Use	PEU1	PEU2	PEU3
Strongly disagree	1.0	1.0	.7
Disagree	1.4	1.4	4.5
Neither agree nor disagree	13.4	6.2	21.7
Agree	54.8	42.1	50.0
Strongly agree	29.3	49.3	23.1
Total	100.0	100.0	100.0

Perceived Enjoyment	PE1	PE2	PE3	PE4
Strongly disagree	12.4	12.8	14.5	6.9
Disagree	23.1	21.0	25.5	6.9
Neither agree nor disagree	26.9	31.0	30.3	12.8
Agree	27.2	29.0	23.8	50.0
Strongly agree	10.3	6.2	5.9	23.4
Total	100.0	100.0	100.0	100.0

Design Aesthetics	DA1	DA2	DA3	DA4
Strongly disagree	6.6	5.2	3.4	2.4
Disagree	13.8	12.1	7.2	9.3
Neither agree nor disagree	19.3	19.3	16.2	24.5
Agree	47.2	52.8	55.9	47.6
Strongly agree	13.1	10.7	17.2	16.2
Total	100.0	100.0	100.0	100.0

Perceived Comfort	PC1	PC2	PC3
Strongly disagree	3.4	5.9	18.6
Disagree	15.9	17.9	26.9
Neither agree nor disagree	26.9	38.3	24.1
Agree	46.9	33.8	23.1
Strongly agree	6.9	4.1	7.2
Total	100.0	100.0	100.0

Perceived Privacy	PP1	PP2	PP3
Strongly disagree	25.5	16.9	17.9
Disagree	40.3	41.4	32.4
Neither agree nor disagree	16.2	15.9	18.6
Agree	15.9	23.1	25.5
Strongly agree	2.1	2.8	5.5
Total	100.0	100.0	100.0

Perceived Value	PV1	PV2	PV3
Strongly disagree	31.0	20.3	20.0
Disagree	42.8	29.0	26.2
Neither agree nor disagree	12.4	29.3	33.4
Agree	12.4	17.9	17.9
Strongly agree	1.4	3.4	2.4
Total	100.0	100.0	100.0

Attitude towards using	AT1	AT2	AT3
Strongly disagree	8.6	13.4	11.7
Disagree	15.2	17.2	14.8
Neither agree nor disagree	34.1	17.9	23.1
Agree	34.1	39.0	39.0
Strongly agree	7.9	12.4	11.4
Total	100.0	100.0	100.0

Subjective Norm	SN1	SN2	SN3
Strongly disagree	32.8	27.2	31.4
Disagree	33.1	24.1	30.0
Neither agree nor disagree	27.6	35.5	33.4
Agree	5.9	12.1	4.1
Strongly agree	.7	1.0	1.0
Total	100.0	100.0	100.0

Perceived Behavioral Control	PBC1	PBC2	PBC3
Strongly disagree	1.4	6.6	.3
Disagree	4.1	13.8	4.8
Neither agree nor disagree	5.5	11.0	7.2
Agree	49.0	46.2	51.0
Strongly agree	40.0	22.4	36.6
Total	100.0	100.0	100.0

Purchase Intention	PI1	PI2	PI3
Strongly disagree	41.7	42.4	42.1
Disagree	33.1	33.4	31.4
Neither agree nor disagree	15.9	12.1	13.4
Agree	7.6	8.3	10.3
Strongly agree	1.7	3.8	2.8
Total	100.0	100.0	100.0

Appendix 6: Descriptive statistics/Comparison of means between groups

Perceived Usefulness	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PU1:	3.77	4.07	3.61	4.66	3.66
PU2:	3.39	3.81	3.18	4.31	3.27
PU3:	3.33	3.78	3.11	4.37	3.20
PU4:	2.89	3.48	2.60	4.34	2.71
PU5:	3.28	3.40	3.22	3.47	3.25
Total	3.33	3.71	3.14	4.23	3.21

Perceived Ease of Use	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PEU1:	4.10	4.26	4.02	4.56	4.04
PEU2:	4.37	4.53	4.29	4.72	4.33
PEU3:	3.90	4.08	3.81	4.34	3.85
Total	4.12	4.29	4.04	4.54	4.07

Perceived Enjoyment	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PE1:	3.00	3.52	2.74	4.41	2.83
PE2:	2.95	3.22	2.81	3.69	2.86
PE3:	2.81	3.19	2.62	3.81	2.69
PE4:	3.76	4.19	3.55	4.66	3.65
Total	3.13	3.53	2.93	4.14	3.01

Design Aesthetics	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
DA1:	3.47	3.63	3.39	4.00	3.40
DA2:	3.52	3.69	3.43	3.97	3.46
DA3:	3.76	3.78	3.74	3.94	3.74
DA4:	3.66	3.73	3.62	3.97	3.62
Total	3.60	3.71	3.55	3.97	3.56

Perceived Comfort	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PC1:	3.38	3.73	3.21	4.09	3.29
PC2:	3.12	3.47	2.95	3.81	3.04
PC3:	2.73	3.29	2.46	4.16	2.56
Total	3.07	3.50	2.87	4.02	2.96

Perceived Privacy	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PP1:	2.29	2.73	2.07	3.34	2.16
PP2:	2.53	2.84	2.38	3.47	2.42
PP3:	2.68	3.02	2.52	3.47	2.59
Total	2.50	2.87	2.32	3.43	2.39

Price Value	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PV1:	2.10	2.60	1.86	3.50	1.93
PV2:	2.55	3.05	2.30	3.78	2.40
PV3:	2.57	2.99	2.36	3.62	2.43
Total	2.40	2.88	2.17	3.64	2.26

Attitude	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
AT1:	3.18	3.68	2.93	4.31	3.03
AT2:	3.20	3.82	2.89	4.53	3.03
AT3:	3.23	3.88	2.92	4.53	3.07
Total	3.20	3.79	2.91	4.46	3.05

Subjective Norm	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
SN1:	2.09	2.35	1.95	2.66	2.02
SN2:	2.36	2.77	2.15	3.41	2.22
SN3:	2.13	2.49	1.96	2.97	2.03
Total	2.19	2.54	2.02	3.01	2.09

Perceived Behavioral Control	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PBC1:	4.22	4.42	4.12	4.69	4.16
PBC2:	3.64	3.92	3.51	4.50	3.53
PBC3:	4.19	4.36	4.10	4.66	4.13
Total	4.01	4.23	3.91	4.62	3.94

Purchase Intention	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
PI1:	1.94	2.57	1.63	3.16	1.79
PI2:	1.98	2.65	1.64	3.25	1.82
PI3:	2.00	2.66	1.68	3.16	1.86
Total	1.97	2.63	1.65	3.19	1.82

Technology Innovativeness	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
TI1:	2.73	3.43	2.39	4.13	2.56
TI2:	2.70	3.43	2.34	4.19	2.51
Total	2.72	3.43	2.36	4.16	2.54

Health Consciousness	Mean of group:				
	Total (N=290)	Familiar (N=96)	Non-Familiar (N=194)	SR User (N=32)	SR Non-User (N=258)
HC1:	4.18	4.23	4.16	4.37	4.16
HC2:	3.92	3.98	3.90	4.22	3.89
Total	4.05	4.10	4.03	4.30	4.02

Appendix 7: Analysis of mean differences among groups

Test:	Independent t-test							ANOVA	
Group:	Gender	Age	Education	Usage of wearables	Usage of SR	Familiarity with SR	Usage of rings	Occupation	Income
AT	0.476	0.284	0.176	0.000	0.000	0.000	0.17	0.199	0.000
PI	0.219	0.008	0.128	0.000	0.000	0.000	0.002	0.202	0.000
PSR	0.742	0.000	0.048	-	-	-	0.014	-	0.000
PU	0.443	0.835	0.018	0.000	0.000	0.000	0.837	-	0.005
PEU	0.857	0.000	0.008	0.012	0.000	0.002	0.278	0.002	0.002
PE	0.873	0.739	0.143	0.000	0.000	0.000	0.006	0.265	0.005
DA	0.907	0.012	0.545	0.054	0.000	0.149	0.029	0.087	0.048
PC	0.404	0.030	1.000	0.000	0.000	0.000	0.000	0.043	0.000
PP	0.423	0.190	0.740	0.000	0.000	0.000	0.902	-	0.046
PV	0.138	0.000	0.476	0.000	0.000	0.000	0.025	0.000	0.000
TI	0.000	0.543	0.110	0.000	0.000	0.000	0.833	0.000	0.000
SN	0.924	0.004	0.648	0.000	0.000	0.000	0.000	0.014	0.000
PBC	0.024	0.489	0.002	0.001	0.000	0.000	0.166	0.008	0.000

Appendix 8: Robustness Check Correlation with AT

Pearson Correlation Analysis		PU	PEU	PE	DA	PC	PP	PV	
AT	Total Sample	Correlation	.755**	.318**	.828**	.470**	.675**	.503**	.526**
		Sig.	.000	.000	.000	.000	.000	.000	.000
		N	290	290	290	290	290	290	290
	Non-user	Correlation	.709**	.254**	.817**	.441**	.623**	.419**	.415**
		Sig.	.000	.000	.000	.000	.000	.000	.000
		N	258	258	258	258	258	258	258
	User	Correlation	.715**	.278	.491**	.669**	.655**	.485**	.609**
		Sig.	.000	.123	.004	.000	.000	.005	.000
		N	32	32	32	32	32	32	32
	Familiar with Smart Rings	Correlation	.756**	.359**	.774**	.511**	.670**	.542**	.668**
		Sig.	.000	.000	.000	.000	.000	.000	.000
		N	96	96	96	96	96	96	96
	Unfamiliar with Smart Rings	Correlation	.708**	.237**	.830**	.457**	.615**	.397**	.339**
		Sig.	.000	.001	.000	.000	.000	.000	.000
		N	194	194	194	194	194	194	194

Appendix 9: Robustness Check Correlation with PI

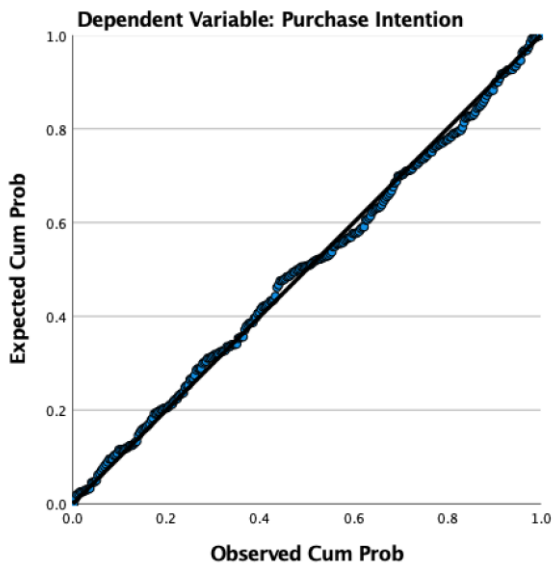
Pearson Correlation Analysis		AT	SN	PBC	PV	
PI	Total Sample	Correlation	.679**	.511**	.280**	.555**
		Sig.	.000	.000	.000	.000
		N	290	290	290	290
	Non-user	Correlation	.658**	.479**	.170**	.484**
		Sig.	.000	.000	.006	.000
		N	258	258	258	258
	User	Correlation	0.259	0.142	.471**	0.286
		Sig.	.152	.439	.006	.112
		N	32	32	32	32
	Familiar with Smart Rings	Correlation	.656**	0.498**	.452**	.637**
		Sig.	.000	.000	.000	.000
		N	96	96	96	96
	Unfamiliar with Smart Rings	Correlation	.620**	0.429**	.077	.331**
		Sig.	.000	.000	.284	.000
		N	194	194	194	194

Appendix 10: Correlation Matrix of Total Sample

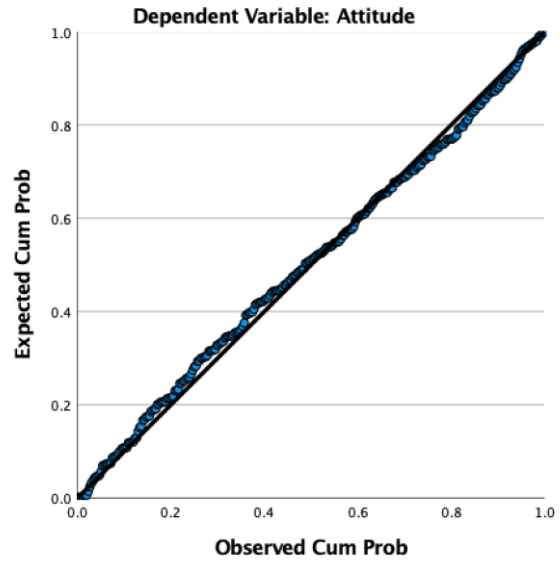
Total Sample (N=290)		PI	PU	PEU	PE	DA	PC	PP	PV	AT	SN	PBC
PI	Correlation	1	.576**	.201**	.601**	.302**	.528**	.438**	.555**	.679**	.511**	.280**
	Sig.		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PU	Correlation	.576**	1	.414**	.722**	.370**	.558**	.478**	.481**	.755**	.440**	.240**
	Sig.	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000
PEU	Correlation	.201**	.414**	1	.340**	.248**	.317**	.272**	.225**	.318**	.112	.426**
	Sig.	.001	.000		.000	.000	.000	.000	.000	.000	.056	.000
PE	Correlation	.601**	.722**	.340**	1	.438**	.689**	.458**	.428**	.828**	.474**	.224**
	Sig.	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000
DA	Correlation	.302**	.370**	.248**	.438**	1	.519**	.218**	.340**	.470**	.256**	.158**
	Sig.	.000	.000	.000	.000		.000	.000	.000	.000	.000	.007
PC	Correlation	.528**	.558**	.317**	.689**	.519**	1	.413**	.474**	.675**	.390**	.246**
	Sig.	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000
PP	Correlation	.438**	.478**	.272**	.458**	.218**	.413**	1	.316**	.503**	.326**	.143*
	Sig.	.000	.000	.000	.000	.000	.000		.000	.000	.000	.015
PV	Correlation	.555**	.481**	.225**	.428**	.340**	.474**	.316**	1	.526**	.388**	.260**
	Sig.	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000
AT	Correlation	.679**	.755**	.318**	.828**	.470**	.675**	.503**	.526**	1	.531**	.224**
	Sig.	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000
SN	Correlation	.511**	.440**	.112	.474**	.256**	.390**	.326**	.388**	.531**	1	.123**
	Sig.	.000	.000	.056	.000	.000	.000	.000	.000	.000		.037
PBC	Correlation	.280**	.240**	.426**	.224**	.158**	.246**	.143*	.260**	.224**	.123*	1
	Sig.	.000	.000	.000	.000	.007	.000	.015	.000	.000	.037	

Appendix 11: Normality Test

Normal P-P Plot of Regression Standardized Residual



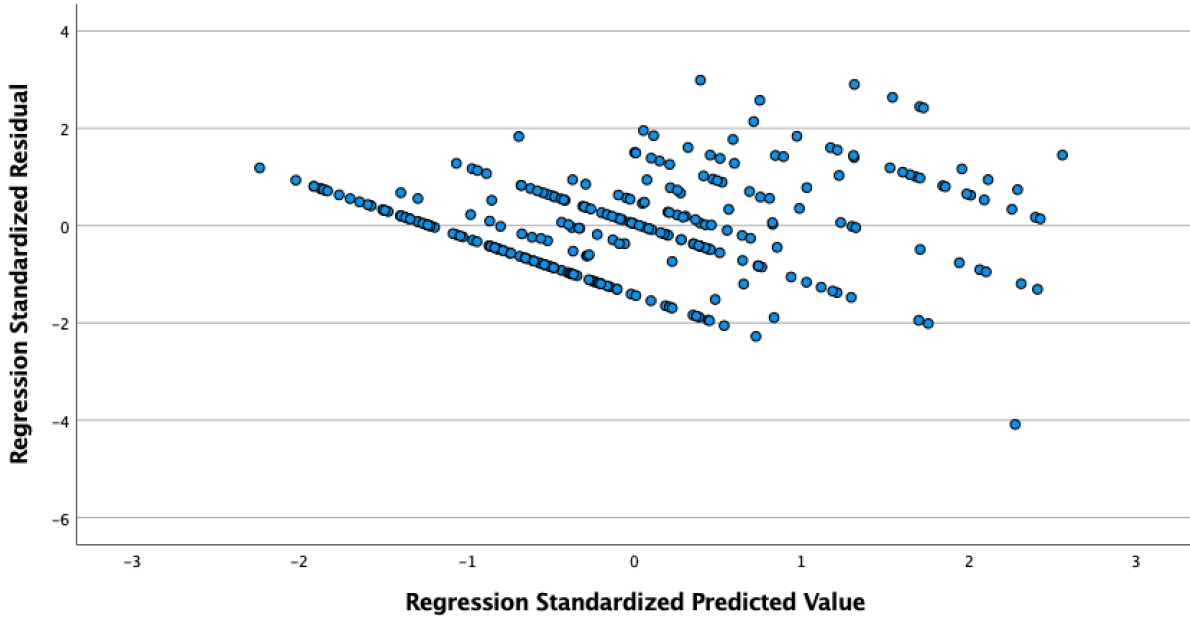
Normal P-P Plot of Regression Standardized Residual

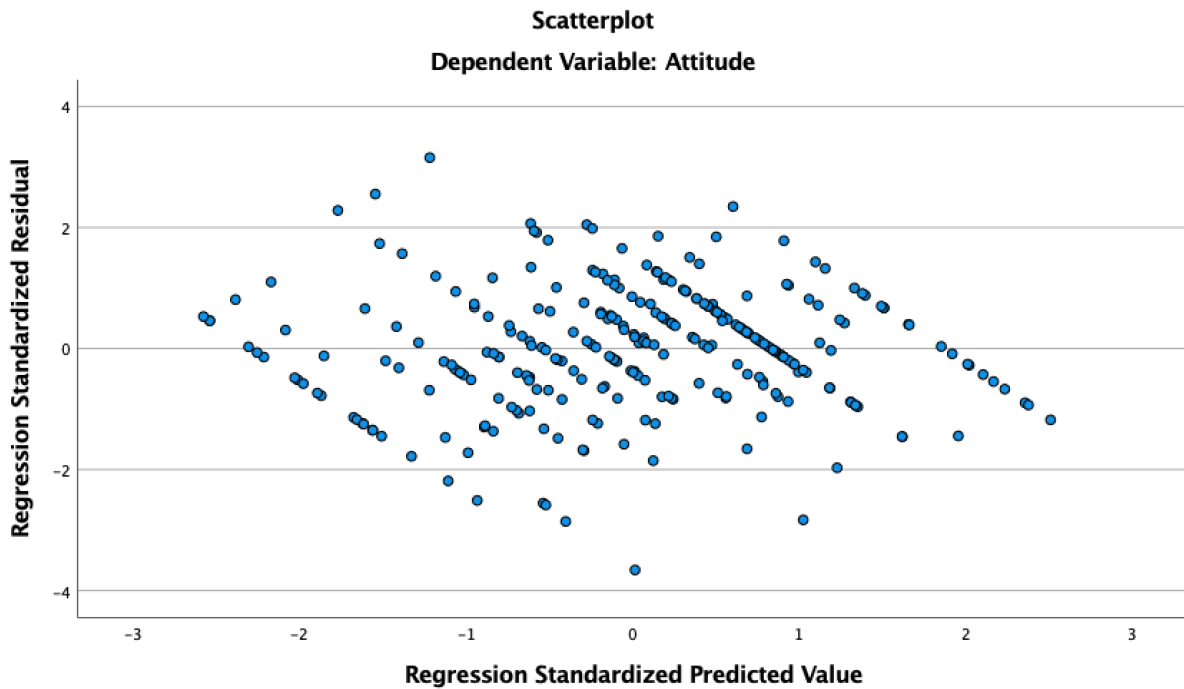


Appendix 12: Homoscedasticity Test

Scatterplot

Dependent Variable: Purchase Intention





Appendix 13: Robustness-Check Multiple Regression Total Sample

Dependent Variable: Attitude	Standardized Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.074		
Perceived Usefulness	0.246	0.000	0.398	2.513
Perceived Ease of Use	-0.050	0.114	0.808	1.238
Perceived Enjoyment	0.478	0.000	0.353	2.834
Design Aesthetics	0.087	0.011	0.690	1.448
Perceived Comfort	0.074	0.087	0.426	2.345
Perceived Privacy	0.075	0.024	0.716	1.396
Price Value	0.096	0.006	0.672	1.488
Familiar with Smart Rings	0.091	0.004	0.811	1.232

Dependent Variable: Purchase Intention	Standardized Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.021		
Price Value	0.182	0.000	0.627	1.594
Attitude	0.391	0.000	0.557	1.796
Subjective Norm	0.144	0.002	0.685	1.461
Perceived Behavioral Control	0.050	0.241	0.831	1.203
Technology Innovativeness	0.093	0.043	0.707	1.415
Familiar with Smart Rings	0.110	0.015	0.733	1.364
Income over 4000	0.118	0.005	0.836	1.196

Appendix 14: Robustness-Check Multiple Regression Sample of participants being **unfamiliar** with smart rings

Dependent Variable: Attitude	Standardized Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.087		
Perceived Usefulness	0.243	0.000	0.488	2.050
Perceived Ease of Use	-0.059	0.132	0.871	1.149
Perceived Enjoyment	0.555	0.000	0.389	2.574
Design Aesthetics	0.113	0.011	0.689	1.452
Perceived Comfort	0.061	0.249	0.485	2.062
Perceived Privacy	0.069	0.088	0.823	1.216
Price Value	0.053	0.181	0.850	1.176

Dependent Variable: Purchase Intention	Standardized Coefficients Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.001		
Price Value	0.106	0.081	0.810	1.235
Attitude	0.499	0.000	0.754	1.326
Subjective Norm	0.176	0.005	0.782	1.279
Perceived Behavioral Control	0.019	0.741	0.929	1.076
Technology Innovativeness	0.075	0.198	0.888	1.126
Income over 4000	0.089	0.115	0.944	1.059

Appendix 15: Robustness-Check Multiple Regression Sample of participants being **familiar** with smart rings

Dependent Variable: Attitude	Standardized Coefficients Beta	Sig.	Collinearity Statistics	
			Tolerance	VIF
(Constant)		0.010		
Perceived Usefulness	0.278	0.003	0.356	2.813
Perceived Ease of Use	-0.033	0.594	0.730	1.369
Perceived Enjoyment	0.321	0.001	0.350	2.857
Design Aesthetics	0.069	0.285	0.692	1.446
Perceived Comfort	0.075	0.375	0.408	2.452
Perceived Privacy	0.105	0.123	0.634	1.577
Price Value	0.239	0.001	0.579	1.728

Dependent Variable: Purchase Intention	Standardized Coefficients	Sig.	Collinearity Statistics	
	Beta		Tolerance	VIF
(Constant)		0.526		
Price Value	0.281	0.007	.485	2.061
Attitude	0.265	0.023	.388	2.579
Subjective Norm	0.128	0.161	.621	1.610
Perceived Behavioral Control	0.109	0.222	.651	1.536
Technology Innovativeness	0.076	0.382	.687	1.456
Income over 4000	0.127	0.111	.821	1.217