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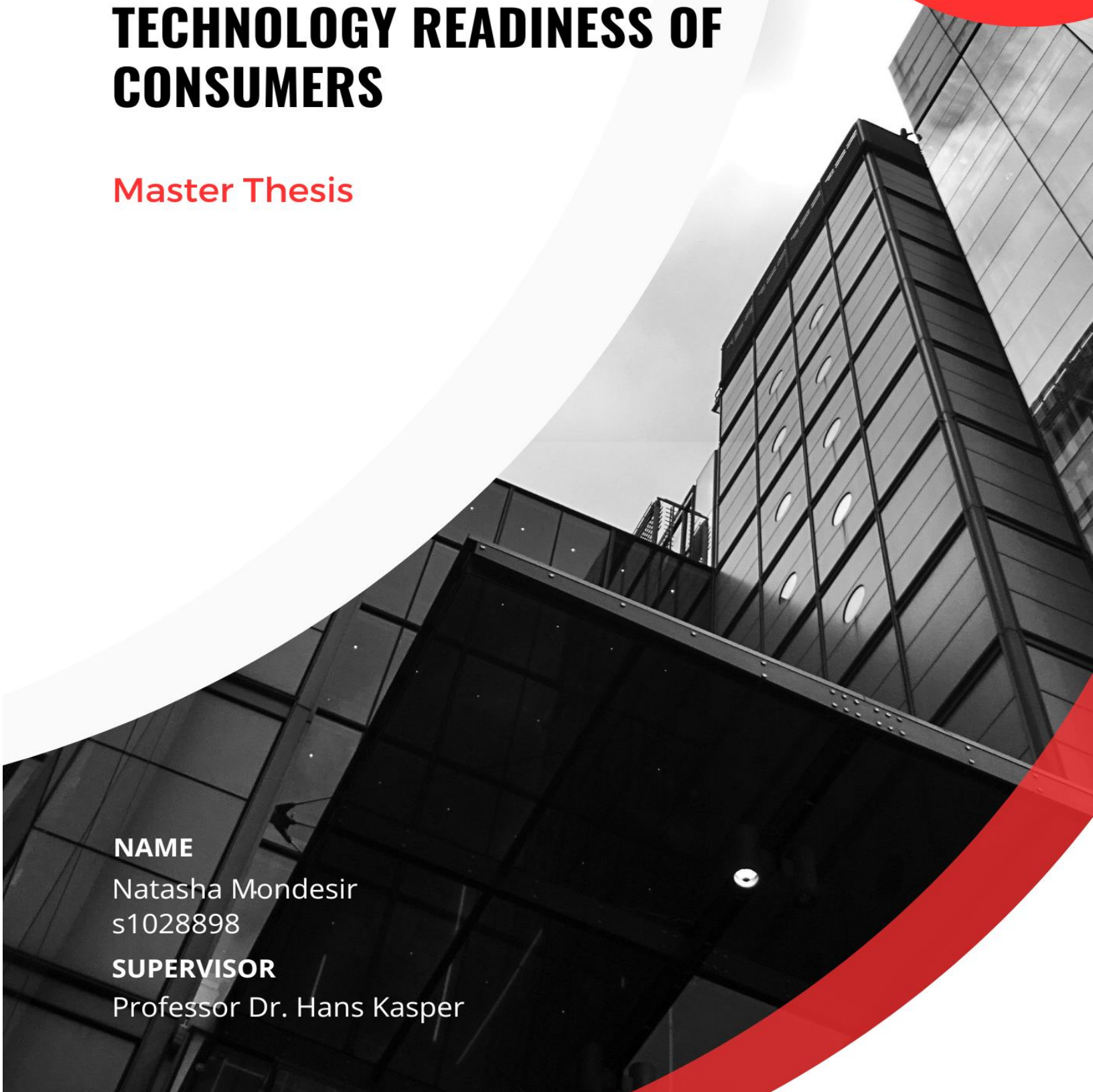
# THE IMPACT OF AGE ON TECHNOLOGY READINESS OF CONSUMERS

## Master Thesis

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# 1. Introduction

Self-scan check-out at the supermarket, online banking, online shopping, smartphones, smartwatches, and the list goes on (Liljander et al. 2006; Parasuraman & Colby, 2015). During the past few decades, we have witnessed a rapid diffusion of technology that completely changed consumers life (Blut & Wang, 2019). Companies are constantly using new technologies to increase productivity and efficiency and simultaneously meet consumers demand and increase satisfaction (Liljander et al. 2006; Gilly et al. 2012). Technology has triggered transformation by accelerating the way of doing business today due to its high speed, capacity, connectivity, functionality, and ease of use (Parasuraman & Colby, 2015). We have shifted into a completely new era. A couple of decades ago, we had to send a letter and wait months to communicate with our loved ones. Nowadays, it takes us less than 5 seconds to send a message to anyone all around the world. In the past, we had to go to the store to buy something we needed. Today, with the developments of computers and the Internet, consumers can sit in the comfort of their homes and order whatever they need all around the world. However, despite the growing importance of technology in consumers life, studies have shown that the use of these technologies is not given (Parasuraman & Colby, 2015; Westjohn et al. 2009; Blut & Wang, 2019).

The rapid development of technology-based products and services brought new challenges for both consumers and companies. For some consumers new technological innovations are considered radical, cutting-edge, or 'really new', and cause discomfort and insecurity (Liljander et al. 2006). In this study, we adopt the definition of new technology by Colby (2002), which defines technology as anything that is (1) cutting-edge and (2) removes a significant part of the human element from the product or service it replaces. The latter makes some consumers reluctant to engage with new technologies (Blut & Wang, 2019). This reluctance to use new technology also becomes a hurdle for companies since it limits them in getting the full benefit from the technological products and services they are offering. Therefore, it is crucial to expand our knowledge of factors affecting consumers' technology readiness (TR) to use new technologies (Liljander et al. 2006).

It has been widely argued in the literature about whether younger consumers have a higher level of readiness when it comes to accepting new technology as compared to older consumers (Rojas-Mendez et al. 2016; Tsikriktsis, 2004; Gilly et al. 2012). If we take The Netherlands, which is according to the World Economic Forum one of the top 10 countries in the world with regard to technological developments, we can see that there are still gaps between certain consumers of a certain age (World Economic Forum, 2020; Government of The Netherlands, 2016). According to the Dutch Central Bureau of Statistics (2020), only 34 percent of elderly consumers are currently exchanging text online as compared to 84 percent of younger consumers in the Netherlands. In addition, CBS (2021) also indicates that only 18 percent of elderly consumers make use of Internet calls as opposed to 58 percent of younger consumers. CBS (2012) also indicates that Internet telephony is also more popular among highly educated than among low-educated consumers. Yet, this difference cannot be explained by the fact that highly educated people use more smartphones nor are younger on average (CBS, 2021). Rojas-Mendez et al., (2016) argue that even though the elderly do engage with new technology developments, this is at a far slower rate as compared to younger consumers. Furthermore, scholars also argue that older consumers are selectively innovative and therefore are less likely to adopt new technology especially when they do not understand the benefits from it (Kasper, 2018). Now the question is: To what extent does age affect the readiness of consumers when it comes to accepting the new technological developments in the market?

Previous studies have considered the role of consumer traits in explaining customer adoption of technologies (Westjohn et al. 2009). This is being researched with the aim of understanding which consumers are more likely to engage with technologies (Blut & Wang, 2019). One of the trait variables that has received a lot of attention is the technology readiness index (TRI), which was developed by scholar Parasuraman (2000) and Parasuraman and Colby (2015) in the US. It was developed on the notion that people have both positive and negative feelings when it comes to the adoption of technological innovation (Parasuraman , 2000). The TRI is a very useful scale to identify whether

consumers are widely accepting new technology or not. Especially in the case of age, this scale can help to identify whether there is a significant discrepancy between younger and older consumers and identify where specifically this discrepancy lies. However, this effect is far from being confirmed in the literature. First, studies on the effect of age on TRI of *consumers* are limited (Blut & Wang, 2019), and have shown inconsistent results (Gilly et al., 2012). Dutot (2014) has found age to be negatively related to TR, suggesting that younger and educated consumers use technology more readily. Yet, other studies have found no significant effect (Gilly et al. 2012). Therefore, multiple studies called for further research on the effect of age on TR (Liljander et al. 2006; Parasuraman , 2000; Blut & Wang, 2019). Second, other scholars that have assessed the effect of demographics on TR have focused on a particular group or technology, whereas the studies of Parasuraman (2000), have predominantly been developed and surveyed TR in general among a random sample of consumers. Multiple studies have focused on managers, entrepreneurs, and primary school teachers who are primarily *employees* (Jaafar et al. 2007; Banta, 2009; Astuti & Nasution, 2014). Therefore, Liljander et al. (2006) argue that these results need to be reassessed since TRI is not readily suitable for explaining TR with respect to a particular product and service. Third, unlike the common belief in the literature that all elderly consumers have a low level of technology readiness, the results of some studies imply that this might not be the case (Tsikriktsis, 2004; Parasuraman & Colby, 2015; Rojas-Mendez et al. 2016). This is because former studies have frequently reported that education and gender play an important role on the TR of consumers (Tsikriktsis, 2004; Rojas-Mendez et al. 2016). Yet, no research has integrated education and gender as a moderating variable on the effect of age on TR. This in turn further motivates us to extend the current literature on the effect of age on TR.

Understanding to what extent age is a key factor when it comes to accepting new technology is important from both a Marketing and a social point of view. From a marketing point of view, marketers are constantly losing connection with the elderly group. This in turn makes it more difficult to create and shape products and services according to the specific needs of the consumer and to communicate them in a way that is

comprehensive for the vast majority. Yen (2005) provides evidence that consumers do not appreciate the value that is created by new technology, due to the extent it is advertised by companies. As already stated, studies on the effect of age on TR are still very limited in the literature (Blut & Wang, 2019). This research aims to extend the literature on the TR of consumers and help both academics and managers understand the distinctive behavioral process behind the adoption of cutting-edge technology products and services. By doing so it highlights how companies should communicate their innovative products and services to different consumers so both companies and consumers of all ages can benefit from them (Tsikriktsis, 2004). From a social point of view, this is also very relevant, because the elderly are missing out on the benefits that these technological developments bring to the table. Recently, we have seen the importance of technology more than ever. In 2020, we encountered the huge challenge of the Corona pandemic crisis which had a -90.2% impact on mobility in the Netherlands (CBC, 2021). Meaning that the way that consumers used to connect and do business has shifted greatly in a rapid time. This lack of mobility had laid extra pressure on the use of technology to stay connected with loved ones, improve social well-being, and to keep business going (Wilson-Nash et al., 2023). If elderly consumers have a lower level of readiness when it comes to accepting new technologies, this means that they are not getting the benefits that technology development can offer. In a grey society such as the Netherlands, where a large percentage of the population consists of the elderly (CBC, 2021), this is an even bigger problem. The latter is because a large proportion of society is not receiving the benefits of technology. Therefore, this research tries to answer the question “To what extent does age affect the readiness of consumers when it comes to accepting the new technological developments in the market?” Answering this research question will help to bring a clear view in the literature on how age affects the technology readiness index of consumers. More specifically it highlights whether age has an impact on the readiness of customers to adopt technological innovations in their life and at work and how education and gender moderate this relationship. But most importantly, this research tries to solve a social and marketing concern.

The first chapter of this research introduces the problem. Chapter two will give an extensive analysis of the literature. In this chapter, the technology readiness theory will be explained and will highlight what we already know about the effect of age on TR. The chapter will be finalized with a conceptual framework that identifies all the relevant variables that can impact the technology readiness index when it comes to the demographic variable age. In chapter three the research method will be explained. Furthermore, in Chapter 4, the analysis will be done and will be further discussed in Chapter 5 where the relationship between age and TRI will be analyzed to come up with a robust answer to our research question. Finally, a conclusion of the research, recommendations to firms, our theoretical contribution, and suggestions for further research will be given.

# 2. Literature Review

In this chapter, an in-depth analysis of the current literature on TR will be made. The idea is to give an overview of everything that is already known about the relationship between age and the technology readiness index. The literature review starts with a clear explanation of the technology readiness index. Secondly, we will highlight what is already known about the relationship between age and TR including other variables that may affect the relationship. Finally, the literature review will be concluded with a theoretical framework that identifies all the relevant variables that will be measured in the following chapters.

## 2.1. Technology readiness index (TRI)

TR refers to "people's propensity to embrace and use new technologies for accomplishing goals in home life and at work" (Parasuraman , 2000, p. 308). According to Parasuraman (2000), Technology Readiness is a state of mind that consists of both positive and negative feelings related to a consumer predisposition to use new technologies. This state of mind can range from extremely positive to extremely negative, depending on the dominance of the feelings related to technology (Parasuraman & Colby, 2015). TR is a trait-like variable that differs based on an individual characteristic (Blut & Wang, 2019). Therefore, not everyone has the same level of readiness when it comes to the adoption of new technology in their lives.

Westjohn et al. (2009) used the Metatheoretical Model of Motivation (3 M Model) (Mowen 2000) to describe the TR construct. Based on this model the TR is characterized as a situational trait that describes a person's predisposition to behave within a particular context (Mowen, 2000). The 3 M model makes a distinction between four different traits in which elemental traits are the most stable one since it is related to an individual's genetics and early learning history. The situational trait on the other hand is less stable since it is subject to change. The latter is because it is context specific and can be influenced by an individual's experiences and situational environment (Mowen, 2000; Westjohn, 2009). This trait-specific aspect of TR makes it different from other constructs in the literature.

2.1.1 TR Construct and Dimensions:

Parasuraman (2000) has operationalized the former idea into 4 dimensions that together measure consumers' overall technology readiness. Two of the dimensions are referred to as the "drivers" (optimism, innovation) of TR, and they indicate the positive feelings related to the adoption of new technology. The other two dimensions are referred to as the "inhibitors" (discomfort, insecurity) of TR and they indicate the negative feelings related to the adoption of new technology. The TRI scale ranges from 1 (strongly disagree) to 5 (strongly agree), where 3 is the midpoint of the scale that indicates that one is neutral about one particular scale item. According to Parasuraman & Colby (2015), the mean TRI score ranges between 2.88 and 3.02. Consumers tend to be generally optimistic about technology (M= 3.75) and more neutral about innovativeness (M= 3.02). For the inhibitors items, consumers tend to be neutral for discomfort (M= 3.09) and slightly above neutral for insecurity (M=3.58) (Parasuraman & Colby, 2015). The four dimensions are further discussed below:

*2.1.1.1 The technology readiness dimensions:*

1. *Optimism:* A positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives. It indicates the benefits perceived by using new technology. (Parasuraman , 2000, p. 311)

Consumers that are optimistic about cutting-edge technology believe that technology will give them greater control in their lives and that it will make them more efficient at home or at work and that these technologies will provide them with greater benefits for their schedule and therefore increase freedom of mobility (Colby, 2002).

2. *Innovativeness:* A tendency to be a technology pioneer and thought leader. (Parasuraman , 2000, p. 311)

This dimension of TRI explains the degree to which an individual likes to explore and experiment with new technologies. Innovative consumers like to know about new

technologies and enjoy sharing their knowledge and source of information with others (Colby, 2002).

3. *Discomfort:* A perceived lack of control over technology and a feeling of being overwhelmed by it. (Parasuraman , 2000, p. 311)

It measures the degree of anxiety consumers feel when they are unable to control a new technology. Consumers that have a high level of discomfort tend to feel incapable of mastering and learning how to use new technologies. Besides, they also feel somewhat embarrassed when it fails (Colby, 2002).

4. *Insecurity:* Distrust of technology and skepticism about its ability to work properly. (Parasuraman , 2000, p. 311)

This dimension explains the degree of distrust a consumer feels when it comes to using cutting-edge technology. Consumers with high levels of insecurity have a low level of trust when it comes to using technology and they also tend to feel that technology somehow evades their privacy (Colby, 2002).

The multi-dimension characteristic of the TR construct has created inconsistencies in the literature on what the best way is to conceptualize it. The question remains on whether TR is best understood as a four-dimensional (optimism, innovation, discomfort, insecurity), a two-dimensional (drivers, inhibitor), or a one-dimensional construct (overall composite of TR) (Blut & Wang, 2019). Various studies have used the four dimensions to explain TR to assess each dimension separately (Lam et al. 2008; Son & Han, 2011; Tsikriktsis, 2004). Even though this approach gives a more detailed overview of the construct and its effect, it did not go without critics. The reason is that the full scale to measure TR has been considered very long and inconvenient to use (Parasuraman & Colby, 2015), and has displayed a similar effect for the two motivators (inhibitors) (Liljander et al. 2006). The question remained whether it is relevant to treat them as four separate dimensions (Blut & Wang, 2019). Other studies have adopted a one-dimension approach to fully capture the effect of the overall TR (Vize et al. 2013). Some studies argued that this approach is methodologically convenient but that it does

not capture the effect of each dimension separately (Blut & Wang, 2019). Moreover, some studies have adopted a two-dimensional approach to conceptualize TR as drivers and inhibitors (Jin, 2013; Blut & Wang, 2019). This has been used as an intermediate approach with the aim to reduce the complexity of the four dimensions while still providing a more complete picture of the positive and negative feelings related to the construct (Jin, 2013). In this study, we will adopt this intermediate approach to give extra insight into the effect of age on TR, drivers, and inhibitors.

## 2.2. Age and TR of consumers

Demographic variables such as age have been considered an antecedent of TR in the literature. This is due to the trait-like characteristic of the TR construct (Blut & Wang, 2019). Existing studies have shown that the age of a consumer plays an important role in accepting and using new technology (Hur et al., 2017). Yet very few studies have focused on the effect of age on the TR of consumers. Unlike the common belief of the effect of age on TR among researchers, the effects are far from being confirmed. Dutot (2014) found a negative relationship between age and TR and a negative relationship between age and the drivers of TR. Meaning, that the older the consumer, the less optimistic and innovative it is towards cutting-edge technology. Rojas-Mendez et al. (2016) also found a similar effect in their cross-cultural study on demographics and TR. However, Gilly et al. (2012) found these effects to be non-significant. Because the findings on this topic are limited and inconclusive (Blut & Wang, 2019; Rojas-Mendez et al. 2016), it provides us the opportunity to further investigate the effect of age on TRI.

## 2.3 Other Demographic Variables

### 2.3.1 Education

Referring to the trait-formation theory, researchers have found other demographic variables also to be related to TR. One of them is Education. Rojas-Mendez et al. (2016) have found education to be direct positively related to the motivators of TR, and direct negatively related to the inhibitors of TR. Meaning that highly educated consumers tend to have a higher level of technology readiness as compared to lower educated consumers.

Various studies have used the TRI scale by Parasuraman (2000) to assess the effect of TR on employees. Jaafar et al. (2007) found education to be positively related to TRI. They found that Malaysian managers with a high education level had a higher level of technology readiness. Astuti & Nasution (2014) found a similar effect when assessing the TR of entrepreneurs of small and medium enterprises (SME) in Bandung. Results of these previous research show us that education needs to be considered when assessing the impact of age on TR.

### 2.3.2 **Gender**

Another demographic variable that is found to be related to TR is gender. Rojas-Mendez et al. (2016 ) found that male consumers score higher on innovativeness and lower on discomfort and insecurity as compared to females. This result is also in line with Tsikriktsis (2004) that report that males tend to be more eager to adopt cutting-edge technologies. Furthermore, Summak et al. (2010) found a similar effect in their study on primary school teachers. Male teachers scored higher on technology readiness as compared to female teachers (Summak et al. 2010). The results of these studies imply that gender may play an important role while assessing the effect of age on TR.

## 2.4 Consumers' characteristics related to TR

In this section, we are going to talk about the size of the technology readiness index and the various segments that have been identified by researchers to better understand the characteristics of various consumers at various technology readiness levels.

To better understand the different characteristics of consumers at various technology readiness levels, the researchers Parasuraman and Colby (2001) developed a segmentation scheme that is divided into five types of consumers which each possess different characteristics. This segmentation can be compared to the five diffusion stages and the s-curve by Rogers (1995). The S-curve is also divided into five adopters categories: (1) the innovators, (2) the early adopters, (3) the early majority, (4) the late

majority, and (5) the laggards. It highlights that there is a difference between people that adopt an innovation first and those that adopt it last. These categories are similar to the segments provided by Parasuraman & Colby (2001). These segments are (1) Explorers, (2) Pioneers, (3) Skeptics, (4) Paranoids, and (5) Laggards. In contrast to Rojers (1995), Parasuraman & Colby segmentation is based on the different levels of optimism, innovativeness, discomfort, and insecurity that each consumer possess (Colby, 2002). See Table 1. The explorers tend to be the consumers with the highest technology readiness, followed by Pioneers, Skeptics, and Paranoids respectively. The Laggards is the segment with the lowest level of TR. They experience a low level of optimism and innovation and simultaneously experience a high level of resistance due to a high level of discomfort and insecurity.

| Segments | Optimism | Innovativeness | Discomfort | Insecurity |
|---|---|---|---|---|
| **Explorers** | High | High | Low | Low |
| **Pioneers** | High | High | High | High |
| **Skeptics** | Low | Low | Low | Low |
| **Paranoids/ Hesitators** | High | Low | High | High |
| **Laggards/ Avoiders** | Low | Low | High | High |

*Table 1:Segments*

### 2.4.1 **Moderating Effect of Gender and Education**

If we look at how the consumers are spread over the segments based on their age, we can see that younger consumers tend to be Explorers. The explorers are profiled as young male consumers, with a high level of education (Parasuraman & Colby, 2001; Tsikriktsis, 2004). If we look at the elderly consumers based on this segmentation, they tend to fit the segment with the lowest TR which is Laggards. The Laggards has been profiled mainly as female older than 45 years old, with low a low level of education (Parasuraman & Colby, 2001; Tsikriktsis, 2004). This result provides us with a new avenue to understand the difference between consumer behavior concerning technology readiness. Unlike the common belief in the literature that all elderly have a low level of

technology readiness (Tsikriktsis, 2004), the result of this segmentation indicates that this might not be the case. It shows us that not all elderly consumers are reluctant to use technology and that both gender and education might play a role in their level of technology readiness. We believe that the effect between age and TR is moderated by gender and the education level of the consumer. Yet no research has tested this effect in the TR literature before. Studies on moderating effect on TR is very rare in the literature (Blut & Wang, 2019). Therefore, we are going to use this opportunity to zoom in a little bit more on the effect of age on TR by understanding how education and gender interact with this relationship. This research is also in line with Westjohn et al. (2009) that suggest that exploring moderating effects of TR may be more meaningful to explore than direct effect.

## 2.5. Conceptual Framework

Regarding the technology readiness, it is very important to understand that the technology readiness of consumers is not an action but rather a cognitive state of mind. So it is not how well consumers are able to use technology, but rather how predisposed they are to using it. The latter brings us back to the positive and the negative feelings related to the technology readiness Index. As aforementioned, every consumer has both positive and negative feelings when it comes to using a new technology and these feelings together explain their technology readiness (Parasuraman, 2000). The latter is the core of this investigation because every human is different and therefore possesses different levels of technology readiness.

When it comes to studies that were previously done on this particular subject, we were able to see in the literature that such differences in consumer characteristics indeed exist. Parasuraman (2001) and Tsikriktsis (2004) were able to show this by creating different segments that contain specific characteristics of humans with certain technology readiness levels. However, it is still unclear in the literature to what extent does the specific demographic variable age affects the technology readiness of consumers.

In addition to that, we were also able to see that there might be other factors that might affect the relationship between age and TRI. The two personal characteristics that

were most frequently reported were the differences in gender and education. Studies have shown that males and females process information differently and that people with higher education have a different cognitive capacity (Kotze et al., 2016), which in turn give them a different predisposition towards new technology (Blut & Wang, 2019). However, these studies have only assessed the direct relationship of the factors on TR. No study in the literature has considered how these differences might moderate the relationship between age and TR. This approach will benefit the literature since it gives a better insight into how the effect of age on TR differs for elderly consumers that have a certain gender or level of education.

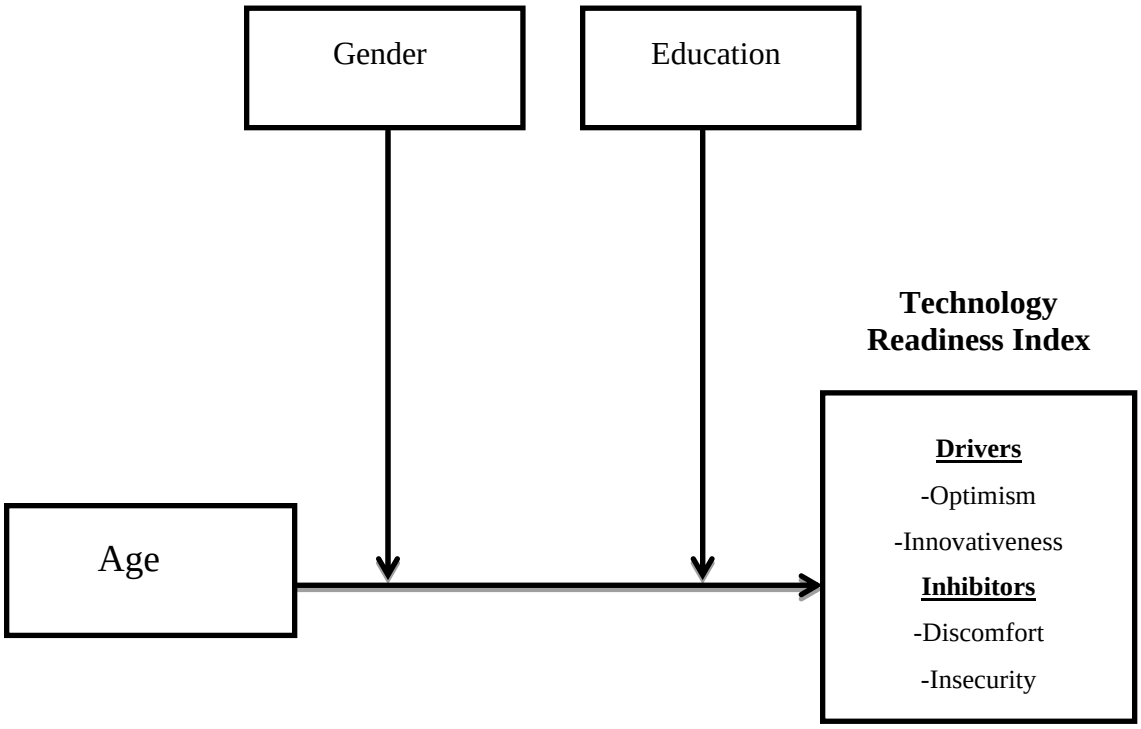


Figure 1: Conceptual Framework

After analyzing the current literature, we propose the conceptual model displayed above. The main question of this study is 'To what extent does age affect the readiness of consumers when it comes to accepting the new technological developments in the market?" As explained in the literature, Technology readiness consists of four dimensions. Two of them are the drivers of the TRI (Optimism & Innovativeness) and the other two are the inhibitors of the TRI (Discomfort & Insecurity). Based on the trait-formation characteristic of the TR, we expect that specific personal characteristics will result in a different level of technology readiness. This study aims to expand the knowledge in the literature by investigating how the demographic variable age affects the level of TR of consumers. Additionally, we further extend this investigation by assessing how other consumer characteristics such as gender and education level, moderate the relationship between age and TR In the case of the elderly, we expect the relationship between age and TRI to provide us with different results when the elderly consumer has a certain gender or level of education. With those relationships in mind, we have formulated the research hypotheses mentioned below.

### 2.5.1. Hypothesis:

#### *2.5.1.1 Direct Effect of age on TRI*

The first hypothesis is related assess the direct effect of age on Technology readiness. Even though studies by Meuter et al., (2003) and Rogers (1995) had doubts on the role of demographics in technology adoption, they consider age as the most consistent predictor of self-service technology usage by consumers. As discussed by Parasuraman & Colby (2001), consumers with a high level of the drivers of TR (optimism, innovation) and a low level of the inhibitors (insecurity, discomfort) are considered high technology ready. Studies on TR have found age to be negatively related to the motivator of TRI (Dutot, 2014; Rojas-Mendez et al., 2016). Older people have generally been considered more reluctant to change (Blut & Wang, 2019). Therefore, they show less optimism concerning technology because they are less able to see the advantages due to reduced

cognitive capabilities (Rojas-Mendez et al., 2016). Additionally, age has been found to be positively related to the inhibitors of TR (Dutot, 2014; Rojas-Mendez et al., 2016). Older people are generally more skeptical due to their richer life experiences and tend to feel more uncomfortable about using cutting-edge technologies (Blut & Wang, 2019). In both the studies of Parasuraman and Colby (2015) and Tsikriktsis (2004) indicate that older people are more likely to be "Paranoids" and the "Laggards" which in turn suggests they experience a low level of optimism and innovativeness and a high level of discomfort and insecurity. However, Gilly et al. (2012) found these effects to be non-significant and create inconsistencies concerning the role of age on TR. This inconsistency on the role of age on TR of consumers gives us support to include age for examination. Therefore, we propose the following hypotheses below:

> ***H1:*** *Age has a negative effect on the overall TRI, consumers in older age categories are expected to be less technology ready than consumers in younger age categories. More specifically they are expected to score (**1A**) lower on the drivers of TR (optimism, innovation), and (**1B**) higher on the inhibitors of TR (discomfort, insecurity).*

#### *2.5.1.2 Moderating Effect of Education*

In line with the trait-formation theory, we expect education to be related to the TR of consumers (Mowen, 2000). Technology readiness literature has long studied the direct effect of education on TR. These studies have found education to be positively related to the drivers of TR (Rojas-Mendez et al. 2016; Jaafar et al 2007; Astuti & Nasution 2014; Summak, Baglibel, & Samancioglu, 2010). Higher-educated people have been found to have more sophisticated cognitive structures which in turn provides them with the opportunity to learn in dynamic environments (Blut & Wang 2019; Rojas-Mendez et al., 2016). Education has been found to increase ones ability to adapt and learn in new environments and therefore is considered to stimulate a more optimistic view of cutting-edge technologies (Blut & Wang 2019; Rojas-Mendez et al., 2016). On the other hand, education have been found to be negatively related to the inhibitors of TR (Rojas-Mendez et al., 2016). Lower-educated people, due to their less sophisticated cognitive ability, tend

to be less confident in their ability to control technology and therefore are more likely to be overwhelmed and feel uncomfortable when using technology (Rojas-Mendez et al., 2016). This is because education reduces people's reservations to use new technology since they are able to understand it better (Blut & Wang, 2019). However, the literature only assessed the direct relationship between education and TR. Recent studies on TR segmentation have shown us that differences occur in the technology readiness level of highly educated vs lower educated consumers (Parasuraman & Colby, 2001; Tsikriktsis, 2004). When it comes to the relationship between age and TR, studies have failed to assess whether the relationship has the same effect when comparing higher-educated consumers to lower-educated consumers. More specifically the segmentation by Tsikriktsis (2004) showed us that the effect of age on TR is more related to consumers with a lower level of education. Therefore, we expect education to moderate the effect of age on TR. More specifically, we expect age to have a stronger effect on TR for consumers with a lower level of education whereas we expect a weaker effect of age on TR for consumers with a higher level of education (Rojas-Mendez et al., 2016). Therefore we propose the following hypothesis:

> ***H2:*** *The effect of age on TRI is stronger for consumers with a low level of education, whereas the effect is weaker for consumers with a higher level of education. More specifically this effect is stronger on (**2A**) drivers of TR (optimism, innovation) when consumers have a low level of education, and (**2B**) weaker on inhibitors of TR (discomfort, insecurity) when consumers have a high level of education.*

#### *2.5.1.3 Moderating Effect of Gender*

As with education, studies in the literature have only assessed the direct effect of gender on TR. Kotze et al. (2016) have shown that men tend to be generally more positive towards technology as compared to women and that women tend to be generally more technophobic as compared to men with these levels of technophobia increasing as the technology becomes more innovative. In line with this reasoning results of Rojas-Mendez et al. (2016) studies on TRI and demographic shows that men tend to have more

positive attitude towards adopting technology as compared to woman. Tsikriktsis (2004) also report that males tend to be more eager to adopt cutting-edge technologies. Furthermore, it has also been shown that women tend to report higher levels of insecurity and discomfort when it comes to technology readiness (Blasko et al., 2020), which in turn results in a lower level of TR (Tsikriktsis, 2004). Furthermore, both Parasuraman & Colby, (2001) and Tsikriktsis (2004) show that females tend to fit in the "Laggards" segment which is the segment with the lowest level of TR. They further report Male to fit the "explorer" segment which is the segment of consumers with the highest level of TR. However, studies on TR in the literature have not assessed the possible moderating effect of gender on the effect of age on TRI. This in turn allows us the opportunity to further investigate this relationship. Therefore we propose the following Hypothesis below:

> ***H3:*** *The effect of age on TRI is stronger for females in comparison to males. More specifically females tend to score lower on (**3A**) drivers of TR (optimism, innovation), and higher (**3B**) on inhibitors of TR (discomfort, insecurity) in comparison to males.*

# 3. Methodology

## 3.1. Research type

To come up with answers to our main research question we will use a quantitative research method, which is a research method based on collecting data in the form of numbers, with the purpose to test or generate a hypothesis. (Sekaran & Bougie, 2016) This method was chosen because the TRI developed by Parasuraman (2000) and Parasuraman & Colby (2015) is measured through a questionnaire, which is the way to collect quantitative data.

There are two versions of the TRI: TRI 1.0, which was developed by Parasuraman (2000), and TRI 2.0, a refined version that was developed by Parasuraman & Colby (2015). Both scales assess the technology readiness index through the 4 sub-dimensions, Optimism, Innovativeness, Discomfort, and Insecurity. However, there is a difference between the two metrics. The TRI 1.0 is a questionnaire that includes 36 items, and the TRI 2.0 is a questionnaire that includes only 16 items (Parasuraman & Colby, 2015). Considering that the existing data has been collected through questionnaires, this automatically implies that a quantitative study is the only option for this study. Furthermore, doing a quantitative study gives us the opportunity to get generalizable answers that can contribute to the existing literature on technology readiness (Sekaran & Bougie, 2016).

## 3.2. Data Collection

This study will be done on existing data. Both American professors Parasuraman and Colby have provided me with the data set of their studies to conduct further analysis and comparison throughout the time. The data were collected in the years, 1999, 2004, 2009, and 2014. The aforementioned datasets consist of both answers that have been collected with the TRI 1.0 and the TRI 2.0. However, due to irregularity in the different dataset (see Appendix 2), this study will only focus on the datasets that were collected in the years 1999, 2004, and 2014. The year 2009 was left out of our analysis because it was an adjusted telephone questionnaire that was based on only 10 items. This in turn varies

too much from the original TRI 1.0 and the TRI 2.0. Using these existing datasets will differentiate this study from other studies because it will be conducted exactly among consumers, which is the target group the TRI was primarily developed on.

### 3.3. Research Analysis

The tool that will be used for processing the data is SPSS 28. This is similar to the other studies done on TRI and demographic variables. The confirmatory Factor analysis will be first used to assess the validity and reliability of the variables in technology readiness. The two variants of TRI were compared to see if the data can be reduced to 16 items same as TRI 2.0, y2014. If so, we would have been able to compare the years with equal items. After careful comparison of the items within each questionnaire, the conclusion can be drawn that it is not possible. The TRI 2.0 contains only 11 items that are included in the first version which is TRI1.0. Five completely new items were included in the scale. Therefore, each year will be analyzed according to its original TRI scale. Appendix A shows a detailed table that shows which items are included in each year. Furthermore, a regression analysis will be conducted in order to understand the relationship between age and TRI and the moderating effect of gender and education on this relationship.

One single procedure was used to test our hypothesis for every dataset. I started by following the guidelines that have been provided by the authors on how to deal with the information in the dataset. The guidelines are mentioned below.

1. Compute new variables for all items and make missing data equal to 3 which is a neutral response. In addition, all respondents who did not answer more than 3 items have been excluded from the study as suggested.
2. An average of each of the four dimensions has been computed.

3. An overall TR score has been calculated based on the formula provided by the authors of the scale. TRI= (Innovative +Optimism + (6-Insecurity) + (6-Discomfort))/4.[1]

Secondly, a series of tests have been conducted to prepare the data for analysis. Each dimension of the TRI has been tested on its reliability to make sure that the items are measuring the same construct. This was also done for the overall TRI construct. See part 4.3. In addition, a factor analysis has been conducted to make sure that the items in each dimension are measuring the same construct. After the former, I inspected the data for its distribution and outliers. Third, I conducted a linearity check to make sure that a multiple linear regression analysis was suitable for this study. Next, I conducted a multiple linear regression analysis to test my hypotheses where age has been divided into age groups that were developed by the developers of the TRI scale (Parasuraman & Colby, 2015). Hypotheses are accepted when the relationship is confirmed in all 3 datasets.

### 3.4. Research ethics:

This research will be conducted ethically, meaning that the data will be carefully analyzed to make sure that the right conclusion will be drawn from the dataset that was provided by the researchers Parasuraman & Colby for this study. Furthermore, due that we are using existing data we need to rely on the ethics of the authors as well. Nevertheless, the best statistical methods will be used, and the dataset will not be used nor shared without the permission of the owners.

1 The Calculation of the TRI is a sum of the Drivers and the Inhibitors of the TRI. The Inhibitors of the TRI are reversed, therefore (6-Inhibor) is used in the formula.

# 4. Results

## 4.1 Sample Description

As explained before, a total of three databases were used for this study. As shown in Table **2**, the biggest dataset is the year 1999 with 968 valid questionnaires followed by the year 2004 and 2014 which has 500 and 267 valid questionnaires respectively. With regards to gender, all three datasets have a fair division – almost 50% - of female and male respondents. With regards to age, most of the respondents were younger than 54 years old whereas the dataset of 1999 had the lowest number of participants with an age of 54 years or older. With regards to education, the group with the highest percentage in every dataset was High school with 41%, 44%, and 44% for y1999, y2004, and y2014 respectively.

## 4.2 Assumptions

A simple linear regression was used in order to test our model. The following assumptions were considered before conducting our analysis. First, we check for additivity and linearity to make sure that the relationship between age and TRI could truly be explained by a linear model. The second assumption considered is normality. Due to the central limit theorem, we can assume that our data is approximately normally distributed. Third, consider the assumption of independence to make sure that the method the errors in our study is not related to each other and that the method chosen is optimal Furthermore, before conducting the regression analysis, we had to make sure that the data had no significant outliers. In cases where the former assumption was not met, the data was winsorized to reduce the outliers. Moreover, the proposed regression model needs to be significant and there should be no sign of multicollinearity. In cases of multicollinearity, the data had to be analyzed to check which variable could be omitted. (Hair et al., 2013)

| | Data Profile | | |
|---|---|---|---|
| **Description** | **2014** | **2004** | **1999** |
| **Valid N** | 267 | 500 | 968 |
| ***Gender*** | | | |
| **Female** | 51% | 52% | 51% |
| **Male** | 49% | 48% | 49% |
| ***Age*** | | | |
| **18-26** | 9% | 11% | 12% |
| **25-34** | 21% | 15% | 19% |
| **35-44** | 17% | 18% | 24% |
| **45-54** | 18% | 18% | 17% |
| **55-64** | 21% | 16% | 12% |
| **65+** | 14% | 21% | 16% |
| ***Education*** | | | |
| **Less than High School** | 2.2% | 8% | 8% |
| **High School** | 44% | 44% | 41% |
| **Some College or Two years degree** | 26% | 25% | 26% |
| **Four years college degree** | 17% | 14% | 14% |
| **Masters/ Professional Degree** | 9% | 8% | 7% |
| **Doctorate** | 0.3% | 1% | 1% |
| **Post Doctorate** | 1.3% | 0.3% | 0.4% |
| **other** | 0.3% | 0% | 2% |

*Table 2: Data Profile*

## 4.3 Validity and Reliability

A principal component analysis (PCA) was conducted on in total of 36 items for y1999 and y2004 and on 16 items for y2014 with an orthogonal rotation VARIMAX. Results are displayed in Table 3. Each analysis was conducted for the dimensions of the TR scale and the overall TRI. The Kaiser-Meyer-Olkin (KMO) & Bartlett's test verified the sampling adequacy for the analysis for each dimension for each year. Look at Table

4. Every dimension had a value above 0.7 for the KMO 7 Bartlett's test which is way above the minimum requirement of 0.5. For the Dimension Optimism, all KMO values are above .8, KMO=0.903; y1999, KMO=0.850; y2004 and KMO=0.803; y2014. For the dimension Innovation, all values were above 0.7, KMO=0.863; y1999, KMO=0.825; y2004 and KMO=0.794; y2014. For the dimension Discomfort, all values were above 0.7, KMO=0.852; y1999, KMO=0.804; y2004 and KMO=0.710. For the last dimension Insecurity, all values were above 0.7, KMO=0.822; y1999, KMO=0.786; y2004 and KMO=0.749; y2014. For the overarching construct, TRI all the KMO values are above .8, KMO=0.890; y1999, KMO=0.844; y2004 and KMO=0.839; y2014.

An initial analysis was run to obtain 'eigenvalues' for each factor in each dimension of our data. As can be seen in Table 3, for the dimensions of Discomfort and Insecurity two factors had eigenvalues over Kaiser's criterion of 1 for both y1999 and y2004. The total variance explained by the two factors for the dimension Discomfort was 40,26%; y2004 and 40,75%; y1999. For Insecurity the total variance explained was 41,13%; y2004 and 42,32%; y1999. For the overall TRI the total variance explained was 46,92%; y1999, 56,32%; y2004 and 65,73%; y2014.

In addition, two factors were also found for the dimension Optimism for y2004. These two factors in combination explained 40,75% of the variance. The scree plot showed inflections that would justify retaining two factors for each of the dimensions mentioned before for y2004 and y1999. However, each year offered a different set of factor loadings. Therefore, in this study we do not retain the factors suggested by the analysis otherwise it would be difficult to compare results across the year. Appendix B summarizes the exploratory factor analysis results. Furthermore, if we look at the individual items in each set of factors loading, for instance, item 3, factor 1 *"You worry that information you share over the internet will be seen by other people"* vs item 8, factor 2 *"When you call a business, you prefer to talk to a person rather than a machine"*, we can see that each item does relate to the feeling insecurity. The latter gives

more justification for using the scale as it was primarily developed by the author Parasuraman (2001).

Furthermore, Liljander et al. (2006) argue that this approach is still justifiable since it keeps the scale intact as it was developed. Mackenzie (2003, p. 324) has also backed up this argument by explaining that "the use of standard scale refinement procedures can result in the dropping of measures that are essential to the domain of the construct." Therefore using the full scale to assess the overall TRI for comparison is the best way since it assesses the construct in its original state.

In order to check for the internal consistency of the data, we inspected the databases for its reliability. To do so we computed the Cronbach's alpha for each dimension and the overall TRI scale. See Table 4 for the results. Overall, all dimensions scored moderately high to high on reliability. The dimension Optimism has high reliabilities for each year with Cronbach's $\alpha = 0.81$; y1999, $\alpha = 0.79$; y2004 and $\alpha = 0.83$; y2014. The dimension Innovation had Cronbach's $\alpha = 0.78$; y1999, $\alpha = 0.77$; y2004 and 0.84; y2014. For discomfort Cronbach's $\alpha = 0.725$; y1999, $\alpha = 0.696$; y2004 and $\alpha = 0.677$; y2014. For the dimension Insecurity, the reliability was also high for every year with Cronbach's $\alpha = 0.72$; y1999, $\alpha = 0.70$; y2004 and $\alpha = 0.73$; y2014 (Hair et al., 2013; Field, 2013). Lastly, the Cronbach's $\alpha$ for the overarching construct TRI was calculated: $\alpha = 0.697$; y1999, $\alpha = 0.738$; y2004 and $\alpha = 0.635$; y2014. The Crombach's $\alpha$ for the Overall TRI is slightly lower than the threshold of 0.7 to 0.8 suggested by (Field, 2013). However, this was to be expected, since the TRI construct is not unidimensional (Field, 2013).

| Factor Analysis | | | |
|---|---|---|---|
| | 2014 | 2004 | 1999 |
| ***OPTIMISM*** | | | |
| KMO | 0.803 | 0.859 | 0.903 |
| Bartlett's Test of Sphericity | 0.001 | 0.000 | 0.000 |
| Eigenvalues | 2.679 | 3.552 | 3.748 |
| Total Component | 1 | 2 | 1 |
| ***INNOVATION*** | | | |
| KMO | 0.794 | 0.825 | 0.863 |
| Bartlett's Test of Sphericity | 0.001 | 0.001 | 0.001 |
| Eigenvalues | 2.698 | 3.001 | 3.062 |
| Total Component | 1 | 1 | 1 |
| ***DISCOMFORT*** | | | |
| KMO & Bartlett's Test | 0.710 | 0.804 | 0.852 |
| Bartlett's Test of Sphericity | 0.001 | 0.001 | 0.001 |
| Eigenvalues | 2.044 | 2.951 | 3.039 |
| Total Component | 1 | 2 | 2 |
| ***INSECURITY*** | | | |
| KMO | 0.749 | 0.786 | 0.822 |
| Bartlett's Test of Sphericity | 0.001 | 0.001 | 0.001 |
| Eigenvalues | 2.255 | 2.629 | 2.772 |
| Total Component | 1 | 2 | 2 |
| ***OVERALL TRI*** | | | |
| KMO | 0.839 | 0.844 | 0.890 |
| Bartlett's Test of Sphericity | 0.000 | 0.000 | 0.000 |
| Eigenvalues | 5.396 | 6.183 | 6.692 |
| Total Component | 4 | 10 | 7 |

*Table 3: Factor Analysis*

| RELIABILITY TEST | | | |
|---|---|---|---|
| ***OPTIMISM*** | | | |
| | 2014 | 2004 | 1999 |
| Cronbach's Alpha | 0.833 | 0.788 | 0.812 |
| ***INNOVATION*** | | | |
| Cronbach's Alpha | 0.839 | 0.769 | 0.783 |
| ***DISCOMFORT*** | | | |
| Cronbach's Alpha | 0.677 | 0.727 | 0.735 |
| ***INSECURITY*** | | | |
| Cronbach's Alpha | 0.730 | 0.695 | 0.718 |
| ***OVERALL TRI*** | | | |
| Cronbach's Alpha | 0.635 | 0.738 | 0.697 |

*Table 4: Reliability Test*

## 4.4 Means

The main research question of this research on the effect of age on TRI. In order to explore the data used to assess that effect, we looked into the means of age, gender, and educational level on overall TRI, inhibitors, and drivers. The results of the mean scores of TRI based on age are presented in Table 5. With regards to TRI based on individual age, the means scores are as follows: M=2.80; y1999, M=2.92; y2004, and M=3.03; y2014. With regards to Drivers based on individual age, the means scores are as follows M=3.41; y1999, M=3.29; y2004, and M=3.14; y2014. See Table 6. With regards to Inhibitors based on individual age, the means scores are as follows M=2.19; y1999, M=2.55; y2004, and M=2.93; y2014. See Table 7.

| TRI Overall age | | | | |
|---|---|---|---|---|
| | | **2014** | **2004** | **1999** |
| **Age group** | 18-24 (1) | 3.07 | 3.12 | 2.98 |
| | 25-34 (2) | 3.10 | 3.02 | 2.98 |
| | 35-44 (3) | 3.06 | 2.95 | 2.81 |
| | 45-54 (4) | 3.03 | 2.93 | 2.83 |
| | 55-64 (5) | 2.97 | 2.79 | 2.61 |
| | 65+ (6) | 2.97 | 2.71 | 2.58 |

*Table 5: Means Age Group TRI*

| TRI Drivers age | | | | |
|---|---|---|---|---|
| | | **2014** | **2004** | **1999** |
| **Age group** | 18-24 (1) | 3.20 | 3.54 | 3.63 |
| | 25-34 (2) | 3.26 | 3.42 | 3.68 |
| | 35-44 (3) | 3.13 | 3.36 | 3.45 |
| | 45-54 (4) | 3.17 | 3.23 | 3.48 |
| | 55-64 (5) | 3.05 | 3.15 | 3.13 |
| | 65+ (6) | 3.04 | 3.05 | 3.08 |

*Table 6: Means Age Group- Drivers*

| TRI Inhibitors age | | | | |
|---|---|---|---|---|
| | | **2014** | **2004** | **1999** |
| **Age group** | 18-24 (1) | 2.95 | 2.7 | 2.33 |
| | 25-34 (2) | 2.94 | 2.63 | 2.27 |
| | 35-44 (3) | 2.98 | 2.54 | 2.18 |
| | 45-54 (4) | 2.91 | 2.63 | 2.18 |
| | 55-64 (5) | 2.90 | 2.42 | 2.10 |
| | 65+ (6) | 2.91 | 2.36 | 2.08 |

*Table 7: Means Age Group-Inhibitors*

The mean scores for our moderating variable education are presented in Table 8, 9, and 10. We see that the means for education for overall TRI appears to increase over the years. This is not the case when you look at the mean for Drivers from y1999 to y2014. It appears that Drivers decrease over the years. Lastly, it appears that Inhibitors slightly increases over the years. Overall, we see that there is a marginal tendency when it comes to the means. The higher the education, the higher the overall TRI and Drivers means appear to be and the lower the Inhibitors means appear to be.

| TRI MEANS | | | |
|---|---|---|---|
| **Education** | **2014** | **2004** | **1999** |
| Less than high school degree | 3.02 | 2.7524 | 2.69 |
| High school graduate or GED | 3.02 | 2.8345 | 2.66 |
| Some college or two-year degree | 3.03 | 2.9655 | 2.87 |
| Four-year college degree | 3.08 | 3.0115 | 3.03 |
| Master's degree or Professional Degree | 3.04 | 3.0324 | 2.99 |
| Doctorate | 3.01 | 3.2763 | 3.18 |
| Post Doctorate | 3.20 | 3.1530 | 3.42 |

*Table 8: Means TRI - Education level.*

| DRIVERS MEANS | | | |
|---|---|---|---|
| **Education** | **2014** | **2004** | **1999** |
| Less than high school degree | 3.08 | 3.12 | 3.24 |
| High school graduate or GED | 3.14 | 3.25 | 3.31 |
| Some college or two-year degree | 3.13 | 3.40 | 3.53 |
| Four-year college degree | 3.19 | 3.28 | 3.60 |
| Master's degree or Professional Degree | 3.13 | 3.31 | 3.50 |
| Doctorate | 3.01 | 3.47 | 3.81 |
| Post Doctorate | 3.32 | 3.29 | 3.96 |

*Table 9: Means Drivers- Education Level*

| INHIBITORS MEANS | | | |
|---|---|---|---|
| **Education** | **2014** | **2004** | **1999** |
| Less than high school degree | 3.04 | 3.63 | 3.85 |
| High school graduate or GED | 3.10 | 3.58 | 3.98 |
| Some college or two-year degree | 3.07 | 3.40 | 3.78 |
| Four-year college degree | 3.03 | 3.28 | 3.55 |
| Master's degree or Professional Degree | 3.06 | 3.25 | 3.52 |
| Doctorate | 2.96 | 2.92 | 3.45 |
| Post Doctorate | 2.93 | 2.98 | 3.12 |

*Table 10; Means Inhibitors- Education*

The mean scores for our moderating variable gender are presented in table 11. With regards to males, the overall TRI mean scores are M=2.94; y1999, M=2.93; y2004, and M=3.19; y2014. With regards to females, the mean scores are M=2.69; y1999, M=2.72; y2004, and M=3.12; y2014. The results suggest that in general males tend to have a slightly higher mean score for TRI as compared to females. Moreover, we can see a consistent increase in the mean values of TRI for both genders over the years. With regards to males, the Drivers mean scores are M=3.56; y1999, M=3.38; y2004, and M=3.17; y2014. With regards to females, the mean scores are M=3.29; y1999, M=3.49; y2004, and M=3.17; y2014. The results do not suggest any patterns when it comes to the mean score for Drivers between males and females. With regards to males, the Inhibitors mean scores are M=3.69; y1999, M=3.44; y2004, and M=3.08; y2014. With regards to females, the mean scores are M=3.929; y1999, M=3.16; y2004, and M=3.06; y2014. The results do not suggest any patterns when it comes to the mean score for Inhibitors between males and females.

| **TRI MEANS** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Gender** | | **2014** | | **2004** | | **1999** | |
| | | *male* | *female* | *male* | *female* | *male* | *female* |
| | **TRI** | 3.04 | 3.02 | 2.97 | 2.84 | 2.94 | 2.69 |
| | **Drivers** | 3.17 | 3.12 | 3.38 | 3.49 | 3.56 | 3.29 |
| | **Inhibitor** | 3.08 | 3.06 | 3.44 | 3.16 | 3.69 | 3.92 |

*Table 11: Means TRI, Drivers, Inhibitors- Gender*

## 4.5 Regression Analysis

4.5.1 Direct effect

A multiple linear regression analysis was conducted to determine the relationship between our independent variable age, our dependent variable TRI, and our moderating variables Gender and Education. Furthermore, this relationship was also tested with the sub-dimensions Drivers and Inhibitors of TRI, as the dependent variable, and our moderating variables Gender and Education. These analyses were conducted for the 3 time periods relevant to this study, y1999, y2004, and y2014.

After carefully assessing the data for our assumptions we conducted the multiple linear regression. First, we did that for the overall TRI. The results of all models can be found in Table 12. The models show us that age is a significant predictor of TRI ($p<0.001$) in all three datasets. The standardized $\beta$eta suggests that there is a negative relationship between age and TRI for all three years, $\beta$=-0.0272, $p<0.001$; y1999, $\beta$=-0.299, $p<0.001$; y2004, $\beta$=-0.153, $p<0.001$; y2014. The analyses suggest that consumers within a higher age group, tend to have a significantly lower overall TRI. The results suggest that consumers within a higher age group, tend to have a significantly lower Drivers, $\beta$=-0.302, $p<0.05$; y1999, $\beta$=-0.256, $p<0.001$; y2004, $\beta$=-0.157, $p<0.05$; y2014. See Table 13. Lastly, we see those consumers within a higher age group, tend to have a significantly higher inhibitor, $\beta$=0.139, $p<0.001$; y1999, $\beta$=0.171, $p<0.001$; y2004, $\beta$=0.058, $p<0.05$; y2014. See Table 14. Based on these results hypotheses 1, 1A, and 1B can be accepted, age group does significantly decrease the overall TRI and Drivers and Increase Inhibitors.

4.5.2 Moderating Effects educational level

After analyzing the results for the main effects, the results for the moderating effects were analyzed. Firstly, the results suggest that consumers within a higher age group, tend to have a significantly higher overall TRI, when they also have a higher level of education in comparison to consumers within a higher age group and a lower level of education, $\beta$=0.237, $p<0.001$; y1999, $\beta$=0.245, $p<0.001$; y2004, $\beta$=0.105, $p<0.05$; y2014.

Furthermore, the results suggest that consumers within a higher age group, tend to have a significantly lower inhibitors level, when they also have a higher level of education in comparison to consumers within a higher age group and a lower level of education, $\beta$=-0.248, p<0.001; y1999, $\beta$=-0.274, p<0.001; y2004, $\beta$=-0.119-007, p<0.05; y2014. Lastly, the results show that, in 1999, consumers within a higher age group, tend to have a significantly lower drivers level, when they also have a higher level of education in comparison to consumers within a higher age group and a lower level of education, $\beta$=0.155, p<0.001; y1999. In the other two years the results were not significant, $\beta$=0.074, p=0.084; y2004, $\beta$=0.045, p=.259; y2014. Based on these results hypothesis 2 can be partially accepted, education level does have a significant moderating effect on the relation between age and TRI and the relation between age and Inhibitors.

4.5.3 Moderating Effects Gender

The results suggest that, in 1999, female consumers within a higher age group, tend to have a significantly lower overall TRI, than male consumers within a higher age group, $\beta$=0.198, p<0.001; y1999. In 2004 we see that female consumers within a higher age group, tend to have a significantly higher overall TRI, than male consumers within a higher age group, $\beta$=-0.091, p<0.05; y2004. In 2014 the results were not significant, $\beta$=-0.018, p=0.569; y2014. The results suggest that, in y1999, female consumers within a higher age group, tend to have a significantly lower inhibitors level, than male consumers within a higher age group, $\beta$=-0.181, p<0.001; y1999. In the other two years, the moderating effect of gender was not significant, $\beta$=0.003, p=0.927; y2004, $\beta$=-0.058, p=0.062; y2014. The results suggest that, in 199 and 2004, female consumers within a higher age group, tend to have a significantly higher drivers level, than male consumers within a higher age group, $\beta$=0.152, p<0.001; y1999, $\beta$=-0.125, p<0.001; y2004. In 2014 female consumers within a higher age group, tend to have a significantly lower drivers level, than male consumers within a higher age group, $\beta$=-0.069, p<0.05; y2014. Based on these results hypothesis 3 is rejected, gender does not have a significant moderating effect on the relation between age and TRI, age and Inhibitors, and age and Drivers.

| Regression Analysis OVERALL TRI | | | | |
|---|---|---|---|---|
| | | | | |
| **Summary regression 2014** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | -0.030 | 0.006 | -0.153 | 0.001*** |
| *Model2* | | | | |
| Age | -0.043 | 0.008 | -0.220 | 0.001*** |
| Interaction_Age_x_Female | -0.003 | 0.004 | -0.018 | 0.569 n.s |
| Interaction_Age_x_Education | 0.005 | 0.002 | 0.105 | 0.009** |
| *Model 1 R2=0.023; F=29.236; p<0.001**** | | | | |
| *Model 2 R2=0.029; F=12.251; p<0.001**** | | | | |
| | | | | |
| **Summary regression 2004** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | -0.078 | 0.008 | -0.299 | 0.001*** |
| *Model2* | | | | |
| Age | -0.111 | 0.012 | -0.423 | 0.001*** |
| Interaction_Age_x_Female | -0.017 | 0.007 | -0.091 | 0.008** |
| Interaction_Age_x_Education | 0.017 | 0.003 | 0.245 | 0.001*** |
| *Model 1 R2=0.090; F=96.254; p<0.001**** | | | | |
| *Model 2 R2=0.131; F=48.931; p<0.001**** | | | | |
| | | | | |
| **Summary regression 1999** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | -0.093 | 0.011 | -0.272 | 0.001*** |
| *Model2* | | | | |
| Age | -0.165 | 0.013 | -0.481 | 0.001*** |
| Interaction_Age_x_Female | 0.055 | 0.009 | 0.198 | 0.001*** |
| Interaction_Age_x_Education | 0.019 | 0.003 | 0.237 | 0.001*** |
| *Model 1 R2=0.07; F=78.205; p<0.001**** | | | | |
| *Model 2 R2=0.15; F=57.205; p<0.001**** | | | | |
| | | | | |

*Table 12: Regression Results- TRI*

| Regression Analysis DRIVERS | | | | |
|---|---|---|---|---|
| | | | | |
| **Summary regression 2014** | | | | |
| **Variable** | **b** | **SEB** | ***β*** | **p** |
| *Model 1* | | | | |
| Age | -0.046 | 0.008 | -0.157 | 0.001*** |
| *Model2* | | | | |
| Age | -0.048 | 0.014 | -0.16 | 0.001*** |
| Interaction_Age_x_Female | -0.015 | 0.007 | -0.069 | 0.026** |
| Interaction_Age_x_Education | 0.003 | 0.003 | 0.045 | 0.259 n.s |
| *Model 1 R2=0.025; F=30.656; p<0.001*** | | | | |
| *Model 2 R2=0.030; F=12.439; p<0.001*** | | | | |
| | | | | |
| **Summary regression 2004** | | | | |
| **Variable** | **b** | **SEB** | ***β*** | **p** |
| *Model 1* | | | | |
| Age | -0.094 | 0.011 | -0.256 | 0.001*** |
| *Model2* | | | | |
| Age | -0.090 | 0.018 | -0.244 | 0.001*** |
| Interaction_Age_x_Female | -0.033 | 0.009 | -0.125 | 0.001*** |
| Interaction_Age_x_Education | 0.007 | 0.004 | 0.074 | 0.084 n.s |
| *Model 1 R2=0.065; F=67.851; p<0.001*** | | | | |
| *Model 2 R2=0.081; F=28.678; p<0.001*** | | | | |
| | | | | |
| **Summary regression 1999** | | | | |
| **Variable** | **b** | **SEB** | ***β*** | **p** |
| *Model 1* | | | | |
| Age | -0.134 | 0.014 | -0.302 | 0.001*** |
| *Model2* | | | | |
| Age | -0.197 | 0.017 | -0.445 | 0.001*** |
| Interaction_Age_x_Female | 0.054 | 0.011 | 0.152 | 0.001*** |
| Interaction_Age_x_Education | 0.016 | 0.004 | 0.155 | 0.001*** |
| *Model 1 R2=0.091; F=97.913; p<0.001*** | | | | |
| *Model 2 R2=0.130; F=48.375; p<0.001*** | | | | |
| | | | | |

*Table 13: Regression Results- Drivers*

| Regression Analysis INHIBITORS | | | | |
|---|---|---|---|---|
| | | | | |
| **Summary regression 2014** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | 0.013 | 0.007 | 0.058 | 0.043** |
| *Model2* | | | | |
| Age | 0.039 | 0.01 | 0.166 | 0.001*** |
| Interaction_Age_x_Female | -0.010 | 0.005 | -0.058 | 0.062 n.s |
| Interaction_Age_x_Education | -0.007 | 0.002 | -0.119 | 0.003*** |
| *Model 1 R2=0.003; F=4.111; p<0.043*** | | | | |
| *Model 2 R2=0.013; F=5.242; p<0.001**** | | | | |
| | | | | |
| **Summary regression 2004** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | 0.065 | 0.012 | 0.171 | 0.001*** |
| *Model2* | | | | |
| Age | 0.135 | 0.018 | 0.358 | 0.001*** |
| Interaction_Age_x_Female | 0.001 | 0.01 | 0.003 | 0.927 n.s |
| Interaction_Age_x_Education | -0.027 | 0.004 | -0.274 | 0.001*** |
| *Model 1 R2=0.029; F=29.723; p<0.001**** | | | | |
| *Model 2 R2=0.069; F=24.356; p<0.001**** | | | | |
| | | | | |
| **Summary regression 1999** | | | | |
| **Variable** | **b** | **SEB** | **$\beta$** | **p** |
| *Model 1* | | | | |
| Age | 0.053 | 0.012 | 0.139 | 0.001*** |
| *Model2* | | | | |
| Age | 0.132 | 0.015 | 0.35 | 0.001*** |
| Interaction_Age_x_Female | -0.055 | 0.01 | -0.181 | 0.001*** |
| Interaction_Age_x_Education | -0.022 | 0.004 | -0.248 | 0.001*** |
| *Model 1 R2=0.019; F=19.268; p<0.001**** | | | | |
| *Model 2 R2=0.092; F=32.747; p<0.001**** | | | | |
| | | | | |

*Table 14: Regression Results- Inhibitors*

# 5. Discussion & Conclusion

The main research question of this study is: "To what extent does age affect the readiness of consumers when it comes to accepting the new technological developments in the market?" In this section, we are going to interpret and discuss the results of this study and simultaneously link them to the literature review to draw a robust conclusion. The idea is to bring new insights into the literature about the effect of age on the TRI, and the moderating effect of education and gender on this relationship. At the end of this section, this study will provide theoretical and managerial implications that can be drawn based on the results, explain the limitations of this study, and give recommendations for future research.

## 5.1 Discussion

This study summarizes 3 main findings. The first finding is related to the main research question and our first hypothesis which is the direct effect of age on TRI. The result of our study shows a consistent significant negative effect of age on TRI in all three datasets (y1999, y2004 & y2014). These results are in line with Rojas-Mendez et al., 2016 that suggests that the older the consumer gets, the lower their technology readiness. These results are also consistent with Dutot (2014) that suggests that every generation has a different level of technology awareness. However, our result is in disagreement with (Jaafar et al., 2007; Summak, Baglibel, & Samancioglu, 2010), who argue that age does not influence TRI. Since the target group of these studies was based on employees, our result appears to strengthen the argument of Liljander et al., (2006) which argues that TRI might not be a suitable measurement to assess a particular group or technology. Furthermore, our result shows that age does have a significant negative effect on Drivers and significant positive effect on Inhibitors. This suggests that the older a consumer gets the less positive feelings it has regarding technology and the more negative feelings towards using and adopting new technology. These results were found in all three datasets (y1999, y2004, y2014). The fact that this study provides a consistent significant

effect of age on TRI for a time period of 15 years, highlights that age is a significant predictor of TRI, its drivers, and inhibitors.

The second finding is related to our moderating variable education which is our second hypothesis. This study aimed to establish if educational level moderates the relationship between age and TRI. The results showed that educational level does have a significant moderating effect on the relationship between age and TRI, and the relationship between age and Inhibitors. This implies that older consumers with a high level of education tend to have a slightly higher TRI and (lower) Inhibitors in comparison to older consumers with a lower level of education. Rojas-Mendez et al., (2016) argue that consumers with a higher level of education are more positive and are more aware of new technologies and are more technology ready. This result highlights that even if elderly consumers have a lower level of TR, this effect is less strong when they have a higher level of education. The latter is also consistent with the findings of Tsikriktsis' (2004) segment ‘Laggards' which has been profiled to be elderly consumers with lower education. Yet, our study found no significant moderating effect of education on the *drivers* of TRI. This implies that there is no significant effect of age on divers of elderly consumers with a higher level of education, as opposed to those with a lower level of education. Our study shows a significant moderating effect only for y1999, for the other two years (y2004, y2014) this effect became not significant. Scholars have argued that consumer technologies behavior should be seen as waves (Gilly et al., 2012), or moving targets (Franco, 2023). Gilly et al., (2012) argue that some effects might become irrelevant because throughout the years all consumers become more familiar with technologies. This might be a possible argument for the insignificant effect moderating of education on the drivers of TRI.

The third finding is related to our moderating variable gender. This study aimed to establish the moderating effect of gender on the relationship between age and TRI. Based on our regression analysis we were unable to establish a significant moderating effect of gender on the relationship between age and TRI, age and Drivers, and age and Inhibitors. Conflicting results were found in all three datasets. The y1999 displayed a significant

moderating effect on age-TRI, age-drivers, and age-inhibitors. However, these effects were in the opposite direction of what was expected. Similar conflicting results were seen for the other two years (y2004, y2014), which makes it difficult to see a pattern that could explain the moderating effect of gender on the relationship between age and TRI. The former results are in disagreement with studies that found that elderly females have low TR (Rojas-Mendez et al., 2016; Tsikriktsis, 2004). One might wonder whether the inconsistent effects are due to the difference in TRI measurements throughout the years. Since we see conflicting results even for the years that had the same TRI measurements (y1999, y2004), we discard this as a possibility. This in turn leads us back to the suggestion that some differences should be seen as a wave (Gilly et al., 2012). Scholars argue that masculinity-femininity behaviors are short-term oriented (Rojas-Mendez et al., 2016), and therefore should be seen as a "here and now" instead of differing throughout the years (De Mooij, 2011). Therefore, we conclude that when consumers get older, their is no significant difference between the effect of age on TR level of male and female.

| HYPOTHESES | | Conclusion | | |
|---|---|---|---|---|
| | | 1999 | 2004 | 2014 |
| **H1** | ***:*** *Age has a negative effect on the overall TRI, consumers in older age categories are expected to be less technology ready than consumers in younger age categories.* | Accepted | Accepted | Accepted |
| **H1 A** | *More specifically older consumers are expected to score lower on the drivers of TR (optimism, innovation)* | Accepted | Accepted | Accepted |
| **H 1 B** | *More specifically older consumers are expected to score higher on the inhibitors of TR (discomfort, insecurity)* | Accepted | Accepted | Accepted |
| | | | | |
| **H2** | *The effect of age on TRI is stronger for consumers with a low level of education, whereas the effect is weaker for consumers with a higher level of education.* | Accepted | Accepted | Accepted |
| **H2 A** | *More specifically this effect is stronger on (**2A**) drivers of TR (optimism, innovation) when consumers have a low level of education,* | Accepted | Rejected | Rejected |
| **H2 B** | *More specifically this effect is weaker on inhibitors of TR (discomfort, insecurity) when consumers have a high level of education.* | Accepted | Accepted | Accepted |
| | | | | |
| **H3** | *The effect of age on TRI is stronger for females in comparison to males.* | Accepted | Accepted | Rejected |
| **H3 A** | *More specifically females tend to score lower on (**3A**) drivers of TR (optimism, innovation) in comparison to male* | Rejected | Accepted | Accepted |
| **H3 B** | *More specifically females tend to score higher on inhibitors of TR (discomfort, insecurity) in comparison to males* | Accepted | Rejected | Rejected |

*Table 15: Hypothesis Summary*

## 5.2 Conclusion

We live in a greying society (CBC, 2021) where technological development is becoming a top priority every day (Blut & Wang, 2019; Liljander et al., 2006; Rojas-Mendez et al., 2016). This is why it is important to understand why certain consumers have lower 'technology readiness' as compared to others when also taking age, gender, and educational level into account. This research aimed to investigate how the age of a consumer affects their propensity when it comes to accepting new technology in their life. The former was done by using the scale TRI developed by Parasuraman (2000) which theorized that consumers have both positive and negative feelings towards technology, and those feelings together determine their technology readiness. The aim was to use this theory as a building block to add new insight on this topic in the literature as well as to highlight the importance of such a theory in our social community. The former was done by analyzing three datasets that have been collected by the researcher Parasuraman (2000) throughout the years. The result of this research suggests that age does indeed have a direct negative effect on the TR of consumers. The former implies that the older the consumers the lower their technology readiness. This thesis tested the proposed effects for 3 different population groups at 3 different times, namely y1999, y2004, and y2014. The fact that all the main effects remained positive shows that, although the researched population was not the same, the found effects remained the same over time. The same significant patterns are still identified, even 15 years later. By doing so this thesis confirms that age is a significant predictor for TRI. Yet, our results also suggest that gender is not a significant moderator for the relationship between age and TRI. However, the results of this study further showed that educational level is an important factor that can positively or negatively moderate the relationship between age and TRI. This means that older consumers, who have a higher educational level, are more technology ready than older consumers who have a lower educational level. These findings are important to the literature on this topic because, unlike the common belief of previous research, that all older consumers have a low level of TR, the results of this moderating effect suggest the contrary. Elderly consumers do show a higher readiness for technology in the presence of higher educational levels.

## 5.3 Theoretical and Managerial Implications

Due to the growing importance of technology for service provision, customers are increasingly expected to make use of new technology either to get the necessary service in a store or even at home. The decline in human interaction between customer-company interaction brings great pressure on the consumer side. This is because consumers need to have a certain level of technology readiness, to be able to benefit from these new technologies. This study has several implications both theoretically and managerially.

First, on a theoretical level, this study reinforces existing literature on technology readiness, by analyzing the relationship between age and TRI. There have been conflicting results in the literature, about the direct effect of age on consumers TR. Our study provides consistent significant evidence that there is a negative relationship between age and TR in 3 datasets for a time period of 15 years. This in turn provides relevant evidence that elderly consumers do have a lower technology readiness. Future research can further research this topic using a quantitative approach by building on the findings in this thesis.

Second, this research contributes to the literature by providing scholars with new insights on factors that can moderate the relationship between age and TRI. More specifically it gives scholars insights into how the relationship between age and TRI differentiates when consumers possess a certain level of education. Previous studies have considered education as an antecedent of TRI but have never considered it a possible moderator of the relationship between age and TRI. Results of our study indicate that the effect of age on TRI is weaker when elderly consumers have a higher level of education. This in turn shows the importance of further investigating our current assumptions about elderly consumers. Marketing scholars are important in this discussion (Franco, 2023). The former is because age stereotypes are used by marketing scholars to steer marketing theories on older consumers and technology. Inaccurate assumptions about elderly consumers can lead to self-inflected inability to use technology and imply that older consumers are inferior to younger consumers (Franco, 2023). The latter can become very harmful, especially to those older consumers that do not experience technology in these manners.

Our study also provides a couple of practical implications that marketing managers can use in the future. First, the results of our study indicate that elderly consumers do have a lower technology readiness. When designing communication plans for new technologies, marketing managers should make sure that their strategy is target-group specific. For instance, elderly consumers may prefer to deal and interact with the company in a different way using interpersonal means instead of new technologies. Therefore, marketing managers can opt to use traditional advertising or phone services. However, we highly recommend managers to interview their elderly customers to understand their needs, before assuming that they would prefer a certain special treatment. This will help to reduce the tension created by age stereotypes and simultaneously improve older consumers' well-being by tailoring to their unique circumstances and individual preferences.

The second managerial implication we want to provide is regarding education. Our study provides consistent evidence of how important education is to reduce the effect of age on TRI. Marketing managers can use this insight to improve future marketing plans when introducing new technologies to elderly consumers. In such a case, promotions should be focused on informing and educating the elderly about the new benefits of using this new development. In addition, it is also critical that this information is easily accessible to all consumers not only online but also in more traditional ways for the group of elderly that is not as technology ready. By offering continuous support and education, companies can accelerate the diffusion rate and therefore increase turnover.

## 5.4 Limitations of this study

This research has some limitations that other future research should address. First, this research was not completely homogeneous. There were more younger consumers than elderly consumers in all three datasets. In addition to that, most of the participants in all three datasets had a lower level of education compared to a high level of education. Furthermore, two of the datasets were collected based on TRI 1.0 (y1999 and y2004) which was based on 36 items and one of the datasets (y2014) was collected based on 16

items. Consequently, these differences may affect the results. Therefore, we encourage researchers to repeat this study in a more uniform setting.

Second, even though this research shows a consistent significant effect of age on TRI, there is still a gap between the most recent dataset used collected in 2014 to this date. In total, there is an eight-year gap. Therefore, there are eight years of development unaccounted for in this study. The result of our study shows how the TRI of consumers has been evolving, especially for elderly consumers. It would be very interesting to see how this development evolves to this date. This will show whether the effect of age and TRI has changed or stayed the same. Future research should collect more recent data on the TRI of consumers to see how the TR has developed in recent years.

Third, this research was based on the US population, therefore the results may be different for a different type of population that live in a different context. Consumers living in the US may have a completely different way of living as compared to those living in the Netherlands or on a small island like Curaçao and therefore may have a different level of technology readiness. For instance, the habits and the quality of life may be completely different which may, in turn, affect the result of the study. Future research should consider the country context and ethnicity as potential moderators of the TR effects.

Last, this research was based on existing data that was collected by the authors of the TRI scale, and therefore it was limited to the data available. This means that other factors that may have influenced the effect of TR that were not included in the datasets, were also not included in the research. Future research should assess the effect of technology readiness together with other constructs theories such as the Technology Acceptance Model (TAM) which considers the impact of social influences.

## 5.5 Recommendations for Future Research

Future research should collect more recent data on Technology Readiness, to see whether the significant pattern of the effect of age on TRI that we have seen in this study keeps evolving in the same direction in order to draw a more dated conclusion. This research could use the same questionnaire developed by the researchers Parasuraman & Colby to get the same uniform answers in order to conduct a more longitudinal comparison that will lead to a robust conclusion.

Additionally, since the effect of age on TRI is becoming clearer in the literature, researchers need to invest more effort in exploring moderating variables that can influence this relationship. These moderating variables can provide us with more insight to better understand our elderly consumers. This can be done by using variables that are already being measured in the TRI questionnaire such as income, ethnicity, prior job experience, and children at home should be included in the research as antecedents in order to measure how it moderates the effect of Age the level of TRI of the elderly consumers.

Another interesting research would be to conduct longitudinal research on the effect of age on TRI using the same respondents. Since different scholars suggested that a particular TRI level should be seen as a wave, this study would be able to measure if that statement is significantly true.

Nevertheless, future research should also redo this study in different countries. It would be interesting to see how these patterns behave in developed countries such as the Netherlands in Europe, or less developed countries such as a small island like Curacao. By doing this, researchers would be able to determine whether social systems and conditions affect the TR of elderly consumers. Such research will bring interesting insights for future marketers and companies that are interested in doing business with elderly consumers within a different social system.

Moreover, future research possibilities can include designing a new avatar for today's elderly and their TR. This research should use TRI 2.0 together with a completely new set of questions that can help us understand the elderly of today. We encourage researchers to dig deeper into elderly technology use, digital habits, social habits, and

motivations. Our information on elderly consumers' technology readiness is becoming outdated because today's elderly consumers are way more acquainted with technology innovations as compared to decades ago. In order to avoid demeaning stereotypes, we need to understand the relationship between elderly consumers and technology better. Therefore, by doing this, the researcher will be able to add new insights to the literature that will help marketers to make decisions based on an accurate elderly consumer avatar as opposed to elderly stereotypes.

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# 7. Appendix

## Appendix A: TRI 1.0 vs 2.0

| Items | TRI Statements | 2014 | 2009 | 2004 | 1999 |
|---|---|---|---|---|---|
| | ***Optimism*** | | | | |
| **1** | Technology gives people more control over their daily lives | x | | x | x |
| **2** | Products and services that use the newest technologies are much more convenient to use | | | x | x |
| **3** | You like the idea of doing business via computers because you are not limited to regular business hours | | | x | x |
| **4** | You prefer to use the most advanced technology available | | | x | x |
| **5** | You like computer programs that allow you to tailor things to fit your own need | | x | x | x |
| **6** | Technology makes you more efficient in your occupation | | | x | x |
| **7** | You find new technologies to be mentally stimulating | | | x | x |
| **8** | Technology gives you freedom of mobility | x | x | x | x |
| **9** | Learning about technology can be as rewarding as the technology itself | | | x | x |
| **10** | You feel confident that machines will follow through with what you instructed them to do | | | x | x |
| **New 11** | New Technologies contribute to a better quality of life | x | | | |
| **New 12** | Technology makes me more productive in my personal life | x | | | |
| | ***Innovation*** | | | | |
| **13** | Other people come to you for advice on new technologies | x | x | x | x |
| **14** | It seems your friends are learning more about the newest technology then you are | | | x | x |
| **15** | In general, you are among the first in your circle of friends to acquire new technology when it appears | x | x | x | x |

| | | | | | |
|---|---|---|---|---|---|
| **16** | You can usually figure out new high-tech products and services without help from others | x | x | x | x |
| **17** | You keep up with the latest technological developments in your areas of interest | x | | x | x |
| **18** | You enjoy the challenge of figuring out high-tech gadgets | | | x | x |
| **19** | You find you have fewer problems than other people in making technology work for you | | | x | x |
| | ***Discomfort*** | | | | |
| **20** | Technical support lines are not helpful because the don't explain things in terms you understand | x | | x | x |
| **21** | Sometimes, you think that technology systems are not designed for use by ordinary people | x | | x | x |
| **22** | There is no such thing as manual for high-tech product or services that's written in plain language | x | | x | x |
| **23** | When you get technical support from a provider of a high-tech products or service, you sometimes feel as if you are being taken advantage of by someone who knows more than you do | x | x | x | x |
| **24** | If you buy a high-tech product or service, you prefer to have the basic model over one with a lot of extra features. | | | x | x |
| **25** | It is embarrassing when you have trouble with a high-tech gadget while people are watching | | x | x | x |
| **26** | There should be caution in replacing important people-task with technology because new technology can break-down or get disconnected | | | x | x |
| **27** | Manny new technologies have health or safety risk that are not discovered until after people have used them | | | x | x |
| **28** | New technology makes it too easy for governments and companies to spy on people | | | x | x |
| **29** | Technology always seems to fail at worst possible time | | | x | x |
| | ***Insecurity*** | | | | |
| **30** | You do not consider it safe giving up credit card number over a computer | | | x | x |
| **31** | You do not consider it safe to do any king of financial business online | | x | x | x |

| | | | | | |
|---|---|---|---|---|---|
| **32** | You worry that information you send over the internet will be seen by other people | | x | x | x |
| **33** | You do not feel confident doing business with a place that can only be reached online | x | | x | x |
| **34** | Any business transaction you do electronically should be confirmed later with something in writing | | | x | x |
| **35** | Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes. | | | x | x |
| **36** | The human touch is very important when doing business with a company | | | x | x |
| **37** | When you call a business, you prefer to talk to a person rather than a machine | | | x | x |
| **38** | If you provide information to a machine or over the internet, you can never be sure it really gets to the right place | | x | x | x |
| **New 39** | People are too dependent on technology to do things for them | x | | | |
| **New 40** | Too much technology distracts people to a point that is harmful | x | | | |
| **New 41** | Technology lowers the quality of relationships by reducing personal interaction | x | | | |

## Appendix B: Summary Exploratory Factor Analysis

| Summary exploratory factor analysis results for SPSS TRI questionnaire | | | | | | |
|---|---|---|---|---|---|---|
| | | 2004 | | 1999 | | |
| | | **Factor 1** | **Factor 2** | **Factor 1** | **Factor 2** | |
| | | *N=500* | | *N=968* | | |
| | **Optimism** | | | | | |
| **1** | Technology gives people more control over their daily lives | **0.611** | | | | |
| **2** | Products and services that use the newest technologies are much more convenient to use | **0.708** | | | | |
| **6** | technology makes you more efficient in your occupation | **0.657** | | | | |
| **9** | Learning about technology can be as rewarding as the technology itself | **0.602** | | | | |
| **4** | You prefer to use the most advanced technology available | **0.654** | 0.332 | | | |
| **7** | You find new technologies to be mentally stimulating | **0.561** | **0.441** | | | |
| **8** | Technology gives you freedom of mobility | **0.444** | **0.367** | | | |
| **5** | You like computer programs that allow you to tailor things to fit your own need | | **0.714** | | | |
| **3** | You like the idea of doing business via computers because you are not limited to regular business hours | | **0.781** | | | |
| **10** | You feel confident that machines will follow through with what you instructed them to do | | **0.577** | | | |
| **Eigenvalues** | | 3.04 | 1.04 | | | |
| **% of variance** | | 30.39 | 10.36 | | | |
| **α Cronbach's Alpha** | | 0.768 | 0.717 | | | |
| | **Discomfort** | | | | | |
| **1** | Technical support lines are not helpful because the don't explain things in terms you understand | **0.784** | | 0.395 | **0.545** | |

| | | | | | |
|---|---|---|---|---|---|
| **2** | Sometimes, you think that technology systems are not designed for use by ordinary people | **0.428** | | 0.352 | **0.421** |
| **3** | There is no such thing as manual for high-tech product or services that's written in plain language | **0.575** | | | **0.610** |
| **4** | When you get technical support from a provider of a high-tech products or service, you sometimes feel as if you are being taken advantage of by someone who knows more than you do | **0.734** | | 0.357 | **0.587** |
| **5** | If you buy a high-tech product or service, you prefer to have the basic model over one with a lot of extra features. | 0.348 | **0.403** | | **0.618** |
| **6** | It is embarrassing when you have trouble with a high-tech gadget while people are watching | | **0.440** | | **0.557** |
| **7** | There should be caution in replacing important people-task with technology because new technology can break-down or get disconnected | | **0.711** | **0.672** | |
| **8** | Manny new technologies have health or safety risk that are not discovered until after people have used them | | **0.746** | **0.607** | |
| **9** | New technology makes it too easy for governments and companies to spy on people | | **0.564** | **0.675** | |
| **10** | Technology always seems to fail at worst possible time | 0.377 | 0.359 | **0.640** | |
| **Eigenvalues** | | 2.95 | 1.08 | 3.04 | 1.04 |
| **% of variance** | | 29.51 | 10.75 | 30.39 | 10.36 |
| **α Cronbach's Alpha** | | 0.649 | 0.615 | 0.718 | 0.64 |
| | **Insecurity** | | | | |
| **3** | You worry that information you share over the internet will be seen by other people | **0.752** | | **0.738** | |

| | | | | | |
|---|---|---|---|---|---|
| **6** | Whenever something gets automated, you need to check carefully that the machine or computer is not making mistakes. | **0.537** | | 0.379 | |
| **9** | if you provide information to a machine or over the internet, you can never be sure it really gets to the right place | **0.668** | | **0.676** | |
| **1** | You do not consider it safe giving up credit card number over a computer | **0.574** | 0.363 | **0.663** | |
| **2** | You do not consider it safe to do any king of financial business online | 0.350 | **0.606** | **0.650** | |
| **4** | You do not feel confident doing business with a place that can only be reached online | | **0.671** | 0.304 | **0.581** |
| **5** | Any business transaction you do electronically should be confirmed later with something in writing | | **0.453** | | **0.557** |
| **7** | The human touch is very important when doing business with a company | | **0.683** | | **0.588** |
| **8** | When you call a business, you prefer to talk to a person rather than a machine | | **0.425** | | **0.699** |
| **Eigenvalues** | | 2.63 | 1.07 | 2.77 | 1.04 |
| **% of variance** | | 29.21 | 11.92 | 30.80 | 11.52 |
| **α Cronbach's Alpha** | | 0.64 | 0.625 | 0.69 | 0.496 |

# Appendix C: 1999 Regression Outputs

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .272[a] | .074 | .073 | .51910 | .074 |
| 2 | .387[b] | .150 | .147 | .49790 | .076 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: Overall_TRI_Comb

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Si |
|---|---|---|---|---|---|---|
| 1 | Regression | 21.042 | 1 | 21.042 | 78.088 | |
| | Residual | 262.516 | 974 | .269 | | |
| | Total | 283.558 | 975 | | | |
| 2 | Regression | 42.543 | 3 | 14.181 | 57.205 | |
| | Residual | 241.015 | 972 | .248 | | |
| | Total | 283.558 | 975 | | | |

a. Dependent Variable: Overall_TRI_Comb

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Zero-order | Partial | Part |
| 1 | (Constant) | 3.123 | .040 | | 78.633 | .000 | | | |
| | Age_2 | -.093 | .011 | -.272 | -8.837 | .000 | -.272 | -.272 | -.272 |
| 2 | (Constant) | 3.097 | .038 | | 81.059 | .000 | | | |
| | Age_2 | -.165 | .013 | -.481 | -12.378 | .000 | -.272 | -.369 | -.366 |
| | AgexGender2 | .055 | .009 | .198 | 6.393 | .000 | .117 | .201 | .189 |
| | AgexEducation2 | .019 | .003 | .237 | 6.184 | .000 | -.018 | .195 | .183 |

a. Dependent Variable: Overall_TRI_Comb

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .302[a] | .091 | .090 | .66553 | .091 |
| 2 | .360[b] | .130 | .127 | .65193 | .039 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: drivers

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Si |
|---|---|---|---|---|---|---|
| 1 | Regression | 43.369 | 1 | 43.369 | 97.913 | |
| | Residual | 431.517 | 974 | .443 | | |
| | Total | 474.886 | 975 | | | |
| 2 | Regression | 61.680 | 3 | 20.560 | 48.375 | |
| | Residual | 413.206 | 972 | .425 | | |
| | Total | 474.886 | 975 | | | |

a. Dependent Variable: drivers

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Cor |
|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Zero-order |
| 1 | (Constant) | 3.878 | .051 | | 76.169 | .000 | |
| | Age_2 | -.134 | .014 | -.302 | -9.895 | .000 | -.302 |
| 2 | (Constant) | 3.854 | .050 | | 77.035 | .000 | |
| | Age_2 | -.197 | .017 | -.445 | -11.323 | .000 | -.302 |
| | AgexGender2 | .054 | .011 | .152 | 4.830 | .000 | .060 |
| | AgexEducation2 | .016 | .004 | .155 | 4.003 | .000 | -.089 |

a. Dependent Variable: drivers

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .139[a] | .019 | .018 | .59104 | .019 |
| 2 | .303[b] | .092 | .089 | .56945 | .072 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: Inhibitors

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 6.731 | 1 | 6.731 | 19.268 | .000[b] |
| | Residual | 341.230 | 977 | .349 | | |
| | Total | 347.960 | 978 | | | |
| 2 | Regression | 31.857 | 3 | 10.619 | 32.747 | .000[c] |
| | Residual | 316.104 | 975 | .324 | | |
| | Total | 347.960 | 978 | | | |

a. Dependent Variable: Inhibitors

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Correl | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Zero-order | Pa |
| 1 | (Constant) | 3.632 | .045 | | 80.611 | .000 | | |
| | Age_2 | .053 | .012 | .139 | 4.390 | .000 | .139 | |
| 2 | (Constant) | 3.659 | .044 | | 84.027 | .000 | | |
| | Age_2 | .132 | .015 | .350 | 8.700 | .000 | .139 | |
| | AgexGender2 | -.055 | .010 | -.181 | -5.636 | .000 | -.140 | |
| | AgexEducation2 | -.022 | .004 | -.248 | -6.250 | .000 | -.071 | |

a. Dependent Variable: Inhibitors

# Appendix D: 2004 Regression Outputs

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 |
| 1 | .299[a] | .090 | .089 | .41577 | .090 | 96.254 | 1 | 978 |
| 2 | .361[b] | .131 | .128 | .40669 | .041 | 23.096 | 2 | 976 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: OVERALL_TRI_comb

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 16.639 | 1 | 16.639 | 96.254 | .000[b] |
| | Residual | 169.215 | 979 | .173 | | |
| | Total | 185.854 | 980 | | | |
| 2 | Regression | 24.279 | 3 | 8.093 | 48.931 | .000[c] |
| | Residual | 161.575 | 977 | .165 | | |
| | Total | 185.854 | 980 | | | |

a. Dependent Variable: OVERALL_TRI_comb

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Zero-order | Partial | P |
| 1 | (Constant) | 3.199 | .033 | | 97.764 | .000 | | | |
| | Age_2 | -.078 | .008 | -.299 | -9.811 | .000 | -.299 | -.299 | |
| 2 | (Constant) | 3.186 | .032 | | 99.092 | .000 | | | |
| | Age_2 | -.111 | .012 | -.423 | -9.181 | .000 | -.299 | -.282 | |
| | AgexGender2 | -.017 | .007 | -.091 | -2.647 | .008 | -.236 | -.084 | |
| | AgexEducation 2 | .017 | .003 | .245 | 5.885 | .000 | -.071 | .185 | |

a. Dependent Variable: OVERALL_TRI_comb

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 |
| 1 | .255[a] | .065 | .064 | .59484 | .065 | 67.851 | 1 | 978 |
| 2 | .285[b] | .081 | .078 | .59030 | .016 | 8.567 | 2 | 976 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: drivers

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 24.008 | 1 | 24.008 | 67.851 | .000[b] |
| | Residual | 346.368 | 979 | .354 | | |
| | Total | 370.376 | 980 | | | |
| 2 | Regression | 29.978 | 3 | 9.993 | 28.678 | .000[c] |
| | Residual | 340.398 | 977 | .348 | | |
| | Total | 370.376 | 980 | | | |

a. Dependent Variable: drivers

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Correla | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-order | Par |
| 1 | (Constant) | 3.626 | .047 | | 77.444 | .000 | | |
| | Age_2 | -.094 | .011 | -.255 | -8.237 | .000 | -.255 | |
| 2 | (Constant) | 3.608 | .047 | | 77.301 | .000 | | |
| | Age_2 | -.090 | .018 | -.244 | -5.152 | .000 | -.255 | |
| | AgexGender2 | -.033 | .009 | -.125 | -3.518 | .000 | -.226 | |
| | AgexEducation2 | .007 | .004 | .074 | 1.729 | .084 | -.127 | |

a. Dependent Variable: drivers

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Si |
| 1 | .171[a] | .029 | .028 | .61904 | .029 | 29.723 | 1 | 982 | |
| 2 | .263[b] | .069 | .066 | .60678 | .040 | 21.065 | 2 | 980 | |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: Inhibitors

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 11.390 | 1 | 11.390 | 29.723 | .000[b] |
| | Residual | 376.670 | 983 | .383 | | |
| | Total | 388.060 | 984 | | | |
| 2 | Regression | 26.902 | 3 | 8.967 | 24.356 | .000[c] |
| | Residual | 361.158 | 981 | .368 | | |
| | Total | 388.060 | 984 | | | |

a. Dependent Variable: Inhibitors

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Correlat | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-order | Part |
| 1 | (Constant) | 3.223 | .049 | | 66.233 | .000 | | |
| | Age_2 | .065 | .012 | .171 | 5.452 | .000 | .171 | |
| 2 | (Constant) | 3.232 | .048 | | 67.436 | .000 | | |
| | Age_2 | .135 | .018 | .358 | 7.550 | .000 | .171 | |
| | AgexGender2 | .001 | .010 | .003 | .092 | .927 | .109 | |
| | AgexEducation2 | -.027 | .004 | -.274 | -6.425 | .000 | -.028 | -. |

a. Dependent Variable: Inhibitors

# Appendix E: 2014 Regression Outputs

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 |
| 1 | .153[a] | .023 | .023 | .30666 | .023 | 29.236 | 1 | 1219 |
| 2 | .171[b] | .029 | .027 | .30599 | .006 | 3.694 | 2 | 1217 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: Overall_TRI_combined

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 2.749 | 1 | 2.749 | 29.236 | .000[b] |
| | Residual | 114.668 | 1219 | .094 | | |
| | Total | 117.417 | 1220 | | | |
| 2 | Regression | 3.441 | 3 | 1.147 | 12.251 | .000[c] |
| | Residual | 113.976 | 1217 | .094 | | |
| | Total | 117.417 | 1220 | | | |

a. Dependent Variable: Overall_TRI_combined

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Correl | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Zero-order | Pa |
| 1 | (Constant) | 3.143 | .022 | | 143.311 | .000 | | |
| | Age_2 | -.030 | .006 | -.153 | -5.407 | .000 | -.153 | |
| 2 | (Constant) | 3.142 | .022 | | 143.505 | .000 | | |
| | Age_2 | -.043 | .008 | -.220 | -5.174 | .000 | -.153 | |
| | AgexGender2 | -.003 | .004 | -.018 | -.569 | .569 | -.082 | |
| | AgexEducation2 | .005 | .002 | .105 | 2.619 | .009 | -.055 | |

a. Dependent Variable: Overall_TRI_combined

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .157[a] | .025 | .024 | .46438 | .025 | 30.656 | 1 | 1219 | .000 |
| 2 | .172[b] | .030 | .027 | .46351 | .005 | 3.273 | 2 | 1217 | .038 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: drivers

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 6.611 | 1 | 6.611 | 30.656 | .000[b] |
| | Residual | 262.944 | 1219 | .216 | | |
| | Total | 269.555 | 1220 | | | |
| 2 | Regression | 8.017 | 3 | 2.672 | 12.439 | .000[c] |
| | Residual | 261.538 | 1217 | .215 | | |
| | Total | 269.555 | 1220 | | | |

a. Dependent Variable: drivers

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Correl | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-order | Pa |
| 1 | (Constant) | 3.308 | .033 | | 99.623 | .000 | | |
| | Age_2 | -.046 | .008 | -.157 | -5.537 | .000 | -.157 | |
| 2 | (Constant) | 3.306 | .033 | | 99.680 | .000 | | |
| | Age_2 | -.048 | .013 | -.160 | -3.766 | .000 | -.157 | |
| | AgexGender2 | -.015 | .007 | -.069 | -2.226 | .026 | -.124 | |
| | AgexEducation2 | .003 | .003 | .045 | 1.128 | .259 | -.086 | |

a. Dependent Variable: drivers

**Model Summary[c]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .058[a] | .003 | .003 | .36747 | .003 | 4.111 | 1 | 1219 | .043 |
| 2 | .113[b] | .013 | .010 | .36604 | .009 | 5.792 | 2 | 1217 | .003 |

a. Predictors: (Constant), Age_2

b. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

c. Dependent Variable: Inhibitors

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | .555 | 1 | .555 | 4.111 | .043[b] |
| | Residual | 164.657 | 1219 | .135 | | |
| | Total | 165.212 | 1220 | | | |
| 2 | Regression | 2.107 | 3 | .702 | 5.242 | .001[c] |
| | Residual | 163.105 | 1217 | .134 | | |
| | Total | 165.212 | 1220 | | | |

a. Dependent Variable: Inhibitors

b. Predictors: (Constant), Age_2

c. Predictors: (Constant), Age_2, AgexGender2, AgexEducation2

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Correlations | | |
|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Zero-order | Partial | Part |
| 1 | (Constant) | 3.023 | .026 | | 115.025 | .000 | | | |
| | Age_2 | .013 | .007 | .058 | 2.028 | .043 | .058 | .058 | .058 |
| 2 | (Constant) | 3.022 | .026 | | 115.407 | .000 | | | |
| | Age_2 | .039 | .010 | .166 | 3.881 | .000 | .058 | .111 | .111 |
| | AgexGender2 | -.010 | .005 | -.058 | -1.867 | .062 | -.020 | -.053 | -.053 |
| | AgexEducation2 | -.007 | .002 | -.119 | -2.951 | .003 | -.016 | -.084 | -.084 |

a. Dependent Variable: Inhibitors