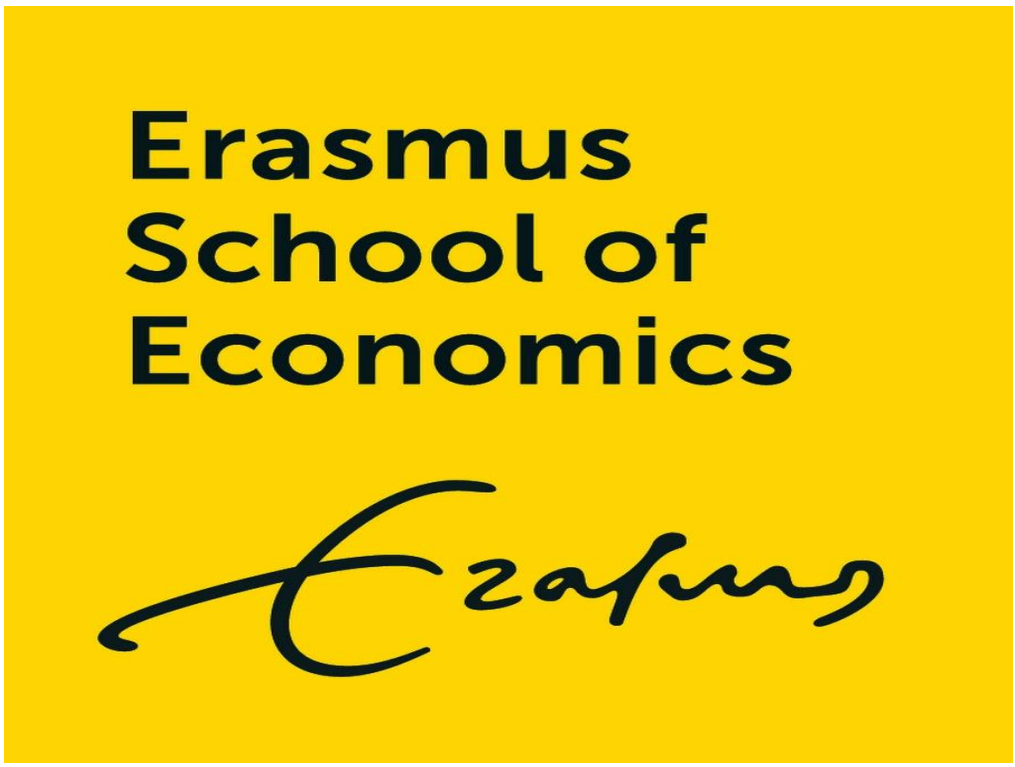

Master Thesis

Customer adoption of innovation: what characteristics influence the adoption in the context of smart home

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Abstract

The increasing importance of product innovation forces companies and businesses to develop new technologies that will meet customers' needs. Making a product that will suit with customers' requirements is a challenge for innovative companies, as all consumers have different personal characteristics that make the process of innovation adoption only longer and harder. This thesis investigates which concrete variables have a stronger effect on innovation adoption in the context of smart home. Besides, I analyzed several moderation effects and also kept certain control variables. In order to test the suggested conceptual map, I conducted a research in which 156 participants took part. After that, I performed various regression analyses. The findings of the research suggest that innovativeness of a person, information seeking and higher relative advantage of the innovation lead to a higher level of innovation adoption. Moreover, the effect of innovativeness on innovation adoption is strengthened by the need for uniqueness.

Keywords: innovation, personal characteristics, customer adoption, smart home

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1. Introduction

1.1 Context

We are all living in a world of rapidly changing technologies, dwindling resources and increasingly fierce global competition. Due to the increasing importance of innovation, companies and businesses are forced to develop new technologies and implement them as fast as possible in order to keep up with the pace of the competitive global environment.

Innovation is a broad topic, and it is defined by Rogers (1995) as "an idea, practice or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p.11). It is considered to be one of the most important business and marketing issues today. The primary goal of innovation is to develop new or modify existing products in order to enhance profitability. Consumers' attitude to innovations can be very different, some of them perceive it as granted, or reject it as being considered unnecessary and inconvenient, or too hard to use (Hauser, Tellis, and Griffin, 2006).

As the success of innovation depends on consumers accepting the new product or service, it is crucial to understand why consumers are accepting or rejecting innovations. "Industrial designers in the process of new product development (NPD) are trying to link innovative product development to the dimensions, instinctive responses, and emotional needs of the user" (Walsh, 1996, p. 513).

1.2. Problem statement, research question and objectives

There are different factors that influence consumers' decision to accept innovations. In order to understand why consumers are willing to accept innovations, the scientific research of this thesis is required.

The research question of this study is to find out and understand the multitude of factors that are influencing consumer adoption of the innovations in the context of smart home. Furthermore, it is needed to find out – on the basis of empirical results – which factors (innovativeness, need for uniqueness, information seeking, preannouncing, compatibility, relative advantage and observability) are more relevant and have a higher impact on consumers' acceptance of innovations in the context of smart home.

1.3 Academic and managerial relevance

The proposed research question has an academic relevance, since adoption of innovations is a broadly discussed theme, as a general matter, and it needs investigations in the field of smart homes – taking into account the increased interest of the market to this subject.

There are several previous researches that investigate which personal characteristics are influencing willingness to accept innovations. At the same time, it is also important to know why consumers resist accepting innovations. And as smart home is considered an innovation, it is interesting to test all these factors on the acceptance of innovations in the context of smart home.

My work is based on the existing literature and academic studies. Arts et al. (2011) conducted a research on personal characteristics that influence consumer adoption of innovation. The following factors of the adopters were examined: age, education, income (social-demographics) and product involvement, innovativeness, opinion leadership, information seeking and media proneness (psychographics). Moreover, Arts et al. (2011) also examined innovation adoption factors, such as: relative advantage, compatibility, complexity, trialability and observability of the innovative products.

My research contributes and adds to the previous research papers. I will test if consumers are willing to accept innovations in terms of smart home, using previously examined factors and adding several new ones. Specifically, regarding the new factors, I focus on need for uniqueness of consumers (Tian et al. 2001), on consumer adoption factors - preannouncing of the innovative product Montaguti et al. (2002). Adding these factors to previous research will enhance my work and make it unique.

Understanding how consumers adopt an innovative product is relevant for managers in the following ways. First, it will help to improve the development and marketing of innovative products. Consumer adoption of innovations is a famous theme nowadays. For instance, in 2015 R&D spending increased by 5.1% to $680 billion, the largest year-over-year increase since 2012 (Global Innovation 1000). In order to invest money more rationally, it is of crucial importance to understand if consumers are likely to adopt or reject the innovation before its launch. Even small adjusting may change consumers' attitude toward innovation.

Second, many marketers found out that prelaunch results of the surveys are not always accurate, as consumers "talk the talk" while taking surveys, but do not generally "walk the walk" when it comes to adoption of innovation (Arts et al. 2011). A lot changes between intentions to adopt and real adoption, as consumers may change their mind over a period (Morrison, 1979), and consumers can never foresee unpredicted circumstances that may influence their adoption choice (Morwitz et al. 2007). That is why consumers' simple intentions to adopt innovations are poor predictors of adoption behaviour and more complex analysis that would evaluate cross dependence and interactions among factors is needed. At the same time, marketers have an opportunity to educate consumers about an innovative product, as they do not have any previous knowledge or judgments (Moreau, 2001). Consumers need to learn about the innovative product and know how to use it in order to understand its benefits (Wood and Lynch, 2002).

Third, innovation adoption is considered to be a process of several stages through which consumers' pass, from first being aware of it to using it (Rogers, 2003). While consumers evaluate the new product, they pay considerable attention to certain innovation characteristics, such as relative advantage, compatibility and observability. If managers could improve these factors, consumers will be more convinced that they need to possess this innovative product. Moreover, all consumers are different, and marketers could not treat them all in the same manner, so it is important to take into account their personal characteristics (socio-demographics and psychographics) as well. At the same time, new product development managers should take into account the changing situation during the evolution of the innovations.

On the other hand, potential adopters of innovations will focus more on potential loses, then on potential gains because of the loss aversion theory (Kahneman & Tversky, 1979). However, if marketers manage to create greater familiarity with the innovative product, consumers will need to make less cognitive effort to evaluate the innovation, which may cause easier adoption of the innovation (Gatignon & Robertson, 1985). When uncertainty is reduced, demand becomes more predictable (Montaguti et al. 2002). All these reasons motivate the importance of my research to understand which characteristics are the most important for innovation adoption process.

1.4. Structure of the Thesis

The remaining of Master Thesis is structured as follows. The next chapter represents the review of the existing literature. The third chapter is dedicated to the hypothesis development. The fourth chapter covers the research methodology. The fifth chapter presents data analysis and test of the hypothesis. The last chapter is dedicated to the managerial implications which are based on the results of the research and also presents limitations and recommendations for future research.

2. Literature review

In the following literature review chapter I present the main and most important points of the existing literature, which will allow a better understanding of the topic of the thesis. The main themes of my research are: product design, smart home, personal characteristics and consumer adoption of innovation.

2.1 Product design topic

Since technologies are developing so fast, and new products appear on the market sooner than we think, it is of extreme importance for marketers to help consumers learn about new technologies. Marketing scholars believe that the term "product" can be described as a variety of goods and services (Bloch, 1995). A product's form is a number of elements which are selected and mixed into something uniform by designers in order to reach a specific sensory effect (Hollins and Pugh 1990; Lewalski 1988). Designers make a wide variety of choices, concerning characteristics, in particular shape, scale, tempo, proportion, materials, colour, reflectiveness, ornament, and texture (Davis 1987; Kellaris and Kent 1993). Moreover, they make decisions regarding the mixture of the elements and decide on the extent of consistency between the elements (Bloch, 1995).

The so-called really new products (Lehmann 1994) are "innovations that defy straightforward classification in terms of existing product concepts" (Gregan-Paxton and Roedder John 1997, p.275) and in such a way "create, or at least substantially expand, a category rather than reallocate shares" within one which already exists (Marketing Science Institute 1994, p.6). Previous psychology and marketing research suggest that when consumers face a new product, they are trying to use information from existing product categories in order to learn about the new products (Gregan-Paxton 1999; Gregan-Paxton and Roedder John 1997; Markman, Yamauchi, and Makin 1997; Yamauchi and Markman 2000). As many innovative products have similar properties with other items from already existing categories, for marketers it is vital to understand how consumers use existing information while learning about a new product category and what the barriers of accepting it are (Moreau et al. 2001). That is why it is of crucial importance for marketers to "prepare the ground" in order to make consumers more willing to accept the innovation (Verganti, 2008).

Since the last decade, design innovation started to gain references in the marketplace, while a more significant number of enterprises started innovating not only by enhancing technology but also by new product forms (i.e., design) (Rubera, 2015). Crawford and Di Benedetto's (2003, p. 278) consider design as "the synthesis of technology and human needs into

manufacturing products". "The New Product Development (NPD) process is an integration of technical and commercial considerations and within NPD, industrial design meets with the advantages of technologies and the needs of potential customers" (Cooper, 1998; Crawford and Di Benedetto, 2003; Ulrich and Eppinger, 2004; Veryzer and Borja de Mozota, 2005). Adding the industrial design in the NPD process will enhance the range of capabilities and artistic state of the design or product (Ulrich and Eppinger, 2004).

Industrial design is generally concentrated on the features of product design that are enhancing the interaction of the product and the user (Ulrich and Eppinger, 2004). It brings contribution that helps to come with new products and to bring them into market (Crawford and Di Benedetto, 2003; Kotler, 2003; Veryzer and Borja de Mozota, 2005). Marketing researchers propose that making the product more complex and aesthetically attractive will lead to the growth of the importance of industrial design and adoption of the product (Kotler, 2003; Veryzer and Borja de Mozota, 2005).

Academics and practitioners pointed out that the role of industrial design in product development is related to ergonomics, ease of manufacture, efficient use of materials, and product performance, but not only to aesthetics (Gemser and Leenders, 2001). Performance is closely linked to ergonomics. "Ergonomics includes the matching of a product to the target users capabilities in order to maximise safety, efficiency of use, and comfort" (Osborne 1987). Ergonomics in many cases has a direct impact on form, affecting characteristics such as weight, texture, and shape (Bloch 1995). Currently, a lot of attention is paid to the properties of the ergonomics as improving "ease of use" is one of the marketers' goals (Nussbaum 1988, 1993).

Kotler and Rath do not agree that 'design is a strategic tool' which gives marketers the opportunity to meet customer desires regarding the performance of the product, it's quality, endurance, exterior and price (Gemser and Leenders, 2001). Moreover, Yamamoto and Lambert highlight that "more than simply the creation of pleasing product shapes and styles, the industrial design role in product development can be viewed as a communicator of the firm's quality image and product integrity" (Gemser and Leenders, 2001).

Gemser and Leenders (2001) decided to define in a general way industrial design as a process of transformation of a set of product requirements into a configuration of materials, elements and components. It can change the product's appearance, user friendliness, ease of manufacture, efficient use of materials, functional performance, etc. Moreover, it is becoming apparent that not the product which is the most beautiful is the best, but the ideal product is with usable and comprehensible form (Bloch 1995). If a particular form evokes positive psychological responses, consumer is supposed to extend the viewing time, listening or touching the product. It indicates the desire to enjoy the product's enjoyable form (Csikszentmihalyi and Robinson 1990;

Mehrabian and Russell 1974). It can also lead to searching for more information about the product and increase willingness to revisit retailers which are selling the product (Block 1995). However, the search for the "ideal" form remains to be achieved first for designers and later by marketing management. Pye (1978) added that workmanship also has an influence on product form. It can happen that workmanship hurts the form presented by the designer. In such a way designers need to take into account both the product form to be pleasing to target consumers and also meet related design restrictions (Lawson 1983).

For a competitive edge more and more firms rely on design innovation (Berkowitz, 1987; Dickson et al. 1995; Gemser and Leenders, 2001; Olson, Cooper, and Slater, 1998; Ulrich and Eppinger, 2004). Gemser and Leenders (2001, p. 35) came to a conclusion, that "Being innovative with respect to design and design strategy can enhance competitiveness regardless of industry evolution".

2.2 Smart home topic

Even though the concept of smart home is pretty popular now, only a few of us will have a certain understanding of it. The term "smart home" was used for the first time in 1984 by the American Association of House Builders. A "smart home" can be presented as a place of living supplied with computing and information technology which forecasts and reacts to the needs of the inhabitants, in order to make their life more comfortable, convenient, secure, economic and fun by the use of technology within the house and outdoors (Harper, 2003).

The first "wired homes" were built in the begging of 1960 by hobbyists. There was a dramatic revolution in domestic technology in the 20th century. At the beginning of the 20th century, the mostly used technologies were from the previous century. However, by the end of the 20th century, the technologies have changed drastically. The first major change was the introduction of electricity into homes in the first quarter of the century. This was a new source of clean and convenient power for household appliances, and in such a way a new era for novel equipment started. In the last quarter of the century, when the information technology was introduced made the changes even more prominent. Since then, the possibility to exchange information between people, appliances, systems and networks in and beyond the house began.

The smart home is called smart not because it is environmentally friendly, or uses solar power or recycles waste water. Yes, it can do this, but it is called smart for interactive technologies that it contains. Consumers find this concept interesting, but still try to postpone the acceptance, as they find the functions too complex, and are happy with simpler control devices. Of course, smart home is expensive, and there is too much technology push, and not enough

attention is paid to users themselves or usability. Previous studies showed that people want from new technologies not automation, they want communication or social connectivity.

Smart products, which are part of the industrial design, may be seen as a radical change in the concept of the original product (Ram, 1987) because of the three most important factors: intelligence, ubiquity and autonomy (Porter & Heppelmann, 2014). Hoffman and Novak (2015, p. 14) describe smart products as products that "interact and communicate with themselves and each other – and with humans – on an ongoing basis by sending and receiving data through the Internet that is stored and organized in a database". Hsu and Lin (2016, p. 516) suggest the following definition of the adoption of technical approach "Smart objects are regarded as a physical embodiment with communication functionality, possessing a unique identifier, some basic computing capabilities and a way to detect physical phenomena and to activate actions having an effect on physical reality".

Smart products have: "sensors" that gather data about the environment, "actuators" that put them into action and control them and "network connectivity" that can be accomplished by Wi-Fi, Bluetooth or RFID (radio frequency identification) (Mani and Chouk, 2016). The smart product market is a relatively new market with a wide range of product segments, such as: health, smart home, lifestyle, etc.

2.3 Personal characteristics topic

Personal characteristics of the adopter can be divided into socio-demographics and psychographics (Arts et al. 2011). *Socio-demographics* are: consumers' age, gender and level of education. *Age* represents the age of the (possible) adopter. *Gender* represents the gender of the (prospective) adopter. *Education* represents the level of education that the (possible) consumer has at the moment.

Adopter *psychographics* include innovativeness, need for uniqueness, information seeking. *Innovativeness* is the general predisposition of the customer to adopt new products (Arts et al. 2011). *Need for uniqueness* is an individual's desire to be different from the others that can be accomplished by using goods that build up one's personal and social identity (Tian et al. 2001). Consumers can possess popular goods but at the same time be in search of new and special products, innovations (Snyder 1992; Tepper 1997). A person can be satisfied by using a differentiated product because it helps to create identity (Snyder and Fromkin, 1977). "The self-concept of the desire to be not like others will be sustained and buoyed if he believes the good he has purchased is recognized publicly and classified in a manner that matches and supports his self-concept" (Grubb and Grathwohl 1967, p. 25).

Information seeking is when an individual is willing to search information about innovations or new products (Arts et al. 2011). *Preannouncing* can also have positive effect as it provides prelaunch information and creates awareness and may help to reduce uncertainty and can increase willingness to pay (Farrell & Saloner, 1986).

2.4 Consumer adoption of innovation topic

Innovation adoption is defined as "the consumer's decision to make full use of an innovation" (Rogers, 2003). Rogers (1962) has defined the innovation adoption process as "the process through which an individual or other decision-making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision."

In general, expected effects of innovation characteristics on consumer innovation adoption are presented in the following paper (Kleijnen et al. 2009). "*Compatibility* is the degree to which the innovation fits with the potential adopters' demand and believes" (Arts et al. 2011). As the number of adopters in a field increases, more and more people will be inspired or motivated (or feel the pressure) to do the same, notwithstanding reasons of technical or economic benefits (DiMaggio & Powell, 1983). While early adopters enjoy the benefits of the innovation and spread them through personal communication or media, as a result, late adopters reduce their uncertainty about it (Strang and Soule, 1998). It is expected that both early and late adopters are motivated by economic and social motivations (Kennedy & Fiss, 2009).

Relative advantage represents the benefits of the innovation in comparison with similar offers, pointing out to potential adopter the inner thoughts to make it desirable (Arts et al. 2011). Moreover, it can increase willingness to pay (Gandal, 1994) and plays a key role in consumer adoption decision (Montaguti et al. 2001). *Observability* is not a real benefit it gives customer the possibility to assess more efficiently the advantage that the innovation can provide (Arts et al. 2011). *Observability* helps to see the innovation benefits and motivates in such a way adopters to use it (Meuter et al. 2005).

3. Hypothesis development and conceptual map

3.1 Hypothesis development

This part of the study develops hypotheses regarding the factors influencing the innovation adoption that were identified in the literature review chapter.

All people are different, and their ability and desire to adopt innovations are different as well. Personal characteristics and perceived characteristics of the innovation are considered to be leading drivers of innovation adoption (Gatignon & Robertson, 1985; Meuter et al. 2005; Rogers, 2003; Tornatzky & Klein, 1982). As some people are willing to adopt the majority of the new equipment and devices that are coming out they can be considered innovative. Need for uniqueness is among the main drivers influencing willingness to accept innovations (Maslach et al. 1985). Therefore, I hypothesize that:

H1a: Innovativeness of a person leads to a higher level of adoption of innovation.

H1b: The effect of innovativeness on adoption of innovation is strengthened by his/her need for uniqueness.

As nowadays people as consumers are overwhelmed with lots of different advertisements and promotions, in many cases they just block, ignore or skip them if it possible, as it is irritating and considered a waste of time. But it can also happen that a particular customer is specifically looking for information and is open for the media and the information that is presented, as he or she is motivated to look for information in order to diminish uncertainty about an innovation (Rogers, 1995). In this case, preannouncing can have a moderation effect on information seeking as it provides information about the new coming product or service in order to reduce uncertainty and in such a way strengthens the relationship of information seeking on innovation adoption. According to Spence (1974), market signals transmit information to other individuals in the market (Eliashberg & Robertson, 1988). The findings are summarized in the following hypothesis:

H2a: Information seeking leads to a higher level of adoption of innovation.

H2b: The effect of information seeking on adoption of innovation is strengthened by promotion effort (preannouncing) by the firm which is launching it.

"Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters". "An idea that is more compatible is not so doubtful for the potential adopter" (Rogers, 1995, p. 223). Even though not

all consumers could be considered early adopters, even late adopters use compatibility as a characteristic which may lead to innovation adoption. Compatibility of an innovation is linked to its rate of adoption. In order to obtain a faster rate of adoption innovations should be seen by consumers as having more prominent compatibility (Rogers, 1995). The above-presented arguments are summarized in the third hypothesis:

H3: Compatibility of innovation leads to a higher level of adoption of innovation.

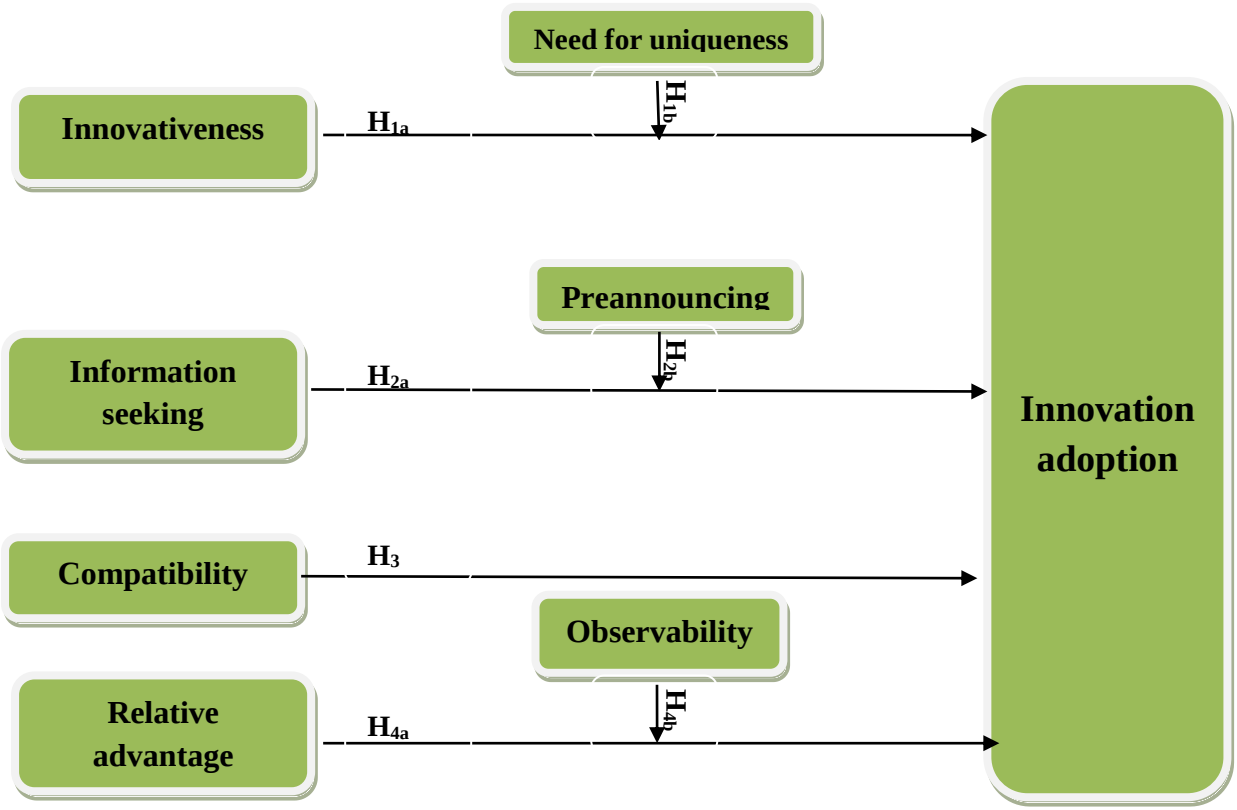
In general, everything that is new is better understood and easier accepted when there is the possibility to try it yourself and see how it works, "learning by doing" (Arrow, 1962). At the same time, if it can be observed it may motivate the consumer even more to adopt innovation. Economic dimensions of relative advantage are among predictors of rate of adoption. As perceived by customers, relative advantage of an innovation is positively related to its rate of adoption. Potential adopters are willing to know if a new idea is better than an existing one and to what extent (Rogers, 1995). So observability has a moderation effect on the relative advantage influencing positively willingness to accept innovations. From the above-presented reasons I derive the fourth hypothesis:

H4a: A higher relative advantage of the innovation leads to a higher level of adoption of innovation.

H4b: The effect of relative advantage of the innovation is increased by observability of innovation and its characteristics.

3.2 Conceptual map

Figure 1 The conceptual map of innovation adoption



4. Research methodology

4.1 Research methodology

After designing the conceptual map and developing the hypotheses, this chapter describes the methodology of the research, including data collection method, sample description, the research process and formulating the key variables.

Questionnaire was selected as research data collection method for the empirical part of the cross-sectional study. A drawback of using it independently (Podsakoff et al. 2012) consists in the risk of common method bias (CMB) which happens when variations in responses are caused by the instrument rather than the actual construct (actual predispositions of the respondents).

The common method bias can be attributed by raters (e.g. consistency motif and social desirability), item characteristics (e.g. complex and ambiguous items) and context (e.g. context-induced mood), and measurement context (e.g. time and location of measurement, common medium to obtain measurement) (Podsakoff et al. 2003).

According to Podsakoff et al. (2012) CMB represents a serious problem because it can a) affect hypothesis tests and lead to type I errors (mistakenly consider a predictor significant) or type II errors (mistakenly consider a predictor insignificant), b) lead to incorrect perceptions about how much variance is accounted for in a criterion construct, and c) enhance or diminish the nomological or discriminant validity of a scale.

For the purpose of testing and diminishing CMB both procedural and statistical measures were used. ***Procedural measures*** included:

(i) Protecting respondent's anonymity: in the introduction to the questionnaire was mentioned about this and a collaboration atmosphere was created (this is also referred to the issue of social desirability and consistency motif);

(ii) Excluding complex and ambiguous questions by using only scales from top journals where the risk of ambiguity is minimal;

(iii) Reducing evaluation apprehension: too personal questions were avoided;

(iv) Excluding researcher subjective impact: web-based questionnaire exclude interviewer personal contact and facilitate the solution of this issue.

Regarding ***statistical measures***, for the purpose of testing CMB was used Harman's single factor score, in which all predictor variables are loaded into one common factor. The acceptable level of variance of this factor is less than 50% meaning that CMB does not affect the results. I used Harman's score for testing the full model and the result is 50.9% that shows a limit situation (see Appendix III, Table 2).

Sample description

The method of purposive sampling was used in order to develop the sample of the research under discussion. According to this method, which belongs to the category of non-probability sampling techniques, sample members are selected on the basis of their knowledge, relationships and expertise regarding a research subject (Freedman et al. 2007).

Participants

The sample unit is represented by a bachelor or master student, which is more open than seniors to innovations and has sufficient knowledge and experience regarding smart home subject. Having the purpose of increasing the representativeness, the target population included students from different universities by such criteria as profile and location.

156 graduate and undergraduate students participated in the study: 62 of the respondents being bachelors and 82 master students. 12 others are representing: 5 PhD students, 2 employed and a school student. 4 respondents decided not to mention their education level. Demographically the group consisted of 105 female and 51 male students. The mean age of the respondents was 23.65, maximum 36 years and minimum 18. The table is attached in Appendix III, Table 3.

4.2 Research process

The data for the present study were collected by using an online questionnaire sent to potential participants using research software Qualtrics. A general and short introduction explained the topic of the study, information about the author of the research project, and hints about the structure of the questionnaire including some guiding principles on how to fill in the form. The questionnaire can be found in Appendix I.

Pretest

Before the main research process, the pretesting of the questionnaire was performed with the purpose of assessing the clarity of the questionnaire and suitability to the participants. I conducted ten personal interviews with master students. After that, I asked them to comment if they understand the questions and the story behind them correctly. According to their comments, I rephrased sentences and changed some words in order to be more clear and understandable. Some questions were too long and boring and I reformulated and shortened them. Moreover, I understood from the interviews that some of the questions were not clear as the respondents lacked definition of the variables, so I decided to describe all of them in a short sentence before asking the question in order to be more precise and easy to understand.

4.3 Measurement of variables

All variables, items and measures used in the questionnaire are presented in Appendix II.

Dependent variable

The rate of adoption represents the dependent variable because its value depends on the value of other variables: independent and moderation. The rate of adoption represents "the relative speed with which an innovation is adopted by customers" (Rogers, 1995, p. 36). The majority of authors, including Rogers examine the innovation adoption as a process, consisting of several stages. According to Rogers (1995, p. 20) there are 5 stages:

1) Knowledge – the stage related to information seeking and gaining some understanding of how the innovation functions;

2) Persuasion - occurs when a favorable or unfavorable attitude toward the innovation is expressed;

3) Decision occurs when a choice to adopt or reject the innovation take place;

4) Implementation occurs when the innovation is put into use;

5) Confirmation occurs when potential buyers seek reinforcement of an innovation-decision already made, but a reversion is possible if they would be exposed to conflicting messages about the innovation.

As measures of this variable I followed and adapted Alexander, Lynch, and Wang (2008).

Independent variables

The independent variables include: *innovativeness, information seeking, compatibility and relative advantage* as main variables and also moderating variables: *need for uniqueness, preannouncing* and *observability.*

Innovativeness variable was constructed using and adapting Goldsmith & Hofacker (1991) scale. In accordance with the proposed method for developing improved measures in marketing research (Churchill, 1979), the initial procedure was to accurately describe the construct of interest, "product specific innovativeness," in such a way pointing out the construct domain (Goldsmith & Hofacker, 1991). Midgley and Dowling (1978) and by Gatignon and Robertson (1985) defined product specific innovativeness. From a more general concept it is known that "innate innovativeness", is a generalized personality trait showing "… the degree to which an individual makes innovative decisions independently of the communicated experience of others" (Midgley and Dowling 1978, p. 235) and from the highly specific, low-level construct "single product purchase". "Domain or product category specific innovativeness reflects the tendency to learn about and adopt innovations (new products) within a specific domain of interest" (Goldsmith and Hofacker 1991, p. 211). In such a way previously mentioned construct

"mediates both conceptually and empirically the relationship between the generalized personality trait, innate innovativeness, and specific innovative behaviors" (Midgley and Dowling 1978, p. 238).

Information seeking variable was constructed based on items from Manning et al. (1995, p. 334). Midgley and Dowling's (1978, p. 235) conceptualization of consumer independent judgment making (CIJM) states that "people are different while making new buying decisions when it comes to believing others and accepting support from them". Consumers, who are predisposed to be early adopters of new products are not searching for new information or help from the others (Manning et al. 1995). Midgley and Dowling's (1978) theorized that early adopters are willing to take the risk and buy new products earlier than others not taking into account that they do not have enough information. Manning et al. define consumer novelty seeking (CNS) as "the desire to seek out new product information". This concept represents consumers' incentive to gain information concerning new products from generally available sources which are mass media, direct product exposure, or various forms of commercial marketing communications (Manning et al. 1995).

Compatibility and *relative advantage* variables are both related to the innovation characteristics or attributes were adapted and constructed using Van Ittersum & Feinberg (2010). "*Compatibility* is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 1995, p. 15). An innovation can be consistent with 1) sociocultural values and beliefs, 2) previously introduce ideas, or 3) client needs for innovations (Rogers, 1995, p. 223). Compatibility variable was constructed using more "neutral" (opinion scale) and more general items (benefits) rather than specific attributes.

"Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 1995, p. 15). Significant parts for the measurement of the degree of relative advantage are the following: social-prestige factors, convenience, and satisfaction. It can be also measured in economic terms. It is not so important if an innovation has a lot of "objective" advantage. It is important for the innovation to be recognized as advantageous. The speed of the rate of adoption depends on how considerable is relative advantage of an innovation (Rogers, 1995). In the case of relative advantage more "personal" scale (importance scale) was used.

Moderating variables

Three situations with moderation variables are examined in this thesis: need for uniqueness as a moderator for innovativeness, preannouncing – in the case of information seeking and observability – for relative advantage.

Need for uniqueness variable's items were adapted from Tian et al. (2001) by grouping and considerably reducing the list of items and giving them a more indirect character. Counterconformity motivation or the pursuit of differentness comparative to others is described in conceptual marketing models as a personal quality that depicts a significant consumer phenomena, such as consumers' reactions to innovative exterior designs of a product (Bloch, 1995), the fashion decision process, style selection, style replacement (Miller, McIntyre, and Mantrala, 1993), and variety-seeking behavior (McAlister and Pessemier, 1982). Empirical studies of the assumptions listed in the above-mentioned marketing models would be improved by the introduction of a characteristic that depicts consumers' counter-conformity motivation, taking into account consumers' urge not only to own but also to show their possessions, thus demonstrating his or hers need for uniqueness. Such a measure would notably refine upon the study of individual particularities of consumer behavior and provide a possibility for the study of how the acknowledgement of consumers' need for uniqueness is stimulated by different causes to affect consumer reactions to design features of products and advertisement. This approach would make the observation of how consumers' need for uniqueness impacts product adoption behavior possible (Tian et al. 2001). As a result, main items of the variable were focused on such person's characteristics like attitude toward fashion and brands, originality of thinking and behavior and influence on reference group members.

Preannouncing variable items were provided by Eliashberg and Robertson and adapted (Eliashberg & Robertson, 1988). Preannouncing can be considered as a signal for the market. It provides the opportunity to acquire support from key player and in order to stimulate the distribution of the innovative product positive word of mouth is necessary (Eliashberg & Robertson, 1988). At the same time, customer adoption of a new product may be put off because of switching costs and may be considered as an impediment to newcomer giving odds to rivals (Porter, 1980). When customers are expecting high switching costs, it is advantageous to have preannouncing as a means of promising planning in advance before transition (Eliashberg & Robertson, 1988). Preannouncing decreases incertitude (Calantone & Schatxel, 2000).

Observability variable was constructed using Van Ittersum & Feinberg (2010). "Observability is the degree to which the results of an innovation are visible to others" (Rogers, 1995, p.16). Some of the results of ideas are easy to be determined and presented to audience, but in some cases, it could be tough to explain the results to audience (Rogers, 1995).

Control variables

Control variables include: age, gender, education, familiarity. *Age* represents the age of the respondent. Gender represents the gender of the respondent. *Education* represents the level of education that the respondent has at the moment.

Familiarity variable was adapted from Machleit, Allen, & Madde (1993) and Mariconda & Lurati (2015). Familiarity represents the overall quantity of information that people have about an object (Yang, 2007). In general, people that are acquainted with the subject have a broader and better base of information available, which helps them and provides the opportunity to settle fixed attitudes toward familiar objects even in the presence of new information. Such base of information makes people more confident about their judgments without searching for more information (Mariconda & Lurati, 2015). People who are more familiar with a subject or object are more confident about their judgments, and it is to a lesser extent possible that they will have confidence in evaluations of third parties (Pollock, Rindova, and Maggitti, 2008). Due to high familiarity with an attitude-object people start to pay more attention and have a more precise understanding of new information about it (Wood et al. 1995). More advanced cognitive framework derives from high familiarity (Marks and Olson, 1981) and contributes to the gaining and understanding of new information concerning the familiar object (Brucks, Park & Lessig, 1981; Wood et al. 1995). The more familiar with an object a person is, the more motivated he or she is to acquire new information about it (Converse, 1962).

Likelihood variable was constructed based on items from Gülden & Manoj (2013). They supposed that if an action is personally relevant, consumers are judging the likelihood of adoption by mentally simulating the plan.

4.4 Model specification

The analysis technique used in the model consists of a set of regression equations that have the purpose of testing seven research hypotheses (H1a, H1b, H2a, H2b, H3, H4a, H4b). The first regression model tests the impact of four main identified factors, namely innovativeness, information seeking, compatibility and relative advantage in the context of smart home (dependent variable). The equation of the regression model is:

$$1)\ \textbf{Innovation Adoption} = \beta_0 + \beta_1 * \textbf{Innovativeness} + \beta_2 * \textbf{InformationSeeking} + \beta_3 * \textbf{Compatibility} + \beta_4 * \textbf{RelativeAdvantage} + \varepsilon_i$$

Where:

Innovation adoption – smart home adoption;

Innovativeness – general predisposition of a customer to adopt new products;

InformationSeeking – individuals desire to search information about innovations or new products;

Compatibility – the degree to which the innovation fits with the potential adopters' demand and believes;

RelativeAdvantage – represents the benefits of an innovation in comparison with similar offers;

β_k – where (k= 0, 1, …, k) refers to the coefficients of the variables which are present in the regression analysis;

ε_i – represents the error in the equation.

Then an in-depth analysis follows and each factor is included separately in the model and impact on the dependent variable is tested and additionally moderation and interaction effects are assessed. The second regression model tests independent variables and moderation variables.

$$2)\ Innovation\ Adoption = \beta_0 + \beta_1 * Innovativeness + \beta_2 * InformationSeeking + \beta_3 * Compatibility + \beta_4 * RelativeAdvantage + \beta_5 * NeedforUniqueness + \beta_6 * Preannouncing + \beta_7 * Observability + \varepsilon_i$$

Where:

NeedforUniqueness – individual's desire to be different from the others;

Preannouncing – represents the prelaunch information that creates awareness and helps to reduce uncertainty;

Observability – helps to notice the benefits of an innovation;

In order to test hypothesis **H1b** the third regression model is performed which includes independent variables and moderation variables plus the interaction between innovativeness and need for uniqueness.

$$3)\ Innovation\ Adoption = \beta_0 + \beta_1 * Innovativeness + \beta_2 * InformationSeeking + \beta_3 * Compatibility + \beta_4 * RelativeAdvantage + \beta_5 * NeedforUniqueness + \beta_6 * Preannouncing + \beta_7 * Observability + \beta_8 * Innovativeness * NeedforUniqueness + \varepsilon_i$$

Where:

Innovativeness*NeedforUniqueness – the interaction between innovativeness and need for uniqueness, referring to moderating variable need for uniqueness.

In order to test hypothesis **H2b** the fourth regression model is performed, which includes independent variables and moderation variables plus the interaction between information seeking and preannouncing.

$$4)\ Innovation\ Adoption = \beta_0 + \beta_1 * Innovativeness + \beta_2 * InformationSeeking + \beta_3 * Compatibility + \beta_4 * RelativeAdvantage + \beta_5 * NeedforUniqueness + \beta_6 * Preannouncing + \beta_7 * Observability + \beta_8 * InformationSeeking * Preannouncing + \varepsilon_i$$

Where:

InformationSeeking*Preannouncing – the interaction between information seeking and preannouncing, referring to moderating variable preannouncing.

In order to test hypothesis **H4b** the fifth regression model is performed, which includes independent variables and moderation variables plus the interaction between relative advantage and observability.

$$5)\ Innovation\ Adoption = \beta_0 + \beta_1 * Innovativeness + \beta_2 * InformationSeeking + \beta_3 * Compatibility + \beta_4 * RelativeAdvantage + \beta_5 * NeedforUniqueness + \beta_6 * Preannouncing + \beta_7 * Observability + \beta_8 * RelativeAdvantage * Observability + \varepsilon_i$$

Where:

RelativeAdvantage*Observability – the interaction between relative advantage and observability, referring to moderating variable observability.

The sixth regression model tests all the variables and interactions together: four independent, 3 moderation and 3 interactions.

$$6)\ Innovation\ Adoption = \beta_0 + \beta_1 * Innovativeness + \beta_2 * InformationSeeking + \beta_3 * Compatibility + \beta_4 * RelativeAdvantage + \beta_5 * NeedforUniqueness + \beta_6 * Preannouncing + \beta_7 * Observability + \beta_8 * Innovativeness * NeedforUniqueness + \beta_9 * InformationSeeking * Preannouncing + \beta_{10} * RelativeAdvantage * Observability + \varepsilon_i$$

5. Assumptions, data analysis and test of the hypotheses

5.1 Assumptions

Before doing the main analysis, I first checked several assumptions as suggested by prior researchers (Janssens, Wijnen, De Pelsmacker, & Van Kenhove, 2008).

Causality assumption

Based on the research findings from the previous literature, I presuppose causality in the conceptual model which suggests that independent variables are influencing innovation adoption.

Relevancy of independent variables

This assumption requires that a model includes all relevant variables. It was checked based on the (ZPRED, ZRESID) scatterplot. In all the models' plots did not show any special patterns. Therefore, the assumption was met.

The same procedure (inspection the (ZPRED, ZRESID) scatterplot) permits to test also other assumptions – that of a linear relationship between the dependent and independent variables and that of homoscedasticity of residuals. The lack of non-linear patterns (e.g. square or logarithmic) confirms that both assumptions were met.

At least interval variables

Most of the scales which were used are the 7-point and 5-point Likert scales that are conventionally considered ratio scales. Only 2 variables ("gender" and "education level") are nominal variables, and for the purpose of analysis were transformed in dummy variables: "gender" – by simply coding (0 and 1), the "education level" – by creating 3 new variables (corresponding to 3 choice options from the questionnaire).

Sufficient number of observations

Taking into account the rule of at least five times as many observations as coefficients to be estimated (13), the number of observations is more than sufficient (5*13=65, whereas there are 156 respondents).

Independence of observations

As the data for the present study were collected using an online questionnaire sent to potential participants, it was assumed that one respondent could fill in the survey only once.

Outliers

The option "Casewise diagnostics" produces a table with observations for which the difference between the actual and the predicted value for the dependent variable does not lie in a range of two standard deviations of the mean residual (See Appendix III, Table 4).

A new linear regression analysis with removed outliers was performed on the basis of the full model. The results show that the model is valid (in ANOVA table p-value>0.05), it explains 66.9% of the variance of the dependent variable (R square) that is better than in the full model with outliers (59.4%) (See Appendix III, Table 5).

But regarding the influence of independent variables the results are worse: not only compatibility has an insignificant p-value (0.069), but also 3 other variables: preannouncing (0.035), information seeking*preannouncing (0.059) and relative advantage*observability (0.134) (See Appendix III, Table 6, 7).

Additive relationship between dependent and independent variables

The assumption was tested by adding a random interaction variable (relative advantage*information seeking) to the full model and examining the change in models' significance levels. The new model remained at the same level of significance (p-value=0.000), and the value of F (20.085) is even less than it was in the full model (21.246) (See Appendix III, Table 8). The conclusion is that random variable did not improve the model. Therefore the assumption was met.

Normality of residuals

The assumption was tested on the basis of Normal P-Plot of standardized residuals (See Appendix IV, Figure 2) and also on the shape of the distribution of residuals (See Appendix IV, Figure 3). In the first case points on normal P-plot do not substantially deviate from the diagonal line and in the second – distribution of residuals in general follow the shape of a normal curve. Therefore the assumption was met.

Collinearity

The assumption was tested on the basis of 3 statistics generated by SPSS: Tolerance, VIF (See Appendix III, Table 9) and Condition Index (See Appendix III, Table 10). The low limit of Tolerance is 0.30 (values higher are good), VIF value cannot exceed 10 and Condition Index cannot be higher than 30. Tolerance and VIF confirm that non-validity appears only as a result of the correlation between those variables that were included as interactions in models. From statistical point of view I expect that collinearity assumption was met.

Regarding condition index, all submodels are valid when main variables area analysed and non-valid in the part of interactions of variables.

Reliability analysis

The value of Cronbach's alpha is 0.840. Therefore it exceeds the minimum threshold of 0.70, and the conclusion is that constructs used for measuring variables are in good correlation (See Appendix III, Table 11).

Deleting the variables does not increase the Cronbach's alpha (the only exception is for preannouncing, 0.844) but the increase of 0.004 is insignificant (See Appendix III, Table 12).

Convergent and discriminant validity

Factor analysis (principal component analysis) identified 6 components from items of 8 variables: 5 components containing 1 variable and 1 component containing 3 variables (innovativeness, compatibility and relative advantage). Therefore there are no problems with convergent validity: all variables kept their items as parts of some specific component. But discriminant validity was violated in case of those 3 variables: respondents did not see the clear difference between the items as part of different constructs and perceive them as one single construct (See Appendix III, Table 13).

5. 2 Data analysis

In order to test the formulated hypotheses I used the technique of multiple regression analysis. At the first stage of the analysis variables were included according to the six main equations (six submodels), later an analysis of the same variables mixed with controlling factors was performed, and finally "robustness analysis" was used in order to compare the impact of the independent variables on a new dependent variable (likelihood of adoption of the innovation).

Table 14 Comparative analysis of the validity of six submodels

Submodels	R square	Significance (ANOVA based)
Submodel 1 (main independent variables)	0.476	0.000
Submodel 2 (main independent variables and moderators)	0.531	0.000
Submodel 3 (Submodel 2 plus "innovativeness * need for uniqueness" interaction)	0.561	0.000
Submodel 4 (Submodel 2 plus "information seeking * preannouncing" interaction)	0.541	0.000
Submodel 5 (Submodel 2 plus "relative advantage * observability" interaction)	0.536	0.000
Submodel 6 (full model: independent variables, moderators and all interactions)	0.594	0.000

All submodels are statistically valid since their p-value (ANOVA column) is less than 0.05, but the value of R square is practically at the limit, because the level of 0.50 is considered by many authors as minimal (Janssens, Winjen, De Pelsmacker, & Van Kenhove, 2008). The submodel 1 is even lower than accepted minimum, indicating that 4 main independent variables are not sufficient to characterize the causality. The best results are obtained in the case of full model with the highest R square (0.594).

Table 15 Impact of the independent variables

Independent variables	Submodel 1		Submodel 2		Submodel 3		Submodel 4		Submodel 5		Submodel 6	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Main independent variables												
Innovativeness	.06	.321	.09	.123	-.31	.028**	.10	.111	.09	.118	-.45	.002***
Need for uniqueness (NU)			.10	.203	-.48	.017**	.10	.204	.10	.213	-.70	.001***
Information seeking	.17	.003***	.07	.221	.08	.152	.55	.050**	.08	.189	.86	.002***
Preannouncing (P)			-.01	.879	-.03	.670	.44	.105	.00	.978	.70	.008***
Compatibility	.21	.028**	.09	.362	.080	.394	.10	.306	.08	.410	.08	.377
Relative advantage	.45	.000***	.37	.000***	.40	.000***	.38	.000***	.75	.022**	1.01	.001***
Observability (O)			.46	.000***	.45	.000***	.48	.000***	.80	.007***	.99	.001***
Interactions												
Innovativeness * NU					.13	.002***					.17	.000***
Information seeking * P							-.10	.082*			-.16	.005***
Relative advantage * O									-.10	.216	-.15	.050**

*p=0.01

**p=0.05

***p=.001

In submodel 1 (only main variables) three variables have a significant influence (p-value less than 0.05): information seeking, compatibility and relative advantage, and one variable is insignificant (innovativeness). A change by 1 unit in information seeking, compatibility and relative advantage will result in changing the innovation adoption by 0.165, 0.209 and 0.453 units respectively. This submodel confirms that the decision to select four main variables was correct (all independent variables have a positive influence on the rate of adoption), and the insignificance of innovativeness need to be studied more deeply.

In submodel 2 (main variables and moderators) two variables have a significant influence (p-value less than 0.05): relative advantage and observability, all others are insignificant. A change by 1 unit in relative advantage and observability will result in changing the innovation adoption by 0.368 and 0.462. The main conclusion from this submodel is that only observability, as a moderation variable influences the dependent variable, other 2

moderating variables do not have a direct impact on innovation adoption. Moreover, 2 main variables (information seeking and compatibility) became insignificant in this model.

In submodel 3 (main variables, moderation variables plus the interaction between innovativeness and need for uniqueness) four variables have a significant influence (p-value less than 0.05): innovativeness, need for uniqueness, relative advantage and observability. Information seeking, preannouncing and compatibility are insignificant. The interaction between innovativeness and need for uniqueness is significant: the p-value is 0.002.

A change by 1 unit in innovativeness and need for uniqueness will result in changing the innovation adoption negatively reducing it by 0.308, and 0.478 units respectively. At the same time, 1 unit increase in relative advantage and observability will lead respectively to an increase of 0.400 and 0.128 units in innovation adoption. Regarding the interaction, 1 unit increase in need for uniqueness lead to 0.128 units increase of impact of innovativeness on innovation adoption. This is a contradictory situation, taking into account the negative influence of both variables when taken separately.

In submodel 4 (main variables, moderation variables plus the interaction between information seeking and preannouncing) three variables have significant influence (p-value less than 0.05): information seeking 0.050, relative advantage 0.000, and observability 0.000. The rest of the variables are insignificant. A change by 1 unit in information seeking, relative advantage and observability will result in changing the innovation adoption by 0.550, 0.381 and 0.476 units respectively.

The interaction between information seeking and preannouncing is also insignificant as the p-value is higher than 0.05 (0.082) and is negative (preannouncing do not "help" "information seeking" to have a positive impact).

In submodel 5 (main variables, moderation variables plus the interaction between relative advantage and observability) two variables have a significant influence (p-value less than 0.05): relative advantage and observability. All the other variables are insignificant. A change by 1 unit in relative advantage and observability will result in changing the innovation adoption by 0.749, 0.799 units respectively.

The interaction between relative advantage and observability is also insignificant as the p-value is higher than 0.05 (0.216).

In submodel 6 (**main variables, moderation variables plus all three interactions)** all variables have a significant influence (p-value less than 0.05), except compatibility which is insignificant (0.377).

A change by 1 unit in innovativeness, need for uniqueness, information seeking, preannouncing, relative advantage and observability will result in changing the innovation

adoption by -0.446, -0.690, 0.856, 0.704, 1.013, 0.985, units respectively. One unit increase in the need for uniqueness will lead to an increase by 0.174 units the impact of innovativeness on the innovation adoption. One unit increase in the preannouncing will lead to a decrease by 0.163 units the impact of information seeking on the innovation adoption. One unit increase in observability will lead to a decrease by 0.147 units the impact of relative advantage of the innovation adoption.

5.3 Test of the hypotheses

H1a: Innovativeness of a person leads to a higher level of adoption of innovation.

This hypothesis is rejected, as according to the model 1 (that explains 47.6 % of the variance of the dependent variable) the influence is not significant; and according to the full model (that explains 59,4 % of the variance of the dependent variable) the influence is negative (although significant). Taking into account the discriminant invalidity of items of 3 variables (innovativeness, compatibility and relative advantage), other 2 having a significant impact (submodel 1), I suppose that discriminant invalidity is a source of errors that caused the rejection.

H1b: The effect of innovativeness on adoption of innovation is strengthened by need for uniqueness.

The hypothesis is accepted since the interaction of 2 factors (model 3) is positive (B=0.128) and significant.

H2a: Information seeking leads to a higher level of adoption of innovation.

The hypothesis is accepted since the influence of information seeking is positive and significant in model 1 and full model.

H2b: The effect of information seeking on adoption of innovation is strengthened by promotion effort (preannouncing) by the firm which is launching it.

The hypothesis is rejected since the increase of preannouncing leads to a negative impact in submodels 3 and 6 (-0.102 and -0.163, respectively) and the influence is insignificant in submodel 3 (0.082).

H3: Compatibility of innovation leads to a higher level of adoption of innovation.

The hypothesis is rejected, as the influence of compatibility is insignificant in the full model, despite the fact its influence is positive and significant in model 1. This probably can also be explained by the discriminant invalidity of 3 variables (innovativeness, compatibility and relative advantage-equation PCA).

H4a: A higher relative advantage of the innovation leads to a higher level of adoption of innovation.

The hypothesis is accepted since the influence of relative advantage is positive and significant.

H4b: The effect of relative advantage of the innovation is increased by observability of innovation and its characteristics.

The hypothesis is rejected since the increase of observability leads to a negative (-0.097) and insignificant (p-value = 0.216) impact of relative advantage on innovation adoption.

As a general conclusion, I could mention that main factors that influence the adoption of innovations are relative advantage of innovations and information seeking. The impact of innovativeness and compatibility is not significant, but this could be caused by their discriminant invalidity. Interactions with moderators (need for uniqueness, preannouncing and observability) have a negative impact on innovation adoption in all three cases.

5.4 Test of control factors

Four control variables were included in the analysis in order to test if there are differences between sample subgroups regarding innovation adoption: three personal characteristics (age, gender and educational level) and familiarity. All variables were included as one factor (controls) in each of six submodels.

Table 16 Impact of control factors

Independent variables	Submodel 1		Submodel 2		Submodel 3		Submodel 4		Submodel 5		Submodel 6	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Main independent variables												
Innovativeness	.04	.529	.07	.207	-.24	.095*	.08	.188	.08	.202	-.39	.008***
Need for uniqueness (NU)			.08	.335	-.39	.065*	.07	.362	.08	.336	-.63	.004***
Information seeking	.13	.019**	.05	.436	.06	.279	.55	.048**	.05	.391	.84	.003***
Preannouncing (P)			.01	.924	-.01	.945	.49	.072*	.02	.779	.73	.007***
Compatibility	.21	.027**	.09	.331	.09	.338	.10	.266	.08	.395	.09	.308
Relative advantage	.42	.000***	.35	.001***	.37	.000***	.36	.000***	.80	.013**	.97	.002***
Observability (O)			.43	.000***	.43	.000***	.45	.000***	.84	.004***	.96	.001***
Interactions												
Innovativeness * NU					.10	.018**					.15	.001***
Information seeking * P							-.11	.064*			-.16	.006***
Relative advantage * O									-.12	.134	-.15	.054*
Controls												
Age	.03	.280	.03	.310	.02	.502	.03	.299	.03	.278	.02	.531
Gender	-.11	.363	-.11	.337	-.04	.739	-.10	.364	-.12	.288	-.01	.940
Educational level	-.14	.113	-.12	.154	-.11	.188	-.14	.100*	-.11	.190	-.12	.140
Familiarity	.12	.007***	.10	.013**	.08	.049**	.10	.013**	.11	.009***	.08	.062*

*p=0.01

**p=0.05

***p=.001

The “familiarity” was the variable with the highest impact (significant in 4 models out of 6), that confirms a higher predisposition to adopt innovation for people with more knowledge and experience in the field. Regarding other variables it was found out a high level of homogeneity of the sample from the point of view of age, gender and education level (practically no models with significant influence).

5.5 Robustness analysis by using mean-centered independent variables

At this stage of the research, independent variables were mean-centered in order to obtain better significance of the predictors. At the same time, the scales that were used were not affected. As in the case of original data (See Table 15) all submodels were valid (ANOVA based significance), and all excepted submodel 1 reflect an acceptable level of causality (R square higher than 0.50).

Table 17 Comparative analysis of the validity of six submodels

(Independent variables – mean-centered)

Submodel	R square	Significance (ANOVA based)
Submodel 1 (main independent variables)	0.476	0.000
Submodel 2 (main independent variables and moderators)	0.531	0.000
Submodel 3 (Submodel 2 plus "innovativeness * need for uniqueness" interaction)	0.561	0.000
Submodel 4 (Submodel 2 plus "information seeking * preannouncing" interaction)	0.541	0.000
Submodel 5 (Submodel 2 plus "relative advantage * observability" interaction)	0.536	0.000
Submodel 6 (full model: independent variables, moderators and all interactions)	0.594	0.000

Compared with analysis with original data (See Table 15) no model registered considerable improvement of the results (See Table 18). Models without interactions were not affected at all (submodels 1 and 2) and model with interactions were not better regarding numbers of predictors with significant impact. Some positive aspects are related to the direction of influence: 2 important factors (innovativeness and need for uniqueness) changed the sign to positive that confirms hypothesis 1a.

Table 18 Impact of the independent variables

(Independent variables – mean centered)

Independent variables	Submodel 1		Submodel 2		Submodel 3		Submodel 4		Submodel 5		Submodel 6	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Innovativeness	.06	.321	.09	.123	.10	.080*	.10	.111	.09	.118	.11	.049**
Need for uniqueness (NU)			.10	.203	.10	.206	.10	.204	.10	.213	.09	.222
Information seeking	.17	.003***	.07	.221	.08	.152	.06	.280	.08	.189	.08	.152
Preannouncing (P)			-.01	.879	-.03	.670	-.04	.606	.00	.978	-.07	.397
Compatibility	.21	.028**	.09	.362	.080	.394	.10	.306	.08	.410	.08	.377
Relative advantage	.45	.000***	.37	.000***	.40	000***	.38	.000***	.36	.000***	.43	.000***
Observability (O)			.46	.000***	.45	.000***	.48	.000***	.44	.000***	.43	.000***
Innovativeness * NU					.13	.002***					.17	.000***
Information seeking * P							-.10	.082*			-.16	.005***
Relative advantage * O									-.10	.216	-.15	.050**

*p=0.01

**p=0.05

***p=.001

5.6 Robustness analysis by using the alternative dependent variable ("likelihood to adopt smart home")

Testing an alternative dependent variable was the final part of the further analysis of my research, and the selected variable was "likelihood to adopt smart home". This variable is more close to the final step of the consumer purchase process (actual purchase) compared to the "rate of adoption", and in such a way an eventual significant causality could be considered of higher quality from the marketing point of view.

Table 19 Comparative analysis of the validity of six submodels

(Dependent variable: likelihood to adopt smart home)

Submodel	R square	Significance (ANOVA based)
Submodel 1 (main independent variables)	0.380	0.000
Submodel 2 (main independent variables and moderators)	0.383	0.000
Submodel 3 (Submodel 2 plus "innovativeness * need for uniqueness" interaction)	0.386	0.000
Submodel 4 (Submodel 2 plus "information seeking * preannouncing" interaction)	0.383	0.000
Submodel 5 (Submodel 2 plus "relative advantage * observability" interaction)	0.387	0.000
Submodel 6 (full model: independent variables, moderators and all interactions)	0.389	0.000

All six submodels were valid, or causality is significant according to ANOVA analysis (p-value is less than 0.05), but the percentage explained by independent variables is less than 50% (R square less than 0.50) for all six submodels, that is insufficient for further deep analysis.

Table 20 Impact of the independent variables

(Dependent variable: likelihood to adopt smart home)

Independent variables	Submodel 1		Submodel 2		Submodel 3		Submodel 4		Submodel 5		Submodel 6	
	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.	B	Sig.
Innovativeness	.19	.096*	.20	.085*	.40	.149	.20	.085*	.20	.082*	.36	.218
Need for uniqueness (NU)			-.08	.597	.21	.592	-.08	.597	-.08	.580	.15	.727
Information seeking	.27	.007***	.27	.018**	.27	.020**	.39	.476	.28	.015**	.28	.624
Preannouncing (P)			.12	.430	.13	.393	.23	.661	.15	.353	.15	.780
Compatibility	.53	.003***	.54	.004***	.55	.004***	.54	.004***	.53	.005***	.53	.005***
Relative advantage	.24	.199	.23	.246	.21	.284	.23	.242	.84	.181	.76	.241
Observability (O)			-.05	.827	-.04	.843	-.04	.840	.50	.385	.44	.452
Innovativeness * NU					-.07	.424					-.05	.554
Information seeking * P							-.03	.828			.00	.997
Relative advantage * O									-.16	.303	-.14	.373

*p=0.01

**p=0.05

***p=.001

Analysis of significance of the impact of independent variables confirms the above-mentioned conclusion – only “compatibility” being significant for all six submodels and only submodel 1 having half of the dependent variables significant. Because this model does not explain much variance, we treat the original results (with the other dependent variable) as the final test of our hypotheses.

6. Conclusion

6.1 General conclusion

I suggested a conceptual map of innovation adoption in order to examine and find out which particular variables and interactions have more influence on innovation adoption. 156 participants took part in my quantitative research. I tested which of the variables like innovativeness, information seeking, compatibility and relative advantage influence more innovation adoption. Moreover, I analyzed how need for uniqueness moderates innovativeness, preannouncing moderates information seeking and observability moderates relative advantage. In order to test my conceptual model I implemented various regression analyses: standard and adding control variables. In addition, I performed two types of robustness analyses by mean-centering independent variables and changing the dependent variable.

I determined that from the main variables (innovativeness, information seeking, compatibility and relative advantage) all the variables are significant and have a positive effect on rate of adoption besides innovativeness that needs to be studied more profoundly. Besides, only observability as a moderation variable influences rate of adoption, other two moderation variables (need for uniqueness and observability) do not have a direct impact on innovation adoption. The interaction between innovativeness and need for uniqueness is significant.

In conclusion, four out of seven hypotheses are accepted, meaning that the effect of innovativeness on innovation adoption is strengthened by the need for uniqueness; information seeking leads to a higher level of innovation adoption and higher relative advantage of the innovation leads to a higher level of innovation adoption.

Regarding the control variables (age, gender, education level and familiarity) familiarity was the variable with the highest impact that confirms a higher predisposition to adopt innovations for people who have more knowledge and experience in the field of smart home.

Mean-centering the independent variables gave the possibility to change the sign for innovativeness and need for uniqueness to positive. These bring about the final result which confirms that innovativeness of a person leads to a higher level of innovation adoption.

6.2 Academic contribution and managerial implications

My research has the aim to fill the gap in the academic literature of innovation adoption in concrete context of smart home as now it is quite new and not well research field. By suggesting the conceptual map of consumer characteristics and adoption intentions for smart home my paper adds to the previous research of Arts et al. (2011). This paper provides theoretical contribution by researching the theme of innovation adoption in the context of smart

home. The results of my research imply that not all personal characteristics and innovation adoption factors have the same importance while explaining innovation adoption.

The results of this study provide some interesting thoughts for marketing managers, developers of new revolutionary products and businesses on how consumers adopt new products.

First, my research confirms that consumers who are considered to be more innovative are more predisposed to accept innovative products, which are perceived to be a good fit for them and their needs. I suggest that particularly these consumers should be addressed by marketers firstly in order to increase innovation adoption as they are early adopters and may inspire other consumers to adopt quickly and easily. Moreover, the findings of the research suggest that the effect of innovativeness on innovation adoption is strengthened by the need for uniqueness. I propose managers to emphasize, at least at the early stages of innovation launching, that innovation and in particular smart home, is one of the best options to show their uniqueness as they have the possibility to arrange everything in a unique way that nobody else can copy.

Second, taking into account the research findings that the more familiar an innovative product is, the better it is accepted, it is important to target not only early adopters (that are also intensive information seekers) but also other, more passive categories of potential consumers. There is a long way for the marketers to educate, explain and show potential consumers that smart home technologies are not their costly enemies, but on the opposite, are created to make consumers' life easier, they should emphasize all the benefits it can bring to their everyday life. I recommend marketers to use more segment-oriented or even personalized information channels in order to make customers familiar with innovations.

Third, the chances of innovations to be accepted are higher if they offer something different than already exists on the market, or have distinctive relative advantages. The proportion of rational and emotional components in the consumer behavior are different for different goods, and marketers should find the exact attributes (characteristics) of the innovation that are important for the target market. As for now, consumers consider smart home to be a high-complexity product and "certain features of these products frustrate and overwhelm consumers" (Fournier et al. 1998).

6.3 Limitations and future research

At different stages of the research project some limitations have been identified. At the same time some related to limitations future research directions can be outlined.

First, in my research I tested only some of the personality traits which I considered more relevant to the influence on innovation adoption in the case of smart homes. Other traits like technophobia, skepticism or consumer resistance to accept technological innovations could be

taken into account. At the same time, some factors like perceived risks, privacy violations and increased costs would be a fruitful venue for the future research, depending on the product.

Second, some independent variables consisted of items that were perceived by respondents as quite similar and as a result several constructs (three variables: innovativeness, compatibility and relative advantage) were not sufficiently differentiated. For the future research, preliminary small research (exploratory research) for testing discriminant validity and other assumptions of linear regression would represent good practice.

Third, Likert scale used in the questionnaire permitted to include the respective variables in the linear regression analysis, but taking into account a significant diversity of items (questions), the problem of uniformity of this scale appeared. Mean-centering of independent variables confirmed this presupposition and important findings regarding two variables (innovativeness and need for uniqueness) were obtained. In my opinion, this aspect needs more in-depth statistical analysis and for the future research it has to be taken into consideration.

Fourth, my research was based on a survey as a source of primary data and had the main objective the estimation of influence of factors on adoption of innovation in general and smart homes in particular. Future research could be more specialized on smart homes and oriented to identification of some "bundles" of attributes (potential market offers) preferred by customers. As a research method in such case could serve the choice models. Findings of such research would permit to elaborate more customer tailored market offers that would be more quickly accepted by different market segments.

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Appendix I

Questionnaire

Dear Participant:

My name is Daniela Timbaliuc and I am a Marketing Master student at Erasmus School of Economics. As part of my Master Thesis, I am researching on the Innovation Adoption topic. I invite you to participate in this research study by completing the following survey. The questionnaire will take approximately 5-7 minutes to complete. Please carefully read all the questions and possible answers. Your answers and results are confidential and will be only used for research purposes. The collected data will provide me with useful information regarding innovation adoption and will help me complete my thesis research. Thank you for your participation.

Sincerely,
Daniela

But first, let me introduce the concept of smart home. A "smart home" can be described as a place of living supplied with computing and information technology which forecasts and reacts to the needs of the inhabitants, in order to make their life more comfortable, convenient, secure, economic and fun by the use of technology within the house and outdoors (Harper, 2003).

Innovativeness is the general predisposition of the customer to adopt a new product.

1. Please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
In general, I am among the first in my circle of friends to buy an innovative product when it appears	○	○	○	○	○	○	○
If I heard that an innovative product was available in the store, I would be interested enough to buy it	○	○	○	○	○	○	○
Compared to my friends, I own a lot of innovative products	○	○	○	○	○	○	○

Need for uniqueness is an individual's desire to be different from the others that can be accomplished by using goods that build up one's personal and social identity.

2. Please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Often, when buying a product, an important goal for me is to find something that communicates my uniqueness	○	○	○	○	○
I actively seek to develop my personal uniqueness by buying special products and brands	○	○	○	○	○
I am often on the lookout for new products or brands that will add to my personal uniqueness	○	○	○	○	○

Information seeking is occurring when an individual is willing to search for information about innovations or new products.

3. Please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
I often seek out information about new products and brands	○	○	○	○	○	○	○
I like to go to places where I will be exposed to information about new products and brands	○	○	○	○	○	○	○
I frequently look for new products and services	○	○	○	○	○	○	○

I am continually seeking new product experiences	○	○	○	○	○	○	○
When I go shopping, I spend a lot of time checking out new products and brands	○	○	○	○	○	○	○

Preannouncing is done by the firm in order to provide pre-launch information about a new product.

4. Please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Preannouncing is used to identify new consumers	○	○	○	○	○	○
Preannouncing is used to begin building customer awareness	○	○	○	○	○	○
Preannouncing is used to encourage word-of-mouth advertising among potential customers	○	○	○	○	○	○
Preannouncing is used to make sales take off faster when the product is introduced	○	○	○	○	○	○

Compatibility is the degree to which the innovation fits with the potential adopters' demand and believes.

5. Please indicate to what extent do you agree with the following statements:

	Totally agree	Agree	Neutral	Disagree	Totally disagree
The concept of smart home is compatible with all aspects of my life	○	○	○	○	○
Smart home would fit into my life/work style	○	○	○	○	○

Relative advantage represents the benefits of the innovation in comparison with similar offers, pointing out to potential adopter the inner thoughts to make it desirable.

6. Please indicate your level of agreement with the following statements:

	Totally agree	Agree	Neutral	DIsagree	Totally disagree
Using smart home features in my life/work would increase my productivity	○	○	○	○	○
Smart home increases the quality of output	○	○	○	○	○

Observability gives the customer the possibility to assess more efficiently the advantage that the innovation can provide.

7. Please indicate to what extent do you agree with the following statements:

	Totally agree	Agree	Neutral	Disagree	Totally disagree
I would have no difficulty telling others about the results of using smart home	○	○	○	○	○
I believe I could communicate to others the consequences of using smart home	○	○	○	○	○
The results of using smart home are apparent to me	○	○	○	○	○

The rate of adoption represents the relative speed with which an innovation is adopted by customers.

8. Please indicate your level of agreement with the following statements:

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
I feel quite certain of the benefits I could expect to get if I adopted smart home	○	○	○	○	○	○	○
I am quite sure of what the relevant trade-offs are among the costs and benefits of buying and using smart home	○	○	○	○	○	○	○
I will have to change my behavior significantly to attain the potential benefits of smart home	○	○	○	○	○	○	○
Using smart home would allow me to do things that I can not easily do now	○	○	○	○	○	○	○

Familiarity represents the overall amount of information that people have about an object.

9. Please indicate how familiar you are with a smart home:

Very familiar	○ ○ ○ ○ ○ ○ ○	Not at all familiar
Very experienced	○ ○ ○ ○ ○ ○ ○	Not at all experienced
Very knowledgeable	○ ○ ○ ○ ○ ○ ○	Not at all knowledgeable
Very informed	○ ○ ○ ○ ○ ○ ○	Not at all informed

If a plan is personally relevant, the consumer will judge its **likelihood** of success by mental simulation of the plan.

10. Please indicate how likely you are to adopt smart home:

Very likely ○ ○ ○ ○ ○ ○ ○ Not likely at all

11. What is your age?

12. What is your gender?

Male

Female

13. What is your education level?

Bachelor student

Master student

Other

Appendix II

Table 1

Adapted items and measurement scales

1. Innovativeness (Goldsmith & Hofacker, 1991), independent variable
Indicate your level of agreement with the following statements: a) In general, I am among the first in my circle of friends to buy an innovative product when it appears b) If I heard that an innovative product was available in the store, I would be interested enough to buy it c) Compared to my friends, I own a lot of innovative products
(7 - strongly agree – 6 – 5 – 4 – 3 – 2 – 1 - strongly disagree)
2. Need for uniqueness (Tian et al. 2001), independent variable
Indicate your level of agreement with the following statements: a) Often, when buying a products, an important goal for me is to find something that communicates my uniqueness b) I actively seek to develop my personal uniqueness by buying special products and brands c) I am often on the lookout for new products or brands that will add to my personal uniqueness
(5 - strongly agree, 4 - agree, 3 - neutral, 2 - disagree, 1- strongly disagree)
3. Information seeking (Manning et al. 1995), moderation variable
Indicate your level of agreement with the following statements: a) I often seek out information about new products and brands b) I like to go to places where I will be exposed to information about new products and brands c) I frequently look for new products and services d) I am continually seeking new product experiences e) When I go shopping, I spend a lot of time checking out new products and brands (reverse scoring)
(7 - strongly agree – 6 – 5 – 4 – 3 – 2 – 1- strongly disagree)
4. Preannouncing (Eliashberg & Robertson, 1988), moderation variable
Indicate your level of agreement with the following statements: a) Preannouncing is used to identify new consumers b) Preannouncing is used to begin building customer awareness c) Preannouncing is used to encourage word-of-mouth advertising among potential customers d) Preannouncing is used to make sales take off faster when the product is introduced

(6 - strongly agree – 5 – 4 – 3 – 2 – 1- strongly disagree)
5. Compatibility (of smart home) (Van Ittersum & Feinberg, 2010), independent variable
To what extent do you agree with the following statements: a) The concept of smart home is compatible with all aspects of my life b) Smart home would fit into my life/work style
(5-totally agree, 4-agree, 3-neutral, 2-disagree, 1-totally disagree)
6. Relative advantage (Van Ittersum & Feinberg, 2010), independent variable
Indicate your level of agreement with the following statements: a) Using smart home features in my life/work would increase my productivity b) Smart home increases the quality of output
(5 - totally agree, 4 - agree, 3 - neutral, 2 - disagree, 1- totally disagree)
7. Observability (Van Ittersum & Feinberg, 2010), moderation variable
To what extent do you agree with the following statements: a) I would have no difficulty telling others about the results of using smart home b) I believe I could communicate to others the consequences of using smart home c) The results of using smart home are apparent to me
(5 - totally agree, 4 - agree, 3 - neutral, 2 - disagree, 1- totally disagree)
8. Rate of adoption (Alexander, Lynch, and Wang, 2008), dependent variable
Indicate your level of agreement with the following statements: a) I feel quite certain of the benefits I could expect to get if I adopted smart home (reverse coded) b) I am quite sure of what the relevant trade-offs are among the costs and benefits of buying and using smart home (reverse coded) c) I will have to change my behavior significantly to attain the potential benefits of smart home d) Using smart home would allow me to do things that I can not easily do now
(5 - strongly agree, 4 - agree, 3 - neutral, 2 - disagree, 1- strongly disagree)
9. Age, control variable
(I used standardized score of age)
10. Gender, control variable
0-"male", 1-"female"
11. Education, control variable
1-"Bachelor student", 2-"Master student", 3-"Other"
12. Familiarity, (Machleit, Allen, & Madde, 1993); (Mariconda & Lurati, 2015), control

variable
How familiar are you with a smart home? a) Very familiar/Not at all familiar b) Very experienced/Not experienced c) Very knowledgeable/Not knowledgeable d) Very informed/Not at all informed
7 – very familiar/experienced/knowledgeable/informed, 1 – not at all familiar/experienced/knowledgeable/informed
13. Likelihood, (Gülden & Manoj, 2013), control variable
Please indicate how likely you are to adopt smart home
(7 – very likely – 6 – 5 – 4 – 3 – 2 – 1 – not likely at all)

Appendix III

Table 2

Harman's test for full model

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.601	50.922	50.922	5.601	50.922	50.922
2	1.459	13.259	64.181			
3	1.180	10.729	74.910			
4	.856	7.785	82.695			
5	.693	6.303	88.998			
6	.497	4.517	93.515			
7	.373	3.395	96.910			
8	.299	2.719	99.629			
9	.021	.194	99.823			
10	.013	.116	99.939			
11	.007	.061	100.000			

Table 3

Data of the respondents

Demographic variable and category	**Number**	**%**
Gender		
Male	51	32.69%
Female	105	67.31%
Age		
Mean	23.65	
Min	18	
Max	36	
Occupation		
Bachelor student	62	39.74%
Master student	82	52.56%
Other	12	7.7%

Table 4

Casewise Diagnostics[a]

Case Number	Std. Residual	Rate_of_ADOP	Predicted Value	Residual
11	-2.123	3.25	4.5666	-1.31656
85	-2.023	2.25	3.5047	-1.25467
130	-2.520	3.75	5.3132	-1.56318
137	-2.448	4.25	5.7686	-1.51864
152	-2.387	3.25	4.7307	-1.48067
154	-2.994	3.75	5.6069	-1.85693

Table 5

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.818[a]	.669	.645	.53609

a. Predictors: (Constant), R_A_x_Observ, Preannouncing, Need_for_uniq, Info_seeking, Innovativeness, Compatibility, Observability, Relative_advantage, Innov_X_NU, Inf_seek_X_P

b. Dependent Variable: Rate_of_ADOPTION

Table 6

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	80.611	10	8.061	28.049	.000[b]
	Residual	39.948	139	.287		
	Total	120.559	149			

a. Dependent Variable: Rate_of_ADOPTION

b. Predictors: (Constant), R_A_x_Observ, Preannouncing, Need_for_uniq, Info_seeking, Innovativeness, Compatibility, Observability, Relative_advantage, Innov_X_NU, Inf_seek_X_P

Table 7

Coefficients[a]

Unstandardized Coefficients		Standardized	T	Sig.
B	Std. Error	Beta		
-1.498	1.450		-1.033	.303
-.315	.123	-.471	-2.556	.012
-.472	.180	-.445	-2.622	.010
.539	.253	.748	2.133	.035
.395	.241	.319	1.636	.104
.147	.080	.140	1.831	.069
.793	.273	.677	2.905	.004
.834	.245	.544	3.399	.001
.128	.036	1.006	3.511	.001
-.099	.052	-.845	-1.901	.059
-.099	.065	-.480	-1.508	.134

Table 8

New model with random interaction variable

ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	83.212	11	7.565	20.085	.000[b]
	Residual	54.234	144	.377		
	Total	137.447	155			

a. Dependent Variable: Rate of ADOPTION

b. Predictors: (Constant), RA_x_Inf_Seeking, Preannouncing, Observability, Need_for_uniq, Compatibility, Innovativeness, Relative_advantage, Info_seeking, Innov_X_NU, R_A_x_Observ, Inf_seek_X_P

Table 9

Colinearity statistics: Tolerance (T) and VIF

Independent variables	Submodel 1		Submodel 2		Submodel 3		Submodel 4		Submodel 5		Submodel 6	
	T	VIF	T	VIF	T	VIF	T	VIF	T	VIF	T	VIF
Innovativeness	.475	2.103	.443	2.259	.076	13.07	.442	2.261	.442	2.260	.070	14.23
Need for uniqueness (NU)			.642	1.558	.094	10.63	.642	1.558	.642	1.558	.085	11.73
Information seeking	.644	1.553	.505	1.979	.504	1.985	.022	44.96	.502	1.990	.021	48.66
Preannouncing (P)			.816	1.225	.810	1.234	.070	14.23	.800	1.251	.066	15.08
Compatibility	.460	2.175	.414	2.413	.414	2.414	.413	2.422	.412	2.425	.410	2.436
Relative advantage	.531	1.882	.486	2.056	.481	2.078	.483	2.069	.047	21.48	.044	22.50
Observability (O)			.638	1.568	.637	1.569	.634	1.576	.093	10.73	.091	11.04
Innovativeness * NU					.033	30.04					.030	33.50
Information seeking * P							.013	74.45			.012	80.30
Relative advantage * O									.024	41.74	.023	43.27

Table 10

Collinearity diagnostics: Condition Index

Independent variables	Submodel 1	Submodel 2	Submodel 3	Submodel 4	Submodel 5	Submodel 6
Innovativeness	1.000	11.003	7.657	9.900	11.399	8.310
Need for uniqueness (NU)		13.237	13.973	12.448	12.163	11.373
Information seeking	9.800	14.303	14.498	14.836	15.111	13.890
Preannouncing (P)		19.370	20.369	18.726	16.996	17.378
Compatibility	11.432	22.680	23.956	21.342	22.498	23.080
Relative advantage	15.991	24.303	25.652	25.222	24.909	24.793
Observability (O)		31.677	30.094	32.016	29.537	29.902
Innovativeness * NU			71.914			77.985
Information seeking * P				149.763		133.353
Relative advantage * O					131.239	177.008

Table 11

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.840	.849	8

Table 12

Item-Total Statistics

	Scale Mean if	Scale Variance	Corrected Item-	Squared	Cronbach's
Innovativeness	29.1034	17.855	.676	.565	.812
Need_for_uniq	30.3897	22.120	.557	.365	.824
Info_seeking	28.8761	18.995	.607	.500	.821
Preannouncing	28.8475	24.178	.357	.184	.844
Compatibility	29.8652	21.156	.673	.588	.810
Relative_advantage	29.8491	22.087	.647	.554	.816
Observability	29.6077	23.963	.515	.428	.832
Rate_of_ADOPTION	28.6552	20.627	.676	.531	.808

Table 13

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Innovativeness_1	.524	.601	.226	-.060	.024	.023
Innovativeness_2	.479	.564	.321	-.112	-.090	.035
Innovativeness_3	.526	.586	.111	.009	-.135	.080
Need_for_uniqueness_1	.214	.193	.718	.150	.002	.133
Need_for_uniqueness_2	.176	.260	.764	.128	.000	-.009
Need_for_uniqueness_3	.309	.179	.763	.082	.058	.139
Information_seeking_1	.764	.065	.177	.061	.226	.154
Information_seeking_2	.745	.017	.215	.097	.226	.206
Information_seeking_3	.850	.133	.060	.161	.093	.150
Information_seeking_4	.839	.202	.151	.122	.060	.034
Information_seeking_5	.697	.153	.150	.168	.118	-.075
Preannouncing_1	.052	.137	.265	.447	-.077	.274
Preannouncing_2	.231	.091	.119	.771	.054	-.084
Preannouncing_3	.109	.099	.057	.822	.064	-.005
Preannouncing_4	.038	.005	.010	.744	.123	.052
Compatibility_1	.098	.797	.154	.013	.257	.048
Compatibility_2	.149	.788	.174	.133	.275	.040
Relative_advantage_1	-.038	.701	.174	.193	.247	.180
Relative_advantage_2	.108	.691	.160	.184	.087	.356
Observability_1	.227	.174	-.012	.107	.800	.152
Observability_2	.089	.186	.132	.030	.869	.037
Observability_3	.250	.348	-.163	.136	.559	.247
Rate_of_adoption_1	.350	.477	-.157	.181	.355	.413
Rate_of_adoption_2	.177	.380	-.069	.154	.093	.679
Rate_of_adoption_3	.061	.012	.347	-.160	.194	.654
Rate_of_adoption_4	.182	.493	.243	.086	.181	.492

Appendix IV

Figure 2

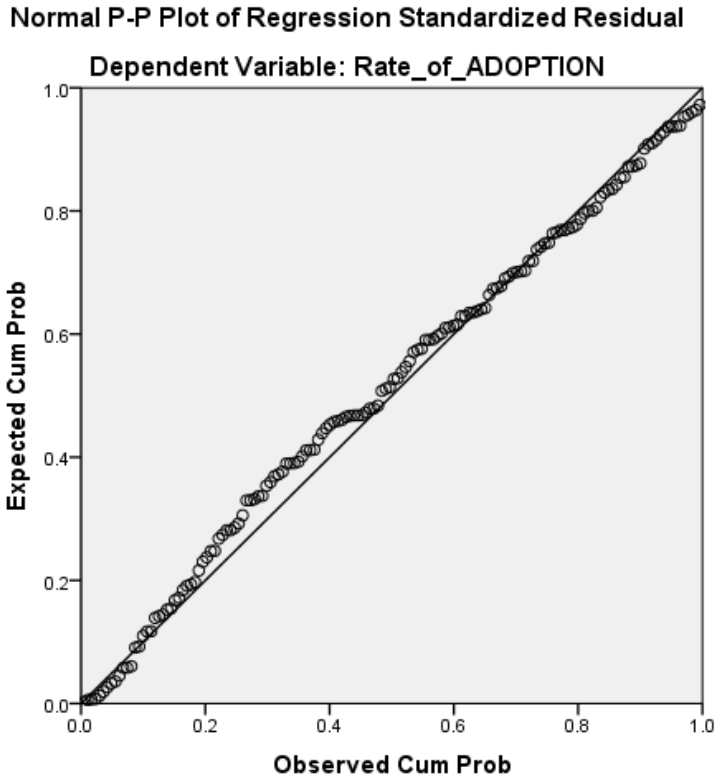

Figure 3