MASTER THESIS

Adoption of IoT at home in Indonesia

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ABSTRACT

The adoption of Internet of Things (IoT) has been investigated by many studies, but not with the adoption of IoT at home, specifically in the developing country, such as Indonesia. As the fourth biggest population in the world and the highest economy in Southeast Asia, Indonesia has a significant potential to bring interest in market adoption of IoT. Hence, this study examines the factors influence this adoption. Using UTAUT and TTF model, combined with additional variables, namely personal innovativeness, perceived risk and trust, this study surveyed 294 Indonesian respondents and quantitatively analyzed the influence of each variable to the intention to adopt. The multiple regression analysis was performed to find the most suited model predicting the dependent variable. Results suggest that the highest factor to drive intention to adopt IoT at home is trust, followed by performance expectancy, social influence, facilitating conditions, personal innovativeness and age. While UTAUT argues that performance expectancy is the strongest determinant to influence adoption, this study demonstrates that by adding trust, this argument will change. At last, novel insights and key recommendations to marketers, such as establishing trust to the company and to the product, as well as the suggestion to develop the technology adoption model are presented in this study.

Keywords: UTAUT, technology acceptance, technology adoption, IoT at home, Indonesia

1. INTRODUCTION

Smart home technology had been created before the invention of the internet. In 1933, "Chicago World's Fair: A Century of Progress Home Planning Group" featured the technological innovations in modern building materials, architecture and interior designs (Brooks, 2018). One of the exhibitions was a modern look-like house named Century Homes "House of Tomorrow". The house which was made of steel and glass rounded out by electric doors. Later in 1950, Emil Mathias of Jackson-Michigan invented the interconnected home system which was known as Push-Button Manor (Railton, 1950). Mathias created some home devices that can be controlled by only pressing a button, such as drowning the curtains or turning on/off the radio in the living room from the button in the bedroom. He also created the automation system for the radio by each scheduled-time, the burglar alarm in a particular condition and the remotely-opened garage doors. Thereafter in 1999, Microsoft envisioned a futuristic smart home by introducing devices with biometric authentication for home entry, mobile location tracking, voice recognition action, smart grocery scanning and other smart appliances.

The advancement of smart homes is nowadays apparent by utilizing a technology called the Internet of Things (IoT). IoT is the condition of devices connected one another through the internet. In a world with IoT, devices at home can be connected and communicated intelligently (Lo & Campos, 2018). Devices which work based on IoT are growing in numbers since the high speed of internet widely is accessible in most of the human locality, Wi-Fi is built into more devices and smartphone is adopted by an increasing number of users (Freemantle & Scott, 2017).

Smart homes serve consumers effectively by communicating various digital devices within IoT (Alaa et al., 2017). Smart home technology makes all electronic equipment around the home act "smart" or more automated. Smart home has the automatic systems to operate lighting, temperature control, security (Sripan, Lin, & Petchlorlean, 2012) and other home appliances (Parag & Butbul, 2018).

The adoption of smart home devices has been spread to many countries in the world. Globally in 2017, countries with the robust market adoption in the smart home industry were United States (with total revenue of US$16.2 billion), Europe (with total revenue of US$8.3 billion) and China (with total revenue of US$4.1 billion). The rest of the world harvested US$6.5 billion from smart-home products sales (Statista, 2018). The growth of smart home adoption globally was supported by the internet and smartphone penetration.

1.1. SMART HOME ADOPTION IN INDONESIA

Indonesia is a country in Southeast Asia between the Indian and Pacific Oceans. Indonesia comprises more than 12,000 islands with the total area of 9.8 million square kilometers (Kurnia, 2006). The World Bank stated that Indonesia has the fourth biggest population in the world, with a total of 263 million people. Moreover, as the largest economy in Southeast Asia, Indonesia's GDP per capita has been steadily rising, from $857 in the year 2000 to $3,603 in 2016 (The World Bank, 2018).

Talking about the Internet of Things, Indonesia has high internet penetration. Indonesia has one of the biggest online markets worldwide. In 2017, more than 104 million people in Indonesia were connected to the internet (Statista, 2018). Indonesian people use the internet mostly for mobile messaging and social media. Although the penetration of internet is high, Indonesian people seem not familiar enough with IoT nor smart homes. Research showed that the adoption of smart home technology in Indonesia was still very low due to the high price factor (Adriansyah & Dani, 2014).

In Indonesia by the year 2018, the total smart home products used in households was 0.7 million, consisting of control and connectivity, security, home entertainment, energy management, smart appliances, comfort and lighting (Statista, 2018). This number is predicted to grow up to 3.9 million products in 2022. The revenue generated from smart homes in 2018 in Indonesia reached €159 million and will get multiplied around six times in 2022, which is predicted to €1.049 billion (Statista, 2018).

On behalf of the Indonesian government, Ministry of Communication and Information Technology supported the adoption of smart home and smart city in Jakarta, the capital city of Indonesia, by providing the fast internet connection 5G in Jakarta. This collaboration was executed with one Indonesian-based mobile telecommunications company in Indonesia, XL Axiata (Kominfo, 2018).

With the significant potential of a growing community in Indonesia, various industrial analyses from Acatech, Cisco, Ericsson, IDC and Forbes identified that IoT embedded in smart devices, forming a smart web of everything, as one big concept to support societal changes and economic growth (Vermesan & Friess, 2014). The adoption of smart devices in Indonesia also brings hope to the development of society and economy.

1.2. PHILIPS HUE

An example of IoT product at home is Philips Hue, the smart and energy-efficient LED light for homes, produced by Dutch manufacturing company Philips Lighting (Philips Lighting changed their name to Signify in May 2018; continues to use brand Philips[1]). Philips Hue was launched by Philips Lighting in 2012. Philips Hue is the primary discussion in this study and chosen as the example of IoT product at home since it was the most popular smart home device in Indonesia (CNN Indonesia, 2018).

Philips Hue's kit consists of bridge, lights and smart control (see Figure 1.1). By using Philips Hue, users can control their home lighting from smartphones, wherever they are. The tasks that can be done with Philips Hue are setting brightness, creating light timers, changing light colors and setting daily routines of home lights ("About Hue", 2018). Philips Hue also can be controlled by sending voice through any smart home hub, such as Amazon Alexa, Apple Home-Kit, Google Assistant or Cortana by Microsoft.

FIGURE 1-1 PHILIPS HUE'S KIT

[1] Philips Lighting is now Signify, 2018, https://www.signify.com/en-gb/about/news/press-releases/2018/20180516-philips-lighting-is-now-signify

In Indonesia, Philips Hue has been introduced to the market since 2012. Again, in November 2016, Philips Indonesia conducted a 4-day event "Philips Lighting Week Jakarta" to particularly emphasize on the innovation of Philips Hue for Indonesian market ("Find Philips HUE in Philips Lighting Week", 2018). Since then, there have been many reviews of Philips Hue on the internet, mentioning that Philips Hue was worth to buy as home security while traveling (Anastasia, 2016), as a convenient way to control light with the internet advancement (Somantrie, 2016), or to support productivity while working (Nyonyamalas, 2016).

After promoting Philips Hue in Indonesia since 2016, the Business Planning Manager of Home Luminaries Signify in Greater China and APAC mentioned that Indonesian market was underperforming versus other countries in the market region, concerning sales and technology adoption (Oh, 2018).

This research mainly addresses the solution to this issue; understanding what factors drive Indonesian consumers to adopt Philips Hue. The intention to adopt IoT products at home, specifically smart lighting, could be induced by some factors; one of those is perceived benefit. The devices of IoT at home help users to earn benefits related to energy conservation, healthcare, cost diminishment of basic needs, entertainment and comfort (Alaa, Zaidan, Zaidan, Talal, & Kiah, 2017). The perceived benefit is a good standing point to get an early understanding of the intention to adopt Philips Hue at home. In this study, perceived benefit is included in the UTAUT variable, which is called performance expectancy.

Contradictory to the positive remark mentioned above, challenges of using the smart home products are also experienced by consumers. Studies have confirmed that barriers adopting IoT at home include cost, privacy, security, reliability and the interoperability of different technologies (Wilson, Hargreaves, & Hauxwell-Baldwin, 2017). These adoption barriers are included accordingly in the variables of this study, such as facilitating conditions, perceived risk and trust.

1.3. Research Question

Although smart homes are not thoroughly perfect which could be seen from the positive and negative perspectives mentioned above, there are still consumers adopting IoT products at their homes. This fact is supported by the statement that 0.7 million smart home products were being used by people in Indonesia (Statista, 2018). Since Philips Hue is the popular smart home product in Indonesia (CNN Indonesia, 2018), we could specify Philips Hue as the example of the IoT product at home. Hence, a following research question is proposed:

What factors influence consumers in Indonesia to adopt IoT product, i.e., Philips Hue, at home?

In order to answer a research question above, this research builds the theoretical foundations from Theory of Acceptance and Use of Technology (UTAUT) and Task-Technology Fit (TTF) with the addition of other variables, i.e., personal innovativeness, perceived risk, trust and demographic characteristics. Afterwards, in the analysis section, a model will be developed to test the variables predicting intention to adopt IoT product at home.

2. Theoretical Framework

UTAUT is the primary theory used in this research which will be extended by including TTF and additional variables, namely personal innovativeness, perceived risk, trust and demographic characteristics, such as age, gender, experience with smart home and the total of family members at home.

UTAUT is chosen as a theoretical foundation since UTAUT is the latest theory developed in the Information System field (in 2003) and encompassed the adoption of technology generally. The Technology Acceptance Model (TAM) also studies technology adoption, but TAM's scope is a subset of UTAUT; both predict and explain the usage of technology. UTAUT covers both voluntary and involuntary usage of technology, while TAM only addresses voluntary usage (Moody, Iacob, & Amrit, 2010).

TTF is incorporated to the theoretical framework since this model argues that the adoption of new technology is dependent on the characteristics which fulfill the desired task (Abbas et al., 2018). TTF explains the consumers' needs or desired tasks, hence will be related to Performance Expectancy, which is the strongest predictor to behavioral intention in UTAUT (Venkatesh, Morris, Davis, & Davis, 2003). The evaluation of combining the task and technology characteristics to get a fit between these two constructs is the main idea of TTF. Therefore, TTF will be included in addition to UTAUT to develop the theoretical concept.

2.1. Unified Theory of Acceptance and Use of Technology

UTAUT is the unified model that integrates elements across eight models including the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behaviour, a model combining the technology acceptance model and the theory of planned behaviour, the model of personal computer utilization, the innovation diffusion theory and the social cognitive theory (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT aims to explain the users' intention to use a technology and their subsequent usage behaviour (Oliveira, Faria, & Thomas, 2014), by proposing four main constructs as direct determinants of behavioural intention, which are performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT also argues that moderators, such as gender, age, experience and voluntariness of use influence the behavioral intention. The complete figure of UTAUT is shown in Figure 1 below.

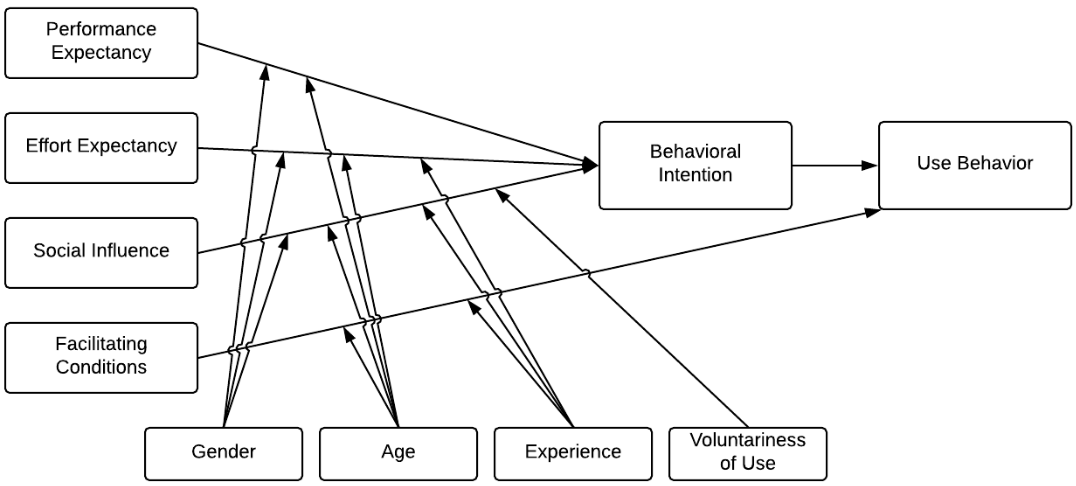

Figure 2-1 UTAUT Model by Venkatesh et al. (2013)

2.1.1. *PERFORMANCE EXPECTANCY*

Performance expectancy (PE) is the degree to which users believe that using the technology will help them to get gains in job performance (Venkatesh, Morris, Davis, & Davis, 2003). PE is the most critical factor influencing consumer to adopt the technology (Oliveira, Faria, & Thomas, 2014). PE comes from five constructs in the preceding theories before UTAUT, including perceived usefulness (the degree to which extent users believe that using a system would enhance their job performance), extrinsic motivation (the perception that users will get value outcomes), job-fit (the capabilities of a system enhance job performance), relative advantage (the degree to which using an innovation is perceived better than its precursor) and outcome expectations (the positive consequences of the behaviour) (Venkatesh, Morris, Davis, & Davis, 2003). These constructs explain that performance expectancy includes all functions of the technology to support users do certain jobs. In the case of this study, when users find the performance expectancy to Philips Hue is positive, it will lead to the higher intention to adopt Philips Hue.

Therefore, this research formulates the following hypotheses.

H1. Performance expectancy positively influences the intention to adopt IoT at home.

2.1.2. *EFFORT EXPECTANCY*

Venkatesh et al. (2003) identified that Effort Expectancy (EE) is the degree of ease associated with the use of the system. This definition comes from the concept of perceived ease of use (the degree to which using a system would be free of effort), complexity (the degree to which a system is perceived as relatively difficult to understand and use) and ease of use (the degree to which using an innovation is perceived as easy to use) (Venkatesh, Morris, Davis, & Davis, 2003).
The users intention to accept new technology is not only predicted by how much the technology performance is positively valued, but also by how easy it is to use the technology and how much effort needs to operate it (Alalwan, Dwivedi, & Rana, 2017; Davis, Bagozzi, & Warshaw, 1989). In this study, it could be mentioned that the ease of use Philips Hue will lead to the higher intention to adopt it. Therefore, this research articulates the following hypothesis.

H2. Effort expectancy positively influences the intention to adopt IoT at home.

2.1.3. *SOCIAL INFLUENCE*

According to UTAUT, social influence (SI) is defined as the degree to which users perceive the importance of other people believe that users should use the new technology (Venkatesh, Morris, Davis, & Davis, 2003). SI in UTAUT combines the subjective norm (the users' perception that most people who are important to them think that they should perform a certain behavior), social factors (the users' reference of group's subjective culture and specific interpersonal agreement of one individual to others in specific social situations) and image concept (the degree to which using an innovation is perceived as enhancing one's social image). Subjective norm is seen as the most crucial factor in the social influence construct, proven by studies about IT adoption in e-recruitment (Laumer, Eckhardt, & Trunk, 2010) and desktop computer application (Al-Gahtani, Hubona, & Wang, 2007).

In this study, social Influence is explained as the notion that consumers adopt the technology driven by subjective norms, which combined with two sources, external and interpersonal (Lopez-Nicolas, Molina-Castillo, & Bouwman, 2008; Bhattacherjee, 2000). Subjective norms are seen as the perception that most people who are essential to a user think that he or she should perform a specific behavior (Venkatesh, Morris, Davis, & Davis, 2003). The external influence is defined as the influence comes from mass media reports, expert opinions and other non-personal information considered by users in making decisions (Bhattacherjee, 2000). The interpersonal influence could be described as the word-of-mouth information received from friends, colleagues, superiors and other prior adopters (Bhattacherjee, 2000).

Considering the importance of social influence driving the adoption of IoT at home, a hypothesis is proposed as follows.

H3. Social influence positively drives the intention to adopt IoT at home.

2.1.4. Facilitating Conditions

Facilitating Conditions (FC) are described as the degree to which users believe that an organizational and technical infrastructure existed to support the use of the technology (Venkatesh, Morris, Davis, & Davis, 2003). The concept of FC combined three different constructs, i.e. perceived behavioural control (the perceptions of internal & external constraints on behaviour, self-efficacy, resources facilitating conditions, and technology facilitating conditions), facilitating conditions (the factors in the environment that make an act easy to do, including provision and computer support) and compatibility (the degree to which an innovation is perceived as a consistency to existing work, need, values). These constructs combine the users' perception of internal and external constraints to use the technology, such as the knowledge necessary to use the system, the resources needed, the guidance or assistance to system difficulties, the compatibility with other work aspects, and the fit to the current working-style.

Adopting a new technology requires a particular kind of skill, resources and technical infrastructure (Alalwan, Dwivedi, & Williams, 2016). Regarding to the adoption of IoT at home, these infrastructures include the sufficient time, sufficient money, sufficient physical chance to get the IoT device, sufficient supporting technology at home and sufficient help on difficulties.

In this study, Facilitating Conditions are divided into five dimensions. First, time is defined as the time of consumers looking for information about Philips Hue until buying the product. Second, money is seen as the capability of the consumers to afford buying Philips Hue. Third, physical chance is defined as the possibility of consumers to get Philips Hue at their home. For example, this device could not be delivered to an isolated area or not available in the small stores. Fourth, supporting technology is described as the resources needed to install Philips Hue at home, which in this case is the stable Wi-Fi at home. Lastly, the necessary facilitating condition to adopt Philips Hue is the ability to get guidance or assistance when users find difficulties on using the device.

The intention to adopt IoT at home should be higher when consumers have the adequate level of facilitating conditions, from time, money, chance to get the products, supporting technology at home, and guidance in difficulties. Therefore, a hypothesis is proposed below.

H4. Facilitating conditions positively influence the intention to adopt IoT at home.

2.2. ADDITIONAL VARIABLES

In addition to the given variables in UTAUT, this study included Personal Innovativeness, Perceived Risk, Trust and Demographic Characteristics as the factors driving intention to adopt IoT at home. The arguments to incorporating these additional variables are explained on the sections below respectively.

2.2.1 PERSONAL INNOVATIVENESS

Personal innovativeness is defined as the willingness of an individual to try out any new information technology (Agarwal & Prasad, 1998). Individuals with the higher personal innovativeness are expected to develop more positive beliefs about the target technology (Lewis, Agarwal, & Sambamurthy, 2003) and hence increase the chance to adopt the technology. The positive beliefs to technology are built by the curiosity and willingness of innovative individuals to try out new experiences. The innovative individuals like to see the improvements of one product or system with any new features. Besides, innovative individuals are also active to seek information about new ideas (Lu, Yao, & Yu, 2005) that will lead them to expect more innovativeness in the technology they use.

In this research, personal innovativeness is placed as a direct predictor to adoption intention. Different levels of innovativeness determine the intention to adopt a technology (Yi, Jackson, Park, & Probst, 2006). An innovative person tends to adopt technology more than the one who is not categorized as innovative. A hypothesis is proposed as below.

H5. Personal innovativeness positively influences the intention to adopt IoT at home.

2.2.2 PERCEIVED RISK

People continuously perceive risk when they evaluate products for purchase or adoption (Bauer, 1967). Perceived risk is defined as the potential for loss in the pursuit of the desired outcome of using an information technology service (Featherman & Pavlou, 2003). Besides the unmet expectancies, risks are also perceived by consumers when they are not fully informed of the product or the technology they use. Perceived risk imply a belief that consumers are unaware of the consequences of action due to uncertainty about a particular behavior (Sung & Jo, 2018). In the case of adopting IoT at home, consumers might not be aware of the assurance sharing some data to the IoT products.

Wilson et al. (2017) published a study about risks in adopting smart home products, mentioning that ceding autonomy or independence in the home was the main perceived risk into the adoption. Moreover, risk on privacy concern or sharing data with the IoT product is also considered as the significant barrier (Wilson, Hargreaves, & Hauxwell-Baldwin, 2017). Besides, a key concern when exploring risks of the smart home is reliability or the possibility of things go wrong (Balta-Ozkan, Davidson, Bicket, & Whitmarsh, 2013), which includes malfunctioning, unintended consequences, or systems getting out of control. The combination of these arguments is included into one hypothesis, specifying the perceived risks. A hypothesis is articulated below.

H6. Perceived risks significantly decrease the intention to adopt IoT at home.

2.2.3 TRUST

Trust is considered as an essential factor to predict consumers perception and intention towards technology (Alalwan, Dwivedi, & Williams, 2016). Trust has been utilized to measure intention to adopt technology, such as online-shopping from e-vendors (Gefen, Karahanna, & Straub, 2003), using driverless cars (Kaur & Rampersad, 2018) and adopting smart home technology (Yang, Lee, & Zo, 2017).

Trust is defined as the firm belief that one company will perform functionally, result in the positive outcomes and not take unexpected actions that result in adverse outcomes (Anderson and Naurus, 1990 as cited in Mitchell, 1999, p.174). From the perspective of business interaction, trust is viewed as the specific beliefs dealing with integrity between buyer and seller (Gefen, Karahanna, & Straub, 2003). Looking at the broader perspective, trust does not only direct to the seller but also towards the products, concerning product information (Zhang, Cheung, & Lee, 2014). Hence, trust in both product and sellers play a significant role in determining consumers' purchasing intention (Pappas, 2016; Wu, 2013).
This study defines that trust related to the company and the product itself, which are Philips and Philips Hue accordingly. The higher trust of the seller and the product, the higher should the intention to buy or adopt the product be.

Therefore, a hypothesis is presented below.

H7. Trust positively influences the intention to adopt IoT at home.

2.2.4 DEMOGRAPHIC CHARACTERISTICS

Demographic characteristics provide the classifiable information about a given population. This study adapted demographic characteristics from the UTAUT, which are age, gender and experience. Venkatesh et al. (2003) conclude that Performance Expectancy's effect is stronger for men and younger workers. Effort Expectancy effect is increased for women, older workers and those with limited experience. Social Influence's effect is stronger for women, older workers and with limited experience. Facilitating Conditions' does not affect the behavioral intention by moderators due to the effect being captured by effort expectancy (Venkatesh et al., 2003).

Besides age, gender and experience, the addition to demographic characteristics is materialized into this study, which is the number of family members at home. A family with 1-2 kids has ~11% higher intention to adopt smart home technologies compared to a single person or married with no children in the house (McKinsey & Company, 2016). This related to the adoption of Philips Hue by assuming that family with kids are more likely to adopt smart lighting.

A series of hypothesis about demographics, includes characteristics from UTAUT and the number of family members, are articulated below.

H8(a). Younger age tends to have a higher effect on the intention to adopt IoT at home.

H8(b). Woman tends to have a higher effect on the intention to adopt IoT at home.

H8(c). Lower experience tends to have a higher effect on the intention to adopt IoT at home.

H8(d). Higher family number tends to have a higher effect on the intention to adopt IoT at home.

2.3. TASK TECHNOLOGICAL FIT

As the most important determinant to drive adoption in UTAUT (Venkatesh, Morris, Davis, & Davis, 2003), Performance Expectancy is explained profoundly in this study. The attempt to elaborate more on Performance Expectancy is executed by extending the variable. Looking back at the section 2.1.1, Performance Expectancy is defined as the degree to which users believe that using the technology will help them to get gains in job performance (Venkatesh, Morris, Davis, & Davis, 2003). Hence, Task-Technological Fit (TTF) model is chosen to extend this variable, by considering that TTF is mainly about the fit of technology and users' tasks (Goodhue, 1995).

TTF is the model developed by Goodhue and Thompson (1995) about user's evaluations of technology. These evaluations are made based on the task characteristics and technology characteristics (see Figure 2-2). Task Characteristics are defined as the actions carried out by individuals in turning inputs into outputs, while Technology Characteristics are viewed as the tools used by individuals in carrying out their tasks (Goodhue, 1995). The model of TTF is shown on the Figure 2-2 below.

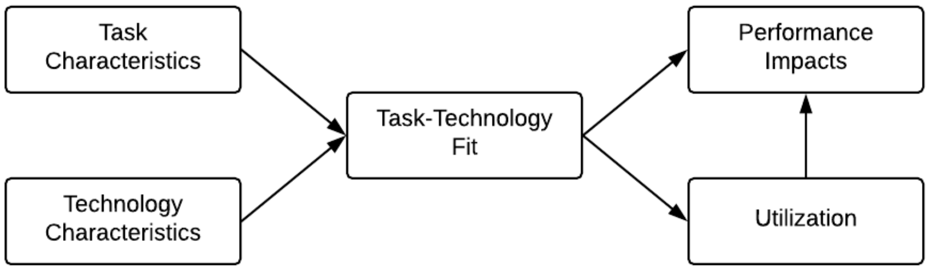

FIGURE 2-2 TTF MODEL OF TTF BY GOODHUE AND THOMPSON (1995)

Studies showed that TTF has been widely used to understand the adoption of technology, such as the adoption of mobile banking (Zhou, Lu, & Wang, 2010; Oliveira, Faria, & Thomas, 2014), the adoption of massive open online courses in a developing country (Khan, Hameed, Yu, Islam, & Sheikh, 2018) and the adoption of e-commerce (Klopping, 2004). Studies also demonstrated that TTF combined with other theories provide an extended view of one theory, for example, TTF-UTAUT to examine the m-Banking adoption (Zhou, Lu, & Wang, 2010), TTF-TAM to study user acceptance of online auctions (Chang, 2010), and TTF-UTAUT2 to explore e-textbook adoption (Gerhart, Peak, & Prybutok, 2015).

Goodhue (1995) argues that the fit between task characteristics and technology characteristics will lead to users' higher evaluations (Lu & Yang, 2014) and higher performance impacts. Existing works of literature (Zhou, Lu, & Wang, 2010; Oliveira, Faria, & Thomas, 2014; J. Zhang, Huang, & Chen, 2010) explain that the relationship of task-technology fit and performance expectancy are significant. Task-technology fit measures the functions of technology to complete users' task (Zhou et al., 2010), while Performance Expectancy measure the usefulness of technology to accomplish user's tasks (Venkatesh et al., 2003). Considering these arguments, this study proposes two hypotheses (H9 and H10) below, in which suggesting that task and technology characteristics are directly correlated with performance expectancy, if supporting each other.

Cited from the Hue's website ("About Hue", 2018), task characteristics of Philips Hue are controlling the light color automatically, controlling brightness, automating the home lighting routines, and controlling lighting at home by voice order. To support these tasks, Philips Hue provides technologies which enable users to get enough color choices and set brightness, arrange ideal automation on home lighting routines and offer hands-free control to home lighting over human voice.

As the example; one task characteristic of Philips Hue is to control the light color at home by using a mobile phone. When users perceived that controlling the light color is an important task or need, the value of one task is high. The higher the need for one task, if underpinned by the technology characteristics of the product, the higher evaluations will be. This high evaluation will lead to higher performance expectancy. Therefore, two hypotheses are proposed below.

H9. Task characteristics, if meet technology characteristics, will positively influence performance expectancy.

H10. Technology characteristics, if meet task characteristics, will positively influence performance expectancy.

2.4. Conceptual Research Model

Combining all of the hypotheses above, the conceptual research model is shown on the figure below.

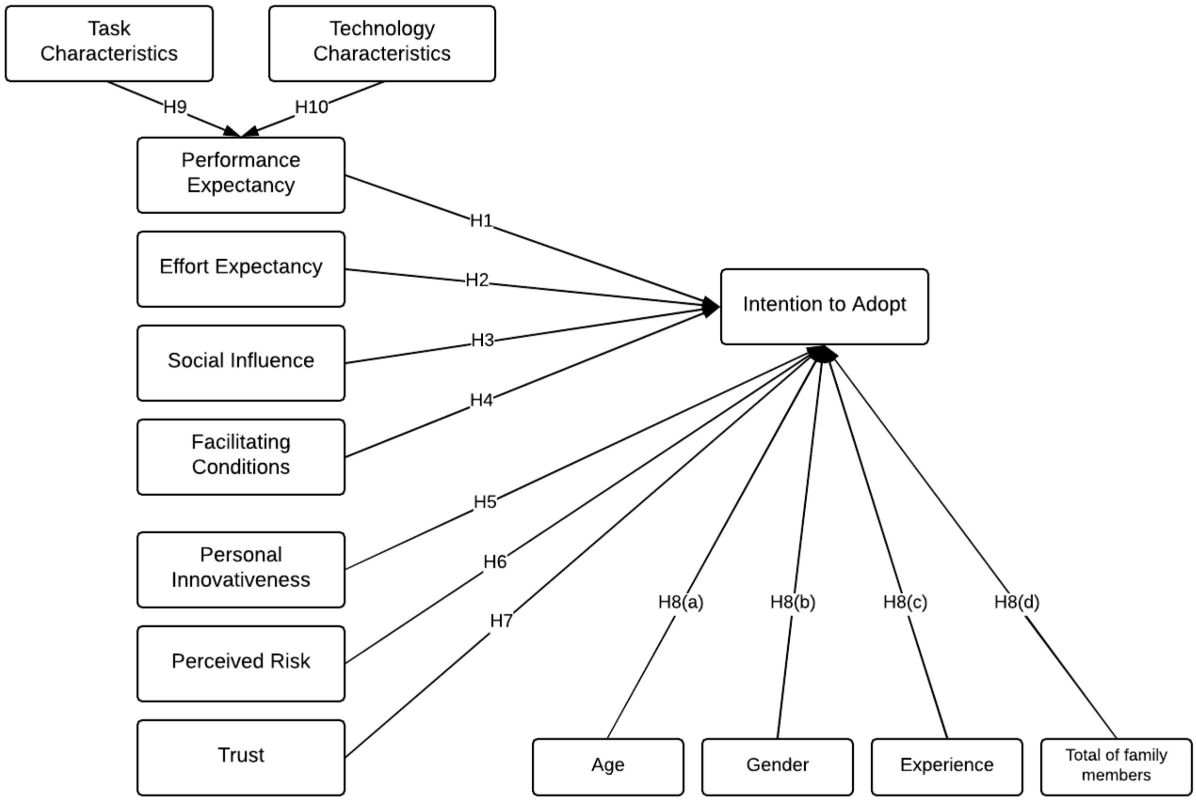

Figure 2-3 Conceptual Research Model

3. METHODOLOGY

3.1. RESEARCH DESIGN AND PROCEDURE

The method of collecting data in this research was executed by online questionnaires. This method supported to test all hypotheses quantitatively. Although it was challenging only to measure the variables by online surveys – not doing it face to face to ensure that respondents understand all questions correctly – this questionnaire was built as easy as possible for respondents to fill in. An online survey method was chosen instead of an offline survey based on two following reasons. Firstly, this study is not an experimental study which requires a direct meeting to all respondents, and hence online survey is possible to collect data. Secondly, an online survey would reach only online users. This is important to be considered since all respondents are familiar with the internet usage. The familiarity with internet is one resource to adopt IoT.

Before spreading the questionnaires for analysis, a pilot survey was conducted. Online surveys were collected from 11 Indonesian respondents to check the comprehension of all questions, the synchronization of questions to the expected answers and to gather general comments about the questionnaire. The results of the pilot survey are shown in Appendix 1. Overall, questions from the pilot survey were all used for the final survey. Accumulating feedback from the respondents of pilot survey, the final questionnaires added more details to the introduction section of Philips Hue.

To collect responses, this study utilized the non-probability sampling approach, which does not rely on the use of randomization techniques. This study collected samples by convenience and snowball sampling. Convenience sampling was conducted by approaching the potential respondents based on convenience to access them. In addition, snowball sampling was executed by asking some selected respondents to escalate the questionnaire to other relevant people.

3.2. RESEARCH PARTICIPANTS

Sample Size Calculator of Qualtrics Software suggested to collect a minimum of 267 respondents based on the given information, such as urban population in Indonesia 127.000.000 (Statista, 2014), confidence level 95% and margin of error 6%. Confidence level is a measure of how certain the results are, whereas margin of error is the degree to which point an estimation is accurate (Antonius, 2017).

A total of 447 respondents filled in the online survey. 294 of the responses were included to further analysis while 153 were excluded. This exclusion was a result of incomplete answers (N=147) and disagreement to the consent form (N=6). Analysis of respondents demographics was conducted in SPSS Statistics 25 and summarized in Table 3.1. The average age of the sample was 27.75 (SD=6.7). Gender was almost evenly distributed, 55.1% and 44.9% respectively for male and female. The educational level of the sample was high, 81.9% of respondents had a university degree including bachelor, graduate or post-graduate.

The city of residence was categorized based on the answers of respondents. Because this question was open to each respondent, it would be easier to analyze the geographical distributions of the sample by a categorization. The categorization was made based on the capital city in each province. For example, when respondents answered "West Jakarta, South Jakarta, East Jakarta, West Jakarta, Bogor, Depok, Tangerang, Bekasi", they would be categorized to Jakarta and surroundings. A total of 132 respondents (44.9%) were from Jakarta and surroundings.

Experience with IoT at home was also measured as the part of demographic characteristics. On the survey question, respondents were asked to which extent their experiences with smart home products was, for example, their experiences to set door-lock system with fingerprint or password, to watch home surroundings from their mobile phone with a CCTV attached at the home corner, to remotely turn on the light, or to manage the smoke detector at home. The Likert four-point scale was chosen to easily categorize experience into two, namely not experienced (not at all & very little) and experienced (somewhat & to a great extent). The result was varied by 39.8% never experienced, 34.7% very little experience, 14.3% somewhat experienced and 11.2 very experienced. From this data, it could be concluded that the sample was mostly (74.5%) not the experienced users of smart home devices.

Numbers of the family at home was calculated to understand the condition of family members who lived in the same house. The average family members resulted as 4.45. This indicated that respondents were most likely having a family with children.

TABLE 3-1 SUMMARY OF DEMOGRAPHIC CHARACTERISTICS (N=294)

		N	Valid %
Age	**Mean**: 27.75		
	SD: 6.7		
Gender	Male	162	55.1
	Female	132	44.9
Education Level	High school and below	35	11.9
	Bachelor	173	58.8
	Graduate	65	22.1
	Post-graduate	3	1.0
	Other	18	6.1
City of Residence	Bandung and surroundings	29	9.9
	Bogor and surroundings	10	3.4
	Jakarta and surroundings	132	44.9
	Medan and surroundings	36	12.2
	Semarang and surroundings	22	7.5
	Surabaya and surroundings	35	11.9
	Yogyakarta and surroundings	7	2.4
	Other cities	23	7.8
Experience with IoT at home	Not at all	117	39.8
	Very little	102	34.7
	Somewhat	42	14.3
	To a great extent	33	11.2
Numbers of family members at home	1	14	4.8
	2	27	9.2

	3	46	15.6
	4	69	23.5
	5	74	25.2
	6	33	11.2
	More than 6	31	10.5

3.3. Measures

The model of UTAUT and its constructs played an important role to build the initial framework of this study. The theory of TTF also served an useful contribution to expand UTAUT model in terms of measuring the effect on performance expectancy. In addition, the additional variables were added into this study, which their measurement items are displayed on Table 3.2 below.

Respondents answers to each measurement item below were based on five Likert scales (1=strongly disagree; 2=somewhat disagree; 3=neither agree nor disagree; 4=somewhat agree; 5=strongly agree).

Table 3-2 Measurements of All Constructs

Construct	Items		Source
Performance Expectancy	PE1	I believe Philips Hue will be useful in my daily life.	Venkatesh, Morris, Davis, & Davis (2003)
	PE2	I believe Philips Hue will increase my chances of achieving important tasks.	
	PE3	I believe Philips Hue will help to accomplish my jobs more quickly.	
	PE4	I believe Philips Hue will increase the productivity to control my home lighting system.	
Effort Expectancy	EE1	I think Philips Hue is easy to learn.	Venkatesh, Morris, Davis, & Davis (2003)
	EE2	I think Philips Hue is easy to install at home.	
	EE3	I believe Philips Hue is easy to use.	
	EE4	I believe it is easy for me to be skillful using Philips Hue.	
Social Influence	SI1	People who are important to me might suggest using Philips Hue.	Venkatesh et al. (2003), Bhattacherjee, (2000)
	SI2	People who influence my behavior might suggest using Philips Hue.	
	SI3	Friends, family and colleagues think that I should use Philips Hue.	
	SI4	Many people around me use Philips Hue.	
	SI5	The mass media including social media, influence me to use Philips Hue.	
	SI6	I see many ads about Philips Hue.	

Facilitating Conditions	FC1	I have sufficient time to look for information about Philips Hue.	Venkatesh, Morris, Davis, & Davis (2003)
	FC2	I have sufficient time to buy Philips Hue.	
	FC3	I have sufficient money to buy Philips Hue.	
	FC4	It is easy to deliver Philips Hue to my home.	
	FC5	I have stable WiFi in my home to use Philips Hue.	
	FC6	I believe it is easy to get help from others when I have difficulties using Philips Hue.	
Personal Innovativeness	PI1	I like to experiment with new and innovative products.	Agarwal & Prasad (1998); Girod, Mayer, & Nägele (2017)
	PI2	Among my friends, I am usually the first to explore new technologies.	
	PI3	If I heard about new technology, I would look for ways to experiment with it.	
Perceived Risk	PR1	I will feel less autonomy since I let Philips Hue control things around me.	New scales, adapted from Wilson et al. (2017) and Balta-Ozkan et al. (2013)
	PR2	I will feel risky to share my information and daily data to Philips Hue.	
	PR3	I am afraid that Philips Hue will not fully function as expected.	
	PR4	I am afraid that Philips Hue will cause some problems at my home.	
Trust	T1	I trust Philips.	New scales, adapted from Pappas (2016)
	T2	I believe Philips has great quality products.	
	T3	I trust Philips Hue.	
	T4	Philips Hue seems secure.	
	T5	Philips Hue is created to help the users.	
Task Characteristics	TAC1	I need to control the light color in my home, for example, to change the light color to yellow or purple.	New scales, adapted from "About Hue" (2018)
	TAC2	I need to control the light brightness in my home, for example, to dim the light for watching TV.	
	TAC3	I need to automate my home with lighting routines, for example, to automatically turn the light off at 7 AM and 11 PM or turn the light on at 6 PM.	
	TAC4	I need to control devices at my home with my voice, by using Google Home, Amazon Echo, or Apple Homepod.	
Technology Characteristics	TEC1	I believe Philips Hue provides enough color choices.	New scales, adapted from

	TEC2	I believe Philips Hue provides enough brightness extension.	"About Hue" (2018)
	TEC3	I believe Philips Hue provides ideal automation on my home lighting routines.	
	TEC4	I believe Philips Hue provides faultless hands-free control through my voice.	
Intention to Adopt	IA1	I plan to adopt Philips Hue.	Venkatesh, Morris, Davis, & Davis (2003)
	IA2	I am willing to adopt Philips Hue.	
	IA3	I will not hesitate to purchase Philips Hue.	
	IA4	I would recommend others to adopt Philips Hue when they plan to adopt smart home.	

UTAUT Variables

In this study, performance expectancy referred to the degree of users believe that using technology help them in coursework. Performance expectancy was a variable adopted from UTAUT, and hence the measurements were taken up also from UTAUT, highlighting the usefulness, value outcomes and advantages (Venkatesh, Morris, Davis, & Davis, 2003).

The similar case was applied to the scales of Effort Expectancy which as well adopted from UTAUT. A slight addition was adjusted to EE2 (the ease to install a product) since UTAUT measurements only cover the ease to learn and ease to use the system. The ease to install a product was an essential factor to include in measurements since it was also mentioned in the complexity construct by Thompson et al. 1991 in Venkatesh (2003) as an example of the mechanical operations.

Social influence measurements were adopted from UTAUT by combining subjective norm and the source of social influence. SI1 and SI2 were adopted from the subjective norm construct by Ajzen (1991), while S3-S4 and S5-56 were the reflections of the interpersonal influence and external influence (Bhattacherjee, 2000) respectively.

Aligned with other UTAUT variables, Facilitating Conditions measures were adopted from the UTAUT model, combining the perceived behavioral control, facilitating conditions and compatibility to the existing environment. FC1 to FC4 measured the perceived behavioral control items emphasizing on the necessary resources to use the system, which was described as the time, money, and possibility to deliver the product to home. FC5 represented the compatibility with the existing system, and FC6 illustrated the facilitating conditions on getting guidance when needed.

The complete measurement items of the original model of UTAUT is displayed in Appendix 4.

Additional Variables

Three additional variables were included in this study, i.e., Personal Innovativeness (PI), Perceived Risk (PR) and Trust (T). The measurements for these variables were explained in the section below accordingly.

Measurements for PI were utilized from the model of personal innovativeness in the domain of information technology adoption, which represented by the adoption of the World-Wide Web (Agarwal & Prasad, 1998). The measurements of PI from Agarwal and Prasad (1998) were also applied to the adoption model of novel green technologies (Girod, Mayer, & Nägele, 2017), the acceptance of wireless internet services (Lu, Yao, & Yu, 2005) and the acceptance of personal digital assistant (Yi, Jackson, Park, & Probst, 2006).

PR in this study covered perceived risks which were adopted from the risk model of smart home technologies (Wilson, Hargreaves, & Hauxwell-Baldwin, 2017), such as the dependency on technology and the invasion of privacy. This study came up to a statement that PR could be measured by an understanding to the feeling of being controlled or having less autonomy. Besides, PR in privacy-setting was related to the risk of sharing information and data. Two additional items were added into this construct by reckoning the general perspective towards Philips Hue that might deliver the unmet expectancies, such as the possibility of the product doesn't fully functioned as expected and might cause some problems at home.

At last, this study included Trust as one variable influencing Intention to Adopt IoT. This study picked the model of consumer trust in online buying behavior (Pappas, 2016) which included the trust to the seller and the product. Afterward, these two concepts are developed into measurement items of trust towards the seller and product, which are explained by T1-T2 and T3-T5 accordingly.

TTF Variables

New scales were developed to measures Task Characteristics (TAC). By referring to the way of published literatures presented the scales of TAC (Zhou, Lu, & Wang, 2010; Oliveira, Faria, & Thomas, 2014; Lu & Yang, 2014) and the definition of Task Characteristics which is users' need for work, this study defined the scales for TAC are related to the tasks or users' needs to use Philips Hue. Adopted from the official website of Philips Hue ("About Hue", 2018), four tasks of using Philips Hue were explained in Table 3.2.

Technology Characteristics (TEC) are defined based on the key dimensions from TAC and specifically linked to the task demands (Zigurs, 1998). Scales of TEC were developed based on the tasks characteristics (Zhou, Lu, & Wang, 2010; Oliveira, Faria, & Thomas, 2014), and hence four scales were provided in Table 3.2.

3.4. Construct Validity and Reliability

3.4.1. Reliability Analysis

The possibility of data error occurred in any surveys. Hence, reliability check was essential to decrease this error and present the more accurate dataset for further analysis. According to Litwin (1995), reliability consists of five types, namely test-pretest, intraobserver, alternate-form, internal consistency and interobserver. This study used the internal consistency type because it measured how well several items in a scale vary together in a sample (Litwin, 1995). Universally, the level of Cronbach's Alpha 0.7 or more represents the excellent reliability.

The initial Cronbach's Alpha of all constructs is shown on Table 3.3. All constructs implied good reliability based on Alpha's values, except Task Characteristics (TAC). TAC had a weak Cronbach's Alpha value (α=.563) and didn't fulfill the good reliability threshold. The lowest item in TA's construct was item T3 – if item deleted, didn't change the value of Cronbach's Alpha to be more than .7, but surged to .575. Therefore, TAC would be excluded from further analysis.

TABLE 3-3 RELIABILITY ANALYSIS

Construct	Numbers of Item	Cronbach's Alpha (α)
Performance Expectancy	4	.810
Effort Expectancy	4	.862
Social Influence	6	.890
Facilitating Conditions	6	.837
Personal Innovativeness	3	.815
Perceived Risk	4	.801
Trust	5	.881
Task Characteristics	4	.563
Technology Characteristics	4	.805
Intention to Adopt	4	.877

3.4.2. FACTOR ANALYSIS

To rotate factors one another, orthogonal rotation (Varimax) was conducted. This rotation showed a correlation between factors in all constructs to improve the relationship between items in a construct. Field (2009) suggested suppressing factor loading less than 0.4 with at least three items in a construct. Also, items should not cross highly to other factors because orthogonally rotated factors have zero intercorrelation by definition (Samuels, 2016).

The initial factor rotation of all constructs is exhibited in Appendix 2. Based on the constructs' summary on Table 3-2, nine components of independent variables should be included in the rotated components matrix. However, the initial factor analysis only provided eight components factor with at least three items in a construct, meaning that one construct is not reliable, which was TAC (α=.563). Hence TAC would be excluded from the next factor analysis. Moreover, to get the correct factor loading of each item, several items should also be removed. Looking at the low and wrong factor loading of TEC4 as well as wrong factor loading of SI4, SI5, SI6, FC5, FC6, these mentioned items would be excluded for further factor analysis. The adjusted matrix rotation is shown in Appendix 3. All factors loading and Cronbach's Alpha of each variable are shown in Table 3-4 below.

TABLE 3-4 FACTOR ANALYSIS

Construct	Mean	Cronbach's Alpha	Items	Factor Loading
Performance Expectancy	3.80	.810	PE1	.669
			PE2	.791
			PE3	.752
			PE4	.645
Effort Expectancy	3.83	.862	EE1	.681
			EE2	.682
			EE3	.732
			EE4	.740
Social Influence	3.40	.912	SI1	.803
			SI2	.861
			SI3	.850

Facilitating Conditions	3.17	.822	FC1	.680
			FC2	.802
			FC3	.769
			FC4	.736
Personal Innovativeness	3.65	.815	PI1	.753
			PI2	.847
			PI3	.821
Perceived Risk	3.23	.801	PR1	.652
			PR2	.761
			PR3	.852
			PR4	.848
Trust	3.76	.881	T1	.725
			T2	.816
			T3	.781
			T4	.704
			T5	.672
Technology Characteristics	3.83	.806	TEC1	.725
			TEC2	.781
			TEC3	.771

4. Results

4.1. Correlation Analysis

Firstly, the test of multicollinearity was applied to the dataset. The multicollinearity test was executed to investigate whether there were two or more independent variables strongly related and could cause the variance to the dependent variable. Independent variable should be independent and not correlated to one another in order to fit the regression model. Multicollinearity could be a threat to the proper estimation of relationships in a regression model (Farrar & Glauber, 1967) because it increased the variance of variables estimation and made the estimations very sensitive to minor change in the model.

Multicollinearity was calculated in SPSS by tolerance and Variance Inflation Factor (VIF) values. Tolerance is the measure of collinearity and VIF is the measure of collinearity's impact among variables in a regression model. The conservative threshold for VIF is 5 and less (Venkatesh, Thong, & Xu, 2012). Hence the tolerance should be more than 0.2 by keeping in mind that tolerance is 1/VIF. Looking at the variables in Table 4.1 below, multicollinearity was not an issue for this study since the lowest value of tolerance was .519 and the highest value of VIF was 1.926.

Table 4-1 Collinearity Statistics

Dependent Variable	Independent Variable	Collinearity Statistics	
		Tolerance	VIF
IA	PE	.622	1.608
	EE	.519	1.926
	SI	.650	1.537
	FC	.658	1.520
	PI	.647	1.546
	PR	.870	1.150

T	.541	1.847
Age (A)	.946	1.057
Gender (G)	.871	1.148
Experience (E)	.836	1.196
Family members (FM)	.944	1.059

Pearson correlation analysis was conducted to measure the linearity between two metric variables. A Pearson correlation (r) measures the amount of variation in one variable that is explained by a linear relationship with another variable (Aljandali, 2016). If two variables are perfectly linearly-related, the correlation is 1. The value 0 shows no linearity between two variables and the value -1 defines the perfect descending correlation.

Table 4.2 shows the bivariate correlation analysis of all variables. The significant correlation (r> .500) are shown in bold font in the table. The greatest correlation among all given variables was the correlation between Trust and Intention to Adopt (r=.595, p<.01). The high value of had a tendency to increase the value of Intention to Adopt and vice versa.

Other variables correlated well with Intention of Adopt were Performance Expectancy (r=.585, p<.01), Facilitating Conditions (r=.529, p<.01) and Social Influence (r=.516, p<.01). Good correlation were also indicated by Trust and Effort Expectancy (r=.593, p<.01) as well as Technology Characteristics and Effort Expectancy (r=.515, p<.01). Perceived Risk and Intention to Adopt showed insignificant correlation (p>.05), meaning that these two variables were not linearly related.

Table 4-2 Correlation Analysis

	PE	EE	SI	FC	PI	PR	T	TEC	A	G	E	FM	IA
PE	1												
EE	.491**	1											
SI	.470**	.465**	1										
FC	.432**	.462**	.416**	1									
PI	.318**	.403**	.310**	.341**	1								
PR	.120*	-.040	.144*	.106	.077	1							
T	.447**	__.593**__	.403**	.434**	.393**	-.14*	1						
TEC	.464**	__.515**__	.428**	.278**	.291**	.094	.465**	1					
A	.041	.082	.105	.113	.085	-.04	.043	.094	1				
G	-.010	-.076	-.055	-.048	-.28**	-.05	-.028	-.082	-.15**	1			
E	.076	.239**	.088	.213**	.322**	-.10	.213**	.093	.115*	-.05	1		
FM	.056	.086	.127*	.090	.124*	.090	.046	.120*	.021	.082	-.042	1	
IA	__.585**__	.469**	__.516**__	__.529**__	.429**	.012	__.595**__	.332**	-.018	-.04	.213**	.124*	1

**. Correlation is significant at the .01 level (2-tailed).
*. Correlation is significant at the .05 level (2-tailed).

4.2. Model Testing

4.2.1. *Regression Analysis to Predict Intention To Adopt*

Regression analysis summarized the correlations or relationships between one variable to another. This method aimed to build a new model based on the impactful variables in the proposed conceptual research model (see Figure 2.3).

Multiple hierarchical regression was performed to find the most suited model predicting Intention to Adopt. From multiple regression, this study attempted to develop a model which weighted the sums of multiple variables from hierarchical stages.

The regression analysis was executed into three steps. The first model aimed to test the variables which were derived from UTAUT constructs. The second model was to test all proposed variables which have been analyzed in factor analysis – TAC and TEC were excluded because they predicted PE and some items of SI & FC were removed in factor analysis. The third model tested all variables in the second model plus the demographic characteristics, such as age, gender, experience with IoT and the total of family members at home.

Table 4.3 shows the summary of three regression models by comparing the values of R-squared, adjusted R-squared, standard error and R-squared change. Model 1 indicated that 48% (R^2=.480) of the variance in IA could be explained by 4 variables mentioned in Table 4.4, which increased 8% (ΔR^2=.080) by adding PI, PR and T. Model 2 would also increase the amount of variance by 1.4% (ΔR^2=.014) by adding demographic characteristics. Model 3 presented the highest variance among another model to explains the relationship of all variables with IA, with a total variance of 57.4% (R^2=.574).

Table 4-3 Regression Model Summary

Model	R^2	Adjusted R^2	Std. Error	ΔR^2
1	.480	.473	.52272	
2	.560	.550	.48322	.080
3	.574	.558	.47883	.014

Table 4.4 exhibits the unstandardized coefficients beta and the standard error, standardized coefficients beta, test value, and significance of all constructs in each model tested. Constructs with significant coefficients (p<.05) are displayed in bold font. The highest standardized coefficients which also indicated strong significance predicting IA was T (β=.293, p<.001), followed by PE (β=.286, p<.001), FC (β=.196, p<.001), SI (β=.189, p<.001), and PI (β=.114, p<.05). Age relates negatively with IA (β=-.098, p<.05). PR, EE, and other demographic characteristics, such as gender, experience and number of family members at home presented the insignificant regression with IA.

Table 4-4 Regression Coefficients

		b	SE-b	β	t
Model 1	(Constant)	.202	.226		.894
	PE	.383	.061	.330***	6.305
	EE	.110	.064	.091*	1.714

	SI	.199	.048	.212***	4.135
	FC	.237	.047	.256***	5.066
Model 2	(Constant)	-.250	.259		-.963
	PE	.326	.057	.281***	5.688
	EE	-.092	.066	-.076	-1.404
	SI	.170	.045	.182***	3.762
	FC	.181	.044	.196***	4.089
	PI	.123	.041	.133**	2.974
	PR	-.036	.040	-.038	-.915
	T	.370	.066	.299***	5.636
Model 3	(Constant)	-.030	.308		-.098
	PE	.332	.057	**.286*** **	5.816
	EE	-.101	.066	-.083	-1.542
	SI	.177	.045	**.189*** **	3.922
	FC	.181	.044	**.196*** **	4.090
	PI	.105	.045	**.114* **	2.358
	PR	-.041	.040	-.043	-1.039
	T	.362	.065	**.293*** **	5.545
	Age	-.010	.004	**-.098* **	-2.462
	Gender	-.011	.060	-.007	-.178
	Experience with IoT	.046	.031	.063	1.485
	Family Members	.020	.015	.055	1.377

*** p < .001, ** p < .01, * p < .05

4.2.2. Regression Analysis to Predict Performance Expectancy

On the hypothesis H1 and H2, it was expected that the higher values of task characteristics and technology characteristics would lead to the increasing value of performance expectancy. Since we have discovered that TAC was not reliable and hence excluded from further analysis, Performance Expectancy would be predicted by only including TEC. Pearson correlation of TEC and PE was .464, with significance p<.001. Table 4.5 illustrates the regression of TEC to PE.

Table 4-5 Regression Analysis on Performance Expectancy

		b	SE-b	β	R^2	Adj. R^2
Model 1					.215	.212
	(Constant)	1.961	.209			
	TEC	.482	.054	.464***		

*** p < .001, ** p < .01, * p < .05

R-squared value for this model was .215, showing that approximately 21.5% variance of TEC were accounted for by this model. Unstandardized coefficients showed that PE differed around .482 for every component changed in TEC (b=.482, SE-b=.054). Standardized coefficients, which showed the regression coefficients if the model fitted to the standardized data, indicated that TEC had a relatively high effect on PE (β=.464, p<.001).

4.3. Overview of Hypotheses

On table 4.6 below is provided hypotheses from all constructs that has been reduced by factor analysis and tested by correlation analysis as well as a regression model.

Table 4-6 Overview of Hypotheses

	Hypothesis	Result
H1	Performance expectancy positively influences the intention to adopt IoT at home.	Supported
H2	Effort expectancy positively influences the intention to adopt IoT at home.	Not Supported
H3	Social influence positively influences the intention to adopt IoT at home.	Supported
H4	Facilitating conditions positively influence the intention to adopt IoT at home.	Supported
H5	Personal innovativeness positively influences the intention to adopt IoT at home.	Supported
H6	Perceived risks significantly decrease the intention to adopt IoT at home.	Not Supported
H7	Trust positively influences the intention to adopt IoT at home.	Supported
H8(a)	Younger age tends to have a higher effect on the intention to adopt IoT at home.	Supported
H8(b)	Woman tends to have a higher effect on the intention to adopt IoT at home.	Not Supported
H8(c)	Lower experience tends to have a higher effect on the intention to adopt IoT at home.	Not Supported
H8(d)	Higher family number tends to have a higher effect on the intention to adopt IoT at home.	Not Supported
H9	Task characteristics, if meet technology characteristics, will positively influence performance expectancy.	Not Supported
H10	Technology characteristics, if meet task characteristics, will positively influence performance expectancy.	Not Supported

4.4. FINAL RESEARCH MODEL

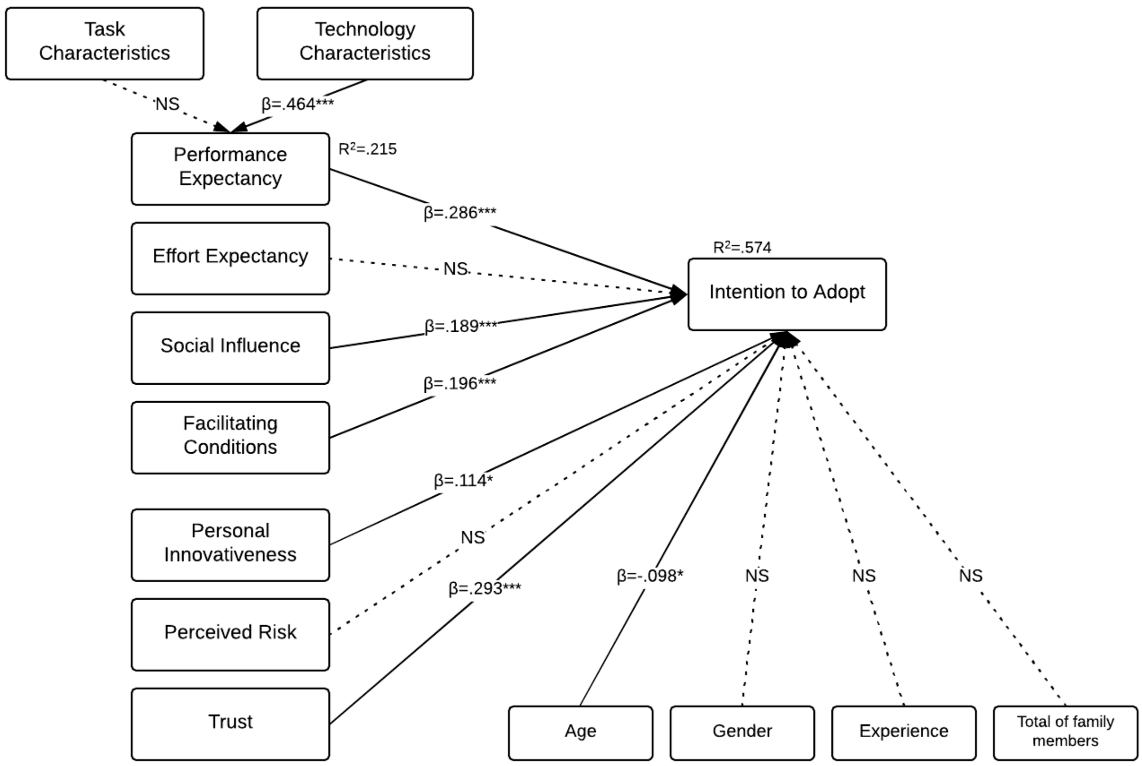

FIGURE 4-1 FINAL RESEARCH MODEL

(Note: *: p<0.05; ***: p<0.001; NS: not significant)

5. DISCUSSION

This study was conducted to answer a research question: what factors influence consumers in Indonesia to adopt IoT product, i.e., Philips Hue, at home? In order to find answers to this question, this study relied on UTAUT to build the initial research model, with the addition of several significant variables such as personal innovativeness, perceived risk, trust and demographic characteristics. To collect data, online surveys were spread to Indonesian respondents and the responses were quantitatively analyzed. The findings showed that the intention to adopt IoT at home in Indonesia was positively influenced by trust, performance expectancy, social influence, facilitating conditions, personal innovativeness and age. Existing studies argued that performance expectancy was the strongest determinant driving intention to adopt technologies (Venkatesh, Morris, Davis, & Davis, 2003; Luo, Li, Zhang, & Shim, 2010; Gefen, Karahanna, & Straub, 2003), but this research emphasized that trust was the strongest factor and followed by performance expectancy. The detailed discussion about these findings is elaborated on the next section accordingly.

5.1. Discussion of Results

The factors influencing intention to adopt IoT at home are explained respectively in this section, started from the strongest factor to the insignificant factors. The arrangement of these factors is as following: trust, performance expectancy, facilitating conditions, social influence, personal innovativeness, age, effort expectancy, perceived risk, task-technology characteristics and insignificant demographic characteristics.

Trust

In this study, trust claimed as the most influential determinant to predict intention to adopt IoT at home. This finding was aligned with the previous related studies which identified that trust in technology adoption was the most critical factor (Zhang et al., 2019) or significant (Lee et al., 2010; Beldad et al., 2010).

Trust is a facilitation in the decision-making process when consumers face uncertainty (Zhang et al., 2019). In these uncertain situations, trust plays an important role to deal with uncertain or uncontrollable future (Kim, Ferrin, & Rao, 2008). In correspondence with this study, the feeling of uncertainty to adopt technology was faced by Indonesian consumers. Hence, they relied on their trust to the seller (Philips) and to the product (Philips Hue) to help them make a decision. Therefore, in order to increase consumers intention to adopt a new technology, the companies need to establish a trustworthy brand and a solid product form.

Performance Expectancy

Among three significant variables of UTAUT in study, performance expectancy had the highest contribution to predict intention to adopt IoT. This was supported by the original study of UTAUT, noting that performance expectancy appeared to be a determinant in most situations of technology adoption (Venkatesh, Morris, Davis, & Davis, 2003). Some studies (Carlsson et al., 2006; Zhou, 2008; San Martín & Herrero, 2012; Oliveira et al., 2014) mentioned that performance expectancy was the most potent factor into technology adoption, while other studies (Alalwan, Dwivedi, & Rana, 2017; Im, Hong, & Kang, 2011) only indicated that performance expectancy had positive contribution to predicting technology adoption. From the findings of this study and combined with other literature, it could be articulated that Indonesian users considered the performance of IoT product before they have an intention to adopt it. The product performance was reflected from the perceived usefulness, users job-accomplishments, the increased productivity and users achievements on important tasks.

Facilitating Conditions

For facilitating conditions, this study supported UTAUT findings that resources and knowledge were perceived essentials before adopting a new technology (Venkatesh, Morris, Davis, & Davis, 2003). However, system compatibility and assistance, which were parts of UTAUT items, were not significant in this study. Hence, for facilitating conditions, this study only took into account resources and knowledge, or also known as the perceived behavioral control. Resources are associated with money, time and locality. The people who possess sufficient time and money as well as located in the reachable area of delivery, show higher intention to adopt IoT compared to who do not. Therefore, hypothesis H6 proposed in this study was supported; and in line with other research findings (Zhou et al., 2010; Kijsanayotin et al., 2009; Chang et al., 2007; Gupta et al., 2008).

Social Influence

A positive case to predict the intention to adopt technology also happened in social influence. Social influence, which the measurements items in this study were modified compared to the original scales in UTAUT, still demonstrated the positive effect on the intention to adopt. It was proposed in the theoretical framework that social influence was related to the subjective norm and included the interpersonal influence, such as the influence by family, friends and colleagues (Bhattacherjee, 2000).

Compared to the original construct of social influence in UTAUT, this study only took subjective norms into account but excluded social factors and image. This study considered that by adding the source of influence, which is interpersonal influence, the social influence construct would be more coherent. The improvisation of social influence construct also appeared in existing literature, such as by adding interpersonal influence and external influence (Bhattacherjee, 2000) as well as proving that in UTAUT model, subjective norms construct itself drove intention to adopt technology (Al-Gahtani et al., 2007; Laumer et al., 2010).

This study highlighted that Social Influence could be explained as the influence from people who are important and influencing for users, in which might act as friends, family and colleagues. In the other hand, external influence, which was proposed earlier in the measurement items of this study, were not significant in the social influence construct; therefore we can ignore the external influence entirely (Taylor & Todd, 1995). External influence covered the influence of mass media including advertisements in online and offline media (Bhattacherjee, 2000).

Finally, subjective norm and interpersonal influence brought positive contributions to enhance the intention to adopt technology. This could be explained that Indonesian people are more likely to be influenced by their peers (e.g., friends, family, colleagues), not by the external influence (e.g., mass media, advertisements, etc.). The closeness and trust to the people who are important or influencing their behavior devoted an significant effect on Social Influence. At last, hypothesis H5 was supported, mentioning that social influence positively drives the intention to adopt IoT at home.

Personal Innovativeness

This study demonstrated that personal innovativeness positively influenced the intention to adopt IoT at home, which aligned with other research findings related to technologies acceptance (Agarwal & Prasad, 1998; Girod, Mayer, & Nägele, 2017; Lu, Yao, & Yu, 2005; Yi et al., 2006). This was also to support hypothesis H7. This research finding gave us explanations that innovative people who like to experiment with new and innovative products and curious about new technology, tend to have high intention to adopt IoT at home.

Age

This study presented that the intention to adopt IoT at home is higher on the younger people. In UTAUT, age is a moderator of performance expectancy to behavioral intention, concluding that performance expectancy's effect is stronger for younger respondents. The average age of respondents in this study is 27.75 (SD=6.7). In correlation analysis, age did not show significant correlations to any constructs but the highest correlation was demonstrated with facilitating conditions. The explanation of this relation is that younger people, with average age of 27, are the ones who has supported conditions to adopt IoT at home, for example to afford buying Philips Hue.

Effort Expectancy

Unexpectedly, effort expectancy rejected UTAUT model in this study, meaning that effort expectancy did not have a significant relation to the intention to adopt technology. This outcome is in line with other studies highlighting that effort expectancy has no apparent effect on the usage intention of technology (Zhou, 2008; Sedana & Wijaya, 2010; Dasgupta et al., 2007; Pardamean & Susanto, 2012). These studies argued that the insignificant effect of effort expectancy to behavioral intention occurred because the system was relatively easy to use. In relation to this study, it could be explained that Philips Hue was intuitively easy to use and install at home. Respondents who answered the questions related to effort expectancy had watched an introduction video of Philips Hue, from installing to controlling Philips Hue's lights using a smartphone. From the introduction video, users believed that the product was easy to use, and hence they did not think that the effort expectancy was a factor influencing their intention to adopt the technology.

Perceived Risks

Perceived Risks did not show a significant correlation with intention to adopt IoT at home. Although the indigenous scales were developed in this construct, this study asserted a reliable internal consistency and acceptable factor loadings. Perceived risk has been commonly developed in the extension of UTAUT model (Slade et al., 2015); however some studies found that there were no significant relationships between perceived risk and adoption intention (Wang & Yi, 2012; Tan et al., 2014; Kapoor et al., 2015). These studies argued that the insignificant effect was perceived by users because the advantages of technology were so significant compared to the risks, some respondents were too young to consider about risks and some users just felt no fear to lose anything in using the technology. In this study, perceived risks were not significant because most of respondents were not familiar with IoT at home or smart home products, and hence they did not become aware of any risks they might face when using IoT.

Contradictory to the finding of this study, some research suggested that perceived risk has a significant effect into behavioral intention in UTAUT, such as the study about internet banking adoption which resulted that seven facets of perceived risk significantly affect intention to adopt (Martins, Oliveira, & Popovič, 2014), study about the use of mobile stock-trading which highlighted that security, economic and functional risk related directly to behavioural intention (Tai & Ku, 2013), and study about remote mobile payments which developed that security and privacy risk influence the adoption (Slade, Dwivedi, Piercy, & Williams, 2015).

Task-Technology Fit

Task Characteristics (TAC) were excluded in all data analysis on the previous chapters since it indicated the low value of Cronbach's alpha (α=.563) and did not fulfill the threshold of universal reliability (α=.7). As a result of unreliability, hypothesis H9 was rejected. Moreover, measurement items of this variable were not consistent, shown by factor analysis in Appendix 2. In the factor analysis, Task Characteristics were placed into the same factor loading with Performance Expectancy. This indicated the interrelations of two constructs from two different models that TAC and PE measured the similar items.

The second construct in TTF was technology characteristics (TEC). TEC had a positive influence to predict performance expectancy. In the theoretical framework above, it was assumed that task-technology fit (the combination of task and technology characteristics) and performance expectancy was strongly correlated, hence could be merged into one. Although TEC is reliable and contribute 21.5% of variance to predict performance expectancy, hypothesis H10 were rejected. In hypothesis H10 it was proposed that TEC can predict performance expectancy if TEC was supported by TAC. This condition was implemented to follow the rule that task-technology fit related to performance expectancy, not only task characteristics or only technology characteristics.

In conclusion, the idea to remove Task-Technology Fit and connect Task Characteristics and Technology Characteristics directly to Performance Expectancy was not supported in this study. Task-Technology Fit construct should be included in any conceptual models.

Demographic Characteristics

This study demonstrated that gender, experience with IoT and number of family members were not the direct determinants to adoption intention. These demographic characteristics might moderate the effect of independent variables to dependent variables, but not placed as the direct factor to independent variable.

5.2. THEORETICAL IMPLICATIONS

A considerable amount of literature has been published related to technology acceptance or adoption. However, a very lack of studies covered the topic of IoT at home adoption or smart home adoption. As an example, from 92 references used to study the smart home adoption using TAM, only one paper discussed the similar field (Park et al., 2018). Regarding the theoretical implications, this study contributed to the development of the UTAUT model, specifically in the field of IoT at home or smart home adoption.

By extending UTAUT with other significant variables, such as personal innovativeness and trust, this study brought the novel insights as consideration for further research. UTAUT argued that the strongest antecedent to adoption intention was performance expectancy. This study illustrated that by adding "trust", the argument will change. Moreover, five measurement items of trust were also initially developed in this study, which consist of trust to the company or seller and trust to the product. This study gave a new perspective to identify trust as an influential factor driving intention to adopt the technology.

This study attempted to extend performance expectancy by providing task and technology characteristics. The first argument was that task-technology fit strongly correlated with performance expectancy and hence could be merged into one. However, the results of this study proposed not to merge Task-Technology Fit and Performance Expectancy but provide both constructs into the research model. Moreover, this study found that Task Characteristics and Performance Expectancy have high interrelations. These two constructs from two different models indicated to measure the similar items. In conclusion, this study proposed not to use UTAUT and TTF in the same research model because Task-Technology Fit were strongly correlated with Performance Expectancy and Task Characteristics measured similar items with Performance Expectancy. Technology characteristics could be added as one single variable to predict the intention to adopt technology.

5.3. PRACTICAL IMPLICATIONS

This study provided insights for companies, especially Philips, to understand better what are the determinants of adopting IoT products at home in Indonesia. From the results, it could be concluded that, firstly, the company might gain more consumers intention to adopt IoT by building trust. This trust concept consisted of two, namely trust to the company and trust to the product. In order to get trust towards the company, it might be important to establish proper relationships with users, offer friendly customer service, create a pleasant customer journey or convince that the company has great quality products. Furthermore, trust in the product might be earned by highlighting that the product is secure and created to help users.

Secondly, marketers should consider the strategical ways to promote the usefulness of the product. This could be achieved by utilizing the social influence or communicating the message through the right channels. This study argued that family, friends and colleagues might contribute to consumers intention to adopt IoT product. It was also substantial to note that people who are important to consumers or people who influence their behaviors played an important role to shape their mind.

Another finding on this study discovered that younger and innovative people are more likely to adopt IoT product. Hence, marketers might consider to target young people and reach the consumers who like to explore new technologies. Besides, this study also implicated that consumers who have sufficient resources and knowledge toward IoT at home have higher intention to adopt. The company could help to provide these facilitating conditions, such as providing the easy-to-read information about the product, the ease to deliver products to home, or guidance when consumers find difficulties.

5.4. FUTURE RESEARCH DIRECTION

Besides some interesting implications for theoretical and practical use, this study also had some limitations due to some reasons. Hence, this section is explaining the limitations of this study and recommendations for future research direction. First, the research was conducted only in Indonesia, encompassing only 294 respondents from some cities in Indonesia. The sample was chosen based on convenient and snowball sampling method. Important to note that Indonesia is a big country with 263 million inhabitants spread in hundreds of cities. These constraints might limit the results since this study didn’t equally get enough samples from the selected cities. Future research could develop the sampling method to probability sampling approach which relies on the use of randomization techniques to select the sample.

Second, this study specified the IoT product at home to Philips Hue. There were many types of IoT for homes available in Indonesia, such as Amazon Alexa virtual assistant, Google Home smart assistant, Xiaomi smart CCTV, LG smart air conditioner and the list goes on. The limitation of IoT product to smart lighting, specifically Philips Hue, was to gather the perspectives of Indonesian users; because most of Indonesian was not familiar with the usage of a smart home product. However, this limitation brought one interest that the result of this study limited to only smart lighting. Further research might develop to other categories of IoT at home.

Third, since Philips Hue was not famous amongst most of the Indonesian users and this might be their first time knowing Philips Hue, there was no guarantee that all respondents are precisely sure about their answers to the online survey questions. Specifically, some variables such as task characteristics, technology characteristics, performance expectancy and effort expectancy were difficult to measure because of this limitation, which needed sufficient basic knowledge about Philips Hue. Further research might include more elaborated information about Philips Hue before asking questions, for example by providing the real or direct experience of using Philips Hue.

Fourth, literature about technology acceptance was significantly available, but very few studies investigated the smart home adoption or IoT at home adoption. This led to a limitation of literature used in this study, which occasionally incorporated some other technology adoption, such as e-commerce adoption, mobile banking adoption and so on. Further research might need to dig more on the adoption of technologies at home, in order to provide the model or theory that can be used by future researchers in a similar field.

Fifth, the analysis to data used in this research is limited to the exploratory factor analysis using SPSS Statistics. Further research may expand the analysis to confirmatory factor analysis to test the instruments or scales in this study. Aligned with these arguments, this study also performed the demographic characteristics as a direct determinant to adoption intention. Further research might develop the analysis method by respectively finding an effect of each demographic characteristic, as moderator, to each construct.

6. CONCLUSION

By incorporating performance expectancy, social influence, facilitating conditions, personal innovativeness, trust and age, this study has brought the empirical results to an extension of UTAUT. This extended model is proposed to understand consumers intention to adopt IoT at home. UTAUT suggests performance expectancy as the most critical factor in technology adoption, but this study offers that trust is the strongest determinant in technology adoption, specifically IoT at home. The concept of trust is also initially developed in this study, by highlighting two types of trust, namely trust to the company or seller and trust to the product. From a theoretical perspective, this study shows that technology adoption is strongly related to uncertainty, and hence consumers put their trust before having the intention to adopt IoT. Therefore, this study recommends, from a practical perspective, that marketers need to build consumers trust into the company and the product. This can be achieved by establishing proper relationships with users, offering friendly customer service, creating a pleasant customer journey and convincing users that the product was created to help them. Besides, trust to the product can be achieved when consumers find the usefulness of using it, thus marketers can highlight on the product performance. Finally, the role of social influence, facilitating conditions, personal innovativeness, trust and age should also be considered since they bring positive impact into intention to adopt IoT at home.

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APPENDICES

APPENDIX 1. PILOT SURVEY RESULTS

No.	The biggest reason to buy Philips Hue	The biggest reason not to buy Philips Hue
1	Save time and provide new environments at home	Overprice
2	Help me to do some tasks at home	High price
3	Automatic control of light	Privacy
4	Long lasting, not easy to be broken	High price
5	Good quality	Expensive
6	Investment of technology products	Expensive and not worth it
7	Provide efficiency to control light	Could be operated by another person which leads to criminality
8	Maybe just useful	Expensive
9	To build the room be more interactive and automatic	I don't spend much time in my personal room
10	Give light at home and provide some lighting effects	Expensive
11	Customization	Expensive

General comments:

- "Please provide more information about IoT at the beginning of the survey since I'm not well-informed about that."
- "The perception of IoT is too broad. Please specify which type of IoT will be discussed on the first page of the questionnaire."
- "The question about a stereotype of IoT at home couldn't be answered by people who are not experienced with it."

APPENDIX 2. ROTATED COMPONENT MATRIX - INITIAL

	Component								
	1	2	3	4	5	6	7	8	9
TAC1				.563					
TAC2				.411					
TAC3									.813
TAC4				.666					
TEC1							**.701**		
TEC2							**.786**		
TEC3							**.760**		
TEC4				.475					
PE1				**.612**					
PE2				**.702**					
PE3				**.682**					
PE4				**.566**					
EE1					**.675**				
EE2					**.648**				
EE3					**.688**				
EE4					**.706**				
SI1		**.787**							
SI2		**.823**							
SI3		**.823**							
SI4	.511	.646							
SI5	.460	.529							
SI6	.603	.484							
FC1	**.670**								
FC2	**.759**								
FC3	**.732**								
FC4	**.730**								
FC5	.483							.453	
FC6	.479				.473				
PI1								**.712**	
PI2								**.821**	
PI3								**.801**	
PR1						**.653**			
PR2						**.747**			
PR3						**.853**			
PR4						**.841**			
T1			**.724**						
T2			**.817**						
T3			**.764**						
T4			**.686**						
T5			**.676**						

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.

APPENDIX 3. ROTATED COMPONENT MATRIX - ADJUSTED

	Components							
	1	2	3	4	5	6	7	8
TEC1							.725	
TEC2							.781	
TEC3							.771	
PE1					.669			
PE2					.791			
PE3					.752			
PE4					.645			
EE1			.681					
EE2			.682					
EE3			.732					
EE4			.740					
SI1				.803				
SI2				.861				
SI3				.850				
FC1		.680						
FC2		.802						
FC3		.769						
FC4		.736						
PI1								.753
PI2								.847
PI3								.821
PR1						.652		
PR2						.761		
PR3						.852		
PR4						.848		
T1	.725							
T2	.816							
T3	.781							
T4	.704							
T5	.672							

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

APPENDIX 4. UTAUT'S MEASUREMENT ITEMS (VENKATESH ET AL., 2003)

Construct	Items
Performance expectancy	1. I would find the system useful in my job
	2. Using the system enables me to accomplish tasks more
	3. Using the system increases my productivity.
	4. If I use the system, I will increase my chances of getting a raise
Effort expectancy	1. My interaction with the system would be clear and understandable.
	2. It would be easy for me to become skillful at using the system.

	3. I would find the system easy to use.
	4. Learning to operate the system is easy for me.
Social influence	1. People who influence my behavior think that I should use the system.
	2. People who are important to me think that I should use the system.
	3. The senior management of this business has been helpful in the use of the system.
	4. In general, the organization has supported the use of the system.
Facilitating conditions	1. I have the resources necessary to use the system.
	2. I have the knowledge necessary to use the system.
	3. The system is not compatible with other systems I use.
	4. A specific person (or group) is available for assistance with system
Behavioral intention to use the system	1. I intend to use the system in the next <n> months.
	2. I predict I would use the system in the next <n> months.
	3. I plan to use the system in the next <n> months.

APPENDIX 5. ONLINE QUESTIONNAIRE

Start of Block: Pembuka

Pembuka Pembaca yang terhormat,
Terima kasih sudah meluangkan waktu untuk berpartisipasi dalam penelitian yang berjudul "**Adopsi *smart home* di Indonesia**". Penelitian ini dilaksanakan oleh Margaretha Sinaga dari *Faculty of Behavioural, Management and Social Sciences*, Universitas Twente, Belanda. Penelitian ini merupakan salah satu syarat akademis untuk mendapatkan gelar magister (MSc) dari Universitas Twente.
Tujuan penelitian ini adalah untuk mengetahui faktor apa saja yang mempengaruhi konsumen untuk mengadopsi *smart home* di Indonesia, yang dalam hal ini adalah adopsi Philips Hue. Anda akan membutuhkan waktu sekitar 5-10 menit untuk menyelesaikan survey ini.

Partisipasi Anda dalam penelitian ini sepenuhnya adalah sukarela dan Anda dapat membatalkannya kapan saja. Semua data akan dijaga kerahasiaannya dan hanya akan digunakan untuk kebutuhan riset. Jika Anda memiliki pertanyaan atau komentar, silakan kontak saya melalui: margarethasinaga@student.utwente.nl

Persetujuan Apakah Anda ingin melanjutkan?

○ Ya

○ Tidak

Skip To: End of Survey If Apakah Anda ingin melanjutkan? = Tidak

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I **DEMOGRAFI**
Silakan pilih jawaban yang sesuai dengan diri Anda.

*

1 Usia

____

2 Jenis Kelamin

○ Pria

○ Wanita

3 Tingkat pendidikan tertinggi

○ Sekolah Menengah

○ Sarjana

○ Magister

○ Doktoral

○ Lainnya

4 Kota tempat tinggal sekarang

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5 Apakah Anda punya pengalaman menggunakan produk-produk *smart home*, misalnya sistem *doorlock* dengan sidik jari atau password, CCTV yang bisa dipantau melalui ponsel, pengatur lampu otomatis, alat pendeteksi asap, dll?

	Tidak ada sama sekali	Pernah	Beberapa kali	Sangat sering
Pengalaman dengan smart home	○	○	○	○

6 Berapa jumlah anggota keluarga yang tinggal di rumah?

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II Di sesi ini, Anda akan menonton video perkenalan tentang **Philips Hue**, salah satu contoh produk *smart home*. Philips Hue adalah sistem pencahayaan pintar di rumah, yang bisa dikontrol melalui ponsel Anda. Philips Hue dapat **mengatur warna lampu** atau **tingkat kecerahan pencahayaan** di rumah, mengatur secara otomatis **rutinitas pencahayaan** di rumah, dan mengatur pencahayaan di rumah **melalui perintah suara**, dengan bantuan Google Home, Amazon Alexa, Apple Homekit, atau sejenisnya.

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III TASK TECHNOLOGICAL FIT

1 Apa saja jenis pekerjaan yang menurut Anda penting untuk dibantu oleh Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Mengatur warna lampu di rumah, misalnya mengubah menjadi warna kuning atau ungu.	○	○	○	○	○
Mengatur tingkat kecerahan lampu di rumah, misalnya meredupkan lampu saat menonton TV.	○	○	○	○	○
Secara otomatis mengadakan rutinitas pencahayaan di rumah, misalnya memadamkan lampu setiap pukul 7 pagi atau 11 malam dan menyalakan lampu setiap pukul 6 sore.	○	○	○	○	○
Mengatur peralatan di rumah dengan perintah suara saya, dengan menggunakan Google Home, Amazon Alexa, atau Apple Homekit.	○	○	○	○	○

2 Menurut Anda, apa saja teknologi yang disediakan oleh Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya merasa Philips Hue menyediakan pilihan warna yang cukup.	○	○	○	○	○
Menurut saya, Philips Hue menyediakan tingkat pengaturan kecerahan yang cukup.	○	○	○	○	○
Saya merasa Philips Hue menyediakan sistem automasi yang baik untuk mengatur rutinitas pencahayaan.	○	○	○	○	○
Saya yakin Philips Hue dapat bekerja sangat baik sesuai dengan perintah suara saya.	○	○	○	○	○

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IV UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

1 Menurut Anda, apakah Philips Hue akan berguna dalam hidup Anda?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Philips Hue akan berguna dalam hidup saya sehari-hari.	○	○	○	○	○
Philips Hue akan meningkatkan kinerja saya melakukan tugas-tugas penting.	○	○	○	○	○
Philips Hue akan membantu menyelesaikan pekerjaan saya lebih cepat.	○	○	○	○	○
Philips Hue akan meningkatkan produktivitas untuk mengatur sistem pencahayaan di rumah.	○	○	○	○	○

2 Menurut Anda, apakah mudah untuk mempelajari penggunaan Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya merasa Philips Hue mudah untuk dipelajari.	○	○	○	○	○
Saya pikir Philips Hue mudah untuk dipasang di rumah.	○	○	○	○	○
Menurut saya, Philips Hue mudah digunakan.	○	○	○	○	○
Saya merasa Philips Hue mudah untuk dipahami sampai mahir.	○	○	○	○	○

3 Menurut Anda, bagaimana pengaruh lingkungan dan orang-orang di sekitar untuk menggunakan Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Orang-orang penting di sekitar saya mungkin akan menyarankan penggunaan Philips Hue.	○	○	○	○	○
Orang-orang berpengaruh buat saya mungkin akan menyarankan penggunaan Philips Hue.	○	○	○	○	○
Keluarga, teman, dan kerabat lainnya berpikir bahwa saya seharusnya menggunakan Philips Hue.	○	○	○	○	○
Banyak orang di sekitar saya menggunakan Philips Hue.	○	○	○	○	○
Media massa, termasuk media sosial, mempengaruhi saya untuk menggunakan Philips Hue.	○	○	○	○	○
Saya melihat banyak iklan mengenai Philips Hue.	○	○	○	○	○

4 Menurut Anda, bagaimana kondisi fasilitas yang mendukung Anda untuk mengadopsi Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya mempunyai cukup waktu untuk mencari informasi mengenai Philips Hue.	○	○	○	○	○
Saya mempunyai cukup waktu untuk membeli Philips Hue.	○	○	○	○	○
Saya mempunyai cukup uang untuk membeli Philips Hue.	○	○	○	○	○
Mudah untuk mendapatkan Philips Hue atau mengirimkannya ke rumah saya.	○	○	○	○	○
Saya mempunyai WiFi yang stabil di rumah untuk menggunakan Philips Hue.	○	○	○	○	○
Akan mudah mendapatkan bantuan jika saya menemukan kesulitan menggunakan Philips Hue.	○	○	○	○	○

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V INOVASI DIRI, RISIKO, DAN TINGKAT KEPERCAYAAN

1 Menurut Anda, bagaimana tingkat inovasi diri Anda?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya suka membeli produk baru dan inovatif.	○	○	○	○	○
Di antara teman-teman, saya biasanya yang pertama mencoba atau mengeksplor teknologi baru.	○	○	○	○	○
Jika saya mendengar teknologi yang baru diluncurkan, saya ingin selalu mencobanya.	○	○	○	○	○

2 Menurut Anda, bagaimana risiko menggunakan Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Philips Hue akan mengurangi wewenang saya mengatur beberapa hal di sekitar saya.	○	○	○	○	○
Saya merasa lebih berisiko membagikan informasi dan data sehari-hari dengan Philips Hue.	○	○	○	○	○
Saya khawatir membayangkan Philips Hue yang tidak bekerja sesuai keinginan.	○	○	○	○	○
Saya khawatir bahwa Philips Hue mungkin akan menimbulkan masalah di rumah saya.	○	○	○	○	○

3 Menurut Anda, bagaimana tingkat kepercayaan Anda terhadap Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya percaya dengan Philips.	○	○	○	○	○
Saya yakin Philips mempunyai kualitas produk yang bagus.	○	○	○	○	○
Saya percaya dengan Philips Hue.	○	○	○	○	○
Philips Hue terjamin aman.	○	○	○	○	○
Philips Hue diciptakan untuk membantu penggunanya.	○	○	○	○	○

4 Bagaimana Anda menilai tingkat keinginan untuk menggunakan Philips Hue?

	Sangat tidak setuju	Tidak setuju	Netral	Setuju	Sangat setuju
Saya berencana akan menggunakan Philips Hue.	○	○	○	○	○
Saya ingin menggunakan Philips Hue.	○	○	○	○	○
Saya tidak akan ragu membeli Philips Hue.	○	○	○	○	○
Saya akan merekomendasikan Philips Hue kepada orang lain ketika mereka ingin beralih ke smart home.	○	○	○	○	○

Penutup Silakan tekan tombol selanjutnya untuk mengirimkan jawaban Anda.

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