Psychological Structure of Human Trust towards Autonomous Vehicles - The Relations of Interpersonal, System Feature, Risk Perception and Behavioral Intention with Trust

by

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ABSTRACT

The objectives of study are to confirm the effect of the latent variables on human trust, which has been revealed in previous studies and to identify a psychological structure of the variables towards autonomous vehicles. A total of 114 queries were prepared for a survey study. The queries were collected primarily from previous studies trying to identify the latent variables and underlying factors of human trust in autonomous vehicles. A total of 195 survey responses were collected through an online survey. A series of statistical analyses, including correlation analysis and factor analysis, revealed that 51 queries in the entire query set are significantly related and affective to human trust.

In order to examine structures of the factors and variables, a structural equation model was developed using the 51 variables. The modeling results revealed 5 higher-level constructs in the psychological structure, including “Interpersonal”, “System Feature,” “Risk Perception,” “Behavioral Intention” and “Trust". Each construct includes sub factors consisting of associated query variables. The construct of “Interpersonal” represents human intrinsic traits such as attitude, expectation and personality. The “System Feature” refers to the knowledge or thoughts gained from recognition of a particular technology or systems.

The modeling outcomes confirmed that: the “Interpersonal” is the most affective to “Behavioral Intention” and “Trust” among other construct; the “System Feature" is also affective but one of its subfactor, “brand of vehicle”, is not significantly effective in the model; and “Risk Perception” is negatively related with the “Behavioral Intention” and “Trust” as well as other constructs. In general, the results may imply that understanding the user's interpersonal

characteristics is important to improve the level of trust of autonomous vehicles. However, while previous studies demonstrated the direct effect of each variable on human trust, this study revealed a comprehensive psychological structure of human trust towards autonomous vehicles by categorizing variables, factors, and constructs in hierarchical manner. Consequently, it is expected that the model could be used for understanding, predicting, and improving user trust towards autonomous vehicles as well as other automated systems

CHAPTER 1

INTRODUCTION

The human-in-the loop automation implies the process of allocating human operator's activities to the system. The technology on automation has recently revolutionized and it has been changing human lifestyle. The autonomous vehicle also has been introduced in the market and it is expected to be a new paradigm of ground transportation, which changes the role of drivers from an active operator to passive observers or, ultimately, passenger in the dynamic system. Although the level of technology on automated vehicles has matured to ensure sufficient safety, it was identified that the one of primary barriers to success of autonomous vehicles is human driver or passenger's level of acceptance, including human trust towards automation. With this reason, there have been studies to identify latent variables and factors affecting the level of user acceptance in autonomous vehicles (Choi and Ji, 2015, Thatcher et al., 2010). The studies have used subjective questionnaires that primarily asked participant's psychological aspects including personality, experience, attitude toward technology. To figure out how to make passenger trust in autonomous vehicles, previous research was conducted by finding factors that influence the level of trust or acceptance in the vehicles (Carlson et al, 2014). These factors can be used for the educational purpose as well as many aspects of vehicle design (Zhang et al., 2019). This study aimed to sort variables from total 114 queries which were collected from previous study to identify user trust in human-in-the-loop automation and autonomous vehicles. Furthermore, it is determined that the relationship among factors mentioned and trust level of passenger is explained by developing a structural equation model.

1.1 Previous Study about User Trust in Autonomous Vehicles

1.1.1 Autonomous vehicles

The automation of machines has been a major topic in research and industry. It is determined that automation is considered an important technology for transportation, especially because it can dramatically reduce human error by providing assistant while driving or controlling it. In this manner, not only has the number of machines using automation increased, but it has also increased in the number of application domains that utilize automation (Carlson et al., 2014). In modern society, it is not much said that people are already using automation technology and familiar with it. Among the automation technology, autonomous vehicles have recently received the greatest interest in people and markets. It is believed that autonomous vehicles can bring about innovations in safety, efficiency, and traffic by navigating themselves (Beiker, 2012). Autonomous vehicles refer to vehicles that have certain technology that has the capability to control and drive a vehicle without physical control or monitoring by a human driver (Nastjuk et al., 2020). Autonomous vehicles have been the most important issue in the coming car innovation. Already, so many automakers are aware of the potential of autonomous vehicles and conducting tests for various commercial purposes. The introduction of autonomous vehicle cars is expected to change user and passenger behavior, which is believed to lead to changes in a variety of behaviors and experiences as well as driving (Gold et al., 2015). Autonomous driving is expected to replace manual driving soon because it can reduce environmental pollution and accidents and guarantee driver comfort (Wang et al., 2020). As the number of media and the number of people experiencing autonomous vehicles increase, the advantages of autonomous vehicles have already been known to people. The criteria for defining autonomous vehicles guidelines are provided by the Society of Automotive Engineers (SAE). Depending on the maturity of the technology, it is divided into six stages, from 0 stages (the lowest level of technology) to 5 stages (the highest level of technology). What can be seen as full-fledged autonomous vehicles are stage 4 (autonomous driving is possible under all circumstances, but the driver can intervene) and stage 5 (autonomous driving is possible under all circumstances, and no driver intervention is necessary) (Kaur and Rampersad, 2018). Various companies and agencies in the U.S. are working together for industries of autonomous vehicles, and information exchange for commercialization is also actively taking place. Through this, we see the need to conduct further research on self-driving cars and require a deeper understanding of safety and acceptance.

1.1.2 User experience in autonomous vehicles

Before the technology of autonomous vehicles, many innovative technologies for vehicles were introduced. Since it is considered that the progressive technology could lead to the success of certain brands of car in the market, many automakers have been adding several high technologies to the process of vehicle design so that vehicles have had more brilliant functions to assist human drivers and satisfy them. The development of intelligent vehicles is accelerating as automotive technology's critical elements have recently shifted to electronification, multimedia, and networks. Through advanced driver assist systems (ADAS), users are already experiencing vehicle assistance systems (Lee et al., 2016). As mentioned above, the technology of autonomous vehicles has been matured enough to be commercialized and accepted by people. Up to now, prior research on autonomous vehicles has been limited to technology-oriented research for functional perfection. (Hakimi, 2018).

Unlike existing cars, autonomous vehicles need to use artificial intelligence systems that automatically make all system decisions. It allows drivers to discover how to accept autonomous vehicles, what factors affect them, and their requirements. The user experience used initially in car design was limited to indoor design or interface for passenger convenience and satisfaction. However, with the development of autonomous vehicles and the application of various vehicles' functions, the user experience is becoming more complex and important. As the era of autonomous vehicles has started, vehicles' use will soon have to undergo another big change. The biggest difference is not only to create an environment significant to the vehicle but also to solve various problems that can occur when driving through communication with the vehicle. Moreover, as self-driving cars have not yet been introduced to the public, user experience in the domain g cars needs to be studied more. These differences in user experiences and are understood to allow users to more comfortably and use autonomous vehicles and eventually give them an advantage in the market (Carlson et al., 2014). Research between human roles and trust in the autonomous vehicle has also been actively conducted. For example, it was found that a significantly different building trust process when a person looks at the vehicle as a pedestrian and when a person feels the vehicle as a passenger (Hulse et al., 2018). Unlike pedestrians, it feels more dangerous when a person is in the vehicle. This study investigates autonomous vehicles' acceptance from a general user's perspective rather than distinguishing human roles from pedestrians and passengers.

1.1.3 User trust in autonomous vehicles

The level of trust has been discussed in various research. Research has been conducted to make the appropriate model to expect and explain the organization of trust, especially in human factors and the human-computer interaction domain. Since it is considered a great tool to guide interaction with humans and technology, this approach has become more critical (Hoff and Bashir, 2015). Due to the change of human's role in an autonomous vehicle from drivers to passengers, it is determined that whole experiences while driving in vehicles would be different for the passenger. To trust autonomous vehicles is a pressing issue to address. Without a sufficient level of trust, either distrust, people may misuse the technology or decline to use it depending on the situation that people are facing (Parasuraman and Riley, 1997). In various previous studies, it is known that it is essential for people to trust autonomous vehicles because they need to accept the technology to use it accurately. Therefore, it is essential to understand what factors make autonomous vehicles more deeply accepted and trusted in the autonomous vehicle domain (Leimeister et al., 2005). As autonomous vehicles have been considered more normal mobility, it is vital to figure out how people will trust the vehicle (Carlson et al., 2014). Since the level of trust can help people adopt the technology and feel more satisfied and enjoyable while using it, trust is considered a good tool for successful adaption of technology in the vehicle (Walker et al., 2016).

1.1.4 Trust modeling

There have been many research efforts to determine the influential factors influencing user trust and create models to predict and expect the level of trust in using technologies or machines. Since it was determined that trust could significantly influence human behavior, those research topics have been considered essential to study to introduce technology to people (Walker et al., 2016). However, it has not been easy to make an appropriate model apply to a particular technology. It is a combination of many factors, including human emotions, feeling, and thinking, which cannot be explained quickly and visible so that it is hard to make it clear (Lee and See, 2004). To figure out the relationship between factors that influence user trust, research related to uncovering factors to have integrated trust in the technology adoption model has been conducted (Bahmanziari et al., 2003). It is crucial that identifying factors influencing user trust and its relationship to creating a model to predict user's trust.

1.2 Previous Studies about Research Approaches

1.2.1 Factors influencing user trust

There are many studies investigating factors influencing user trust or acceptance in automation. The factors could be used to design the vehicle systems and interfaces for passengers in vehicles. By finding viable factors, including dispositional one which represents individual's aspects of a tendency to trust the vehicles, it is possible to know how the vehicle should be designed to be accepted by passenger properly (Hoff and Bashir, 2015). Such as the brand of autonomous vehicles, vehicles' reputation, and aesthetics were used to ask to get general opinions and statistical scores in a survey manner. Choi and Ji (2015) used behavior intention, perceived usefulness, perceived ease of use, system transparency, technical competence, situation management, and perceived risk to test the effectiveness of trust autonomous vehicles. Perceived ease of use, perceived usefulness, perceived privacy risk, and attitude factors were used to ask a participant to determine how much the factors affect their trust level in autonomous vehicles (Zhang et al., 2019).

Including demographic questions such as age and gender, the questions asking individuals' traits, such as general feeling toward new technology, were used in a survey to figure out the relationship between factors and trust (Kaur and Rampersad, 2018). Gold et al. (2015) modified the questions of perceived control of conduct from Amdt (2011) to understand the relationship between trust and those drivers are willing to trust if they have a positive attitude toward autonomous vehicles. Various types of benefits and concerns related to using autonomous vehicles were asked to people to collect many aspects of public opinions on autonomous vehicles to know how to make this technology be accepted by people (Schoettle and Sivak, 2014). Most of the previous research conducted to find significant factors to trust autonomous vehicles usually used a survey with research participants. In this study, similar questionnaires used in previous research to find factors influencing user trust in autonomous vehicles were brought to the survey to get a statistical result to make a structural model in the level of trust in autonomous vehicles.

It is determined that finding factors influencing user acceptance or trust is considered a meaningful research topic for suggesting implementation to design autonomous vehicles and marketing and educational purpose. Also, interpersonal such as personality and system feature such as system functions is imperative that people are affected by factors to trust autonomous vehicles.

1.2.2 Interpersonal and system feature

According to significant progress in automation technology, it is necessary to understand human-related factors and machine-related ones to make a proper trust model and its explanation. There were significant differences among elements between individual traits and situational context in the stage of trust formation. Interpersonal factors refer to dispositional components, an individual's overall tendency to trust automation, such as feeling and general attitude (Lee and See, 2004). It is determined that interpersonal factors could lead to a different result on the trust level. System Features come from the type of system or variables, including the brand of vehicle and gossips influencing the user to trust while using the technology. There have been many studies to understand the relationship between interpersonal and system features in forming trust since it is imperative to understand how people accepted a particular technology. Including cultural, organizational, and contextual factors, external factors have been considered as significant components which influence user trust in a technology (Hancock et al., 2011).

The psychology aspect is considered meaningful to study individual traits and their differences toward a particular behavior. Ulleberg and Rundmo (2003) examined the relations between driving behavior and factors among personal traits such as risk perception and attitude. It is important to study since personal traits influence an individual's decision-making process and behavior. Another research was conducting research related to machine-related factors which might affect user decisions. Hancock et al. (2011) suggested that external factors, which refers to machine-related factors such as system transparency and type of system, could significantly influence human's feelings and behavior. In this study, by collecting factors that have been used to study human trust in automation and autonomous vehicles, it was sorted by the concept of interpersonal and system feature to figure out the relationship between the factors and trust and behavioral intention.

1.2.3 Structural equation modeling for user trust

Structural equation modeling (SEM) is a tool used to explain a large number of statistical models with empirical data. It generally represents general linear modeling (GLM) with analysis of variance (ANOVA) and multiple regression analysis. This method can discover the relationship from modeling indicating factors or variables (Lei and Wu, 2007). SEM has been used a lot in creating proper models to expect trust level. Zheer and Perrone (1998) investigated the role of trust in interpersonal and inter-organizational factors and their effect on performance. As a result, the research found a significant relationship between trust and interpersonal factors. This method has also been used to figure out aspects of humans' psychosocial perspectives in vehicles by estimating each factor type of variable related to people's minds and thoughts (Lois and Lopez (2009). May et al. (2017) applied structural equation modeling to find the relationship between automation and user acceptance. According to this research, this research was able to create a model that predicts how figured factors with statistical results influenced people's acceptance of automation by using the method. Besides, it is expected that the method can provide statistical results among each factor and prioritize them out of factors. In terms of human factors, research in constructs of the human mind has been conducted in various domains.

From the design aspects to the engineering part, identifying factors that may influence certain situations such as accidents or acceptance has been considered an important research topic. For example, to understand the effects of inherited factors such as personality, perception concerning the accident, structural equation modeling was used to determine the closeness between factor and situation (Ulleberg and Rundmom, 2003). Similarly, Zhang et al. (2019) have applied the structural equation modeling method to find the relationship between factors and trust. By comparing initial trust and risk, this research concluded that trust could promote a positive attitude toward AVs. According to the result of research, the implementation was introduced that reducing system flaws and safety enhancement function could help increase the level of trust in AVs. It is determined that structural equation modeling has been widely used to create a model explaining the relationship among factors. In autonomous vehicle research, to find significant factors influencing user acceptance and trust, factors were studied and used to make a model with this method. With this methodology, implementations and suggestions are introduced by explaining statistical results.

1.3 Study Objectives

This study aims to describe the structural relation of passenger (driver)'s trust and factors that were found used by previous research related to user acceptance or trust in autonomous vehicles. By collecting as many significant factors proven to influence user trust in the various domain, including human-robot interaction and human-automation, this study figured out whether the factor is significant or not in terms of user trust level in autonomous vehicles. After collecting factors by reviewing previous studies, the factors are tested by a statistical method, including correlation and factor analysis, to sort with influential factors and create a model that describes the structural model among factors. By using structural equation modeling, it is determined that the relation involving interpersonal, system feature, risk perception, and behavior intention is expected to reveal user trust in autonomous vehicles.

CHAPTER 2

METHODOLOGY

An online survey tool was used to collect data for this study. To investigate factors influencing user acceptance in an autonomous vehicle, demographic questions and 12 constructs, including overall trust, were used to create an online survey. The online survey consisted of 13 sections with 114 questions, including nine demographic questions. Questionnaires were used in the survey. Twenty-seven of the total surveys were used by modifying questions from previous studies related to user acceptance, five newly constructed questions, and 73 questions were taken from previous studies about autonomous vehicles and trust. Before starting to complete the survey, introductions of the autonomous vehicles were provided, including video clips and the definition of autonomous vehicles to help participants understand technology concepts. The first section consisted of demographic questions including age, gender, income, and education. After the first section, the constructs are presented without any relevant order. The survey took 30 minutes to complete the questionnaire. All items were measured on a seven-point Likert scale. The scale indicated the range from "Strongly Disagree (= 1) to Strongly Agree (= 7). Statistical analysis was used on survey data to apply for structural equation modeling. Since the survey has many questions, it was necessary to sort the data with latent variables to have a transparent structural equation model. Except for eight demographic questions, 51 questions in 13 constructs were selected after the statistical analysis. With sorted data samples, a new model was proposed using structural equation modeling to indicate the relationship among constructs, including overall trust.

2.1 Theories of Human Behavior and Technology Acceptance

Previous research has indicated human behavior and their acceptance of new machines or technology. As shown in Figure 1, the Technology Acceptance Model (TAM) is considered one of the most well-explained models to demonstrate the relationships among factors such as people's beliefs, perception, and behavioral intention based on the theoretical results (Davis et al., 1989). Mainly, this model explained someone's attitude toward technology determines the actual usage behavior. Similarly, many studies have also related to creating a model to apply for the autonomous vehicle domain. As Figure 2 shows, Ghazizadeh et al. (2012) added more factors like compatibility and its relationship with trust to understand user attitude deeply with the fundamental concepts of the technology acceptance model. By reviewing related previous research, it is found that autonomous vehicle acceptance models still have great potential to create more precise models. With the meaningful findings such as perceived risk or attitude are strongly related to autonomous vehicle acceptance, it is expected that new research could include factors to find hidden relations related to user acceptance in an autonomous vehicle.

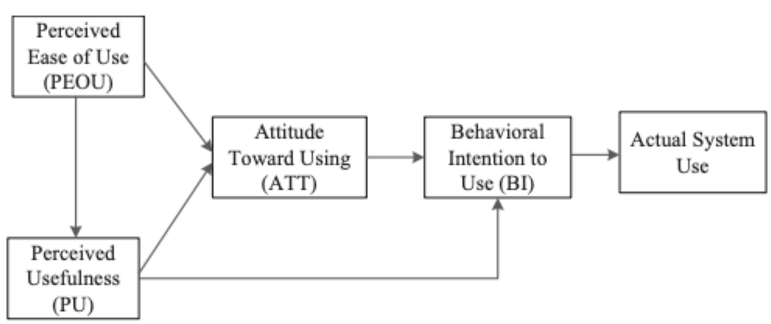

Figure 1. Original TAM (Davis et al.,1989).

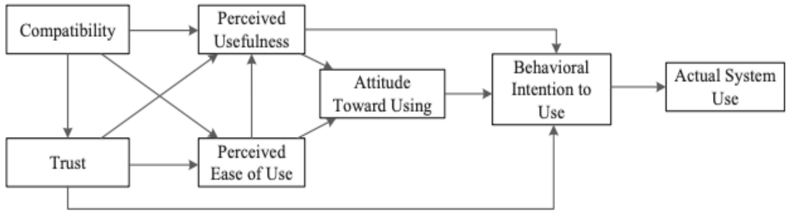

Figure 2. Modified TAM for comprehensive understanding of user trust (Ghazzizadeh et al., 2012).

2.2 Research Model

Zhang et al. (2019) proposed the modified model, which consists of the relation between the two types of risks: perceived safety risk and perceived privacy risk and initial trust in the original technology acceptance model's model to explain user acceptance better. With these facts, this study proposes a new model (shown in Figure 3) to explain trust level better with more factors, including interpersonal and system features, according to previous literature review. As mentioned, there have been efforts to add new factors to the TAM model for deeper understanding.

Also, attempts have been made to interpret factors in multiple dimensions to make multiple trust interpretations. Corrazzini (1977) proposed a multi-model by grouping several factors for trust. It may also be essential to look at each factor's impact directly on trust while simultaneously looking at it together in multiple ways.

In particular, in modern research on trust, many studies have examined the relationship between automation and trust. Hoff and Bashir (2015) suggested that human trust is divided into several structures and that each structure may contain several factors. In this study, factors that were found to affect trust in previous studies were included in each of the higher-level constructs.

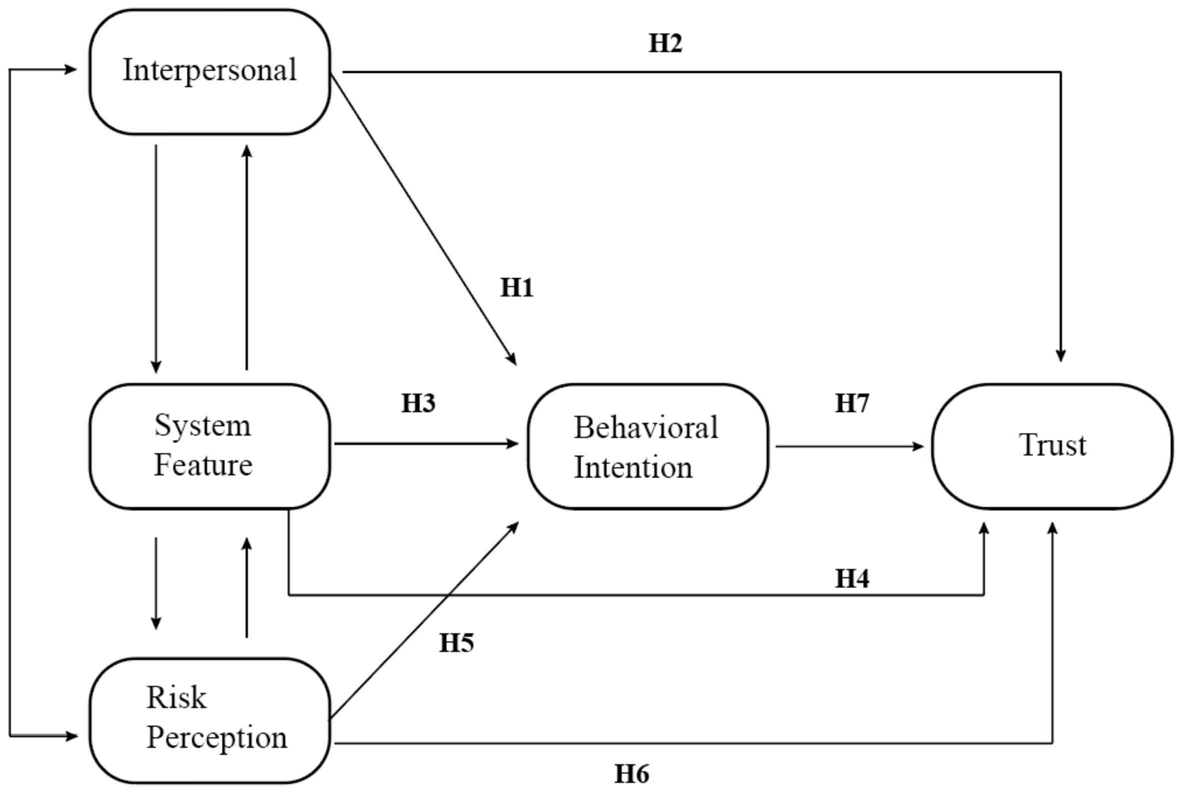

Figure 3. A new proposed structural model and hypotheses.

2.2.1 Interpersonal

The construct of "Interpersonal" represents intrinsic human traits such as attitude, belief, expectation, and personality. This construct also involves the individual's expectation of technology, characteristics, educational environment, and background. In general, the "Interpersonal" describes personal features that have already been developed before recognizing autonomous vehicles. It has been already determined that personality traits significantly influence user behavior in driving situations (Rubin and Noy, 2002). In this study, the factors related to the facts that are human-related were categorized in "Interpersonal." As previously discussed, these factors refer to interpersonal factors which existing in an individual's mind. Questionnaires of Attitude (Table 1), Self-Reported (Table 2), Technical Competence (Table 3), Perceived ease of use (Table 4), and Perceived usefulness (Table 5) were used as constructs in explaining “interpersonal.” Hypothesis for “Interpersonal” in structural relation was identified to figure out the relations with other constructs, including Trust.

H1: Interpersonal has a positive effect on Behavioral intention

H2: Interpersonal has a positive effect on Trust

Table 1. Questionnaires of attitude variables for interpersonal construct.

Factor	Number	Queries	Reference
AT	1	Using autonomous vehicles is a good idea	Zhang et al. (2019)
AT	2	I am wary of autonomous vehicles	Modified based on Davis (1993)
AT	3	Using autonomous vehicles is a wise idea	Zhang et al. (2019)
AT	4	Autonomous vehicles are deceptive	Modified based on Davis (1993)
AT	5	My trust in driverless cars will be based on the reliability of the underlying technologies	Modified based on Davis (1993)
AT	6	Using autonomous vehicles is pleasant	Zhang et al. (2019)
AT	7	I feel assured that the government will be protect me from problems from using driverless vehicles	Modified based on Davis (1993)
AT	8	It is an important factor how smart the car is in order to trust autonomous vehicle	Modified based on Davis (1993)
AT	9	I am suspicious of autonomous vehicles intent action, or outputs	Modified based on Davis (1993)
AT	10	Autonomous vehicles behave in an underhanded manner	Modified based on Davis (1993)
AT	11	Autonomous vehicles actions will have a harmful or injurious outcome	Modified based on Davis (1993)

Table 2. Questionnaires of self-reported variables for interpersonal construct.

Factor	Number	Queries	Reference
SR	1	I am very interested in using new devices or technologies	Hancock et al. (2011)
SR	2	When I find out that new technologies make my life easier, I quickly replace my lifestyle with them	Hancock et al. (2011)
SR	3	I feel comfortable learning new and up-to-date technologies	Hancock et al. (2011)
SR	4	I believe that more technology makes human life more comfortable	Hancock et al. (2011)
SR	5	I think technology is more reliable than people	Hancock et al. (2011)
SR	6	I tend to trust the machine perfectly when taking an elevator or riding a roller coaster	Hancock et al. (2011)
SR	7	I feel comfortable on a plane or boat as a transportation	Hancock et al. (2011)
SR	8	I think that I get a lot of help from machines or technology in my daily life	Hancock et al. (2011)
SR	9	I believe that there will be many technologies that will make people comfortable in the future	Hancock et al. (2011)
SR	10	I think I know how to drive very well	Hancock et al. (2011)
SR	11	I am likely to use the various functions of the vehicle I own	Hancock et al. (2011)
SR	12	I believe that I can drive myself safely than an autonomous vehicle	Hancock et al. (2011)
SR	13	I have heard a lot of autonomous and/or self-driving vehicles	Hancock et al. (2011)
SR	14	I think I can drive safer than the vehicle in Autonomous driving mode	Hancock et al. (2011)
SR	15	I am familiar with autonomous vehicles	Hancock et al. (2011)
SR	16	It is an important factor that to know what percentage of cars in 2020 they would like to be autonomous like this one	Hancock et al. (2011)
SR	17	Driving without accidents is mainly a matter of luck	Choi and Ji (2015)
SR	18	Accidents usually happen because of unexpected events that occur during driving	Choi and Ji (2015)
SR	19	It is difficult to prevent accidents when the driving conditions are difficult, such as darkness, rain, a narrow road with many turns	Choi and Ji (2015)
SR	20	I would like to drive without a preplanned route and without a schedule	Choi and Ji (2015)
SR	21	I think I would enjoy the experience of driving very fast on a steep road	Choi and Ji (2015)
SR	22	I do not have patience for people who drive cars	Choi and Ji (2015)

Table 3. Questionnaires of technical competence variables for interpersonal construct.

Factor	Number	Queries	Reference
TC	1	I would be able to trust if autonomous vehicle is free of error	Choi and Ji (2015)
TC	2	I would be able to trust if I can depend and rely on autonomous vehicle	Choi and Ji (2015)
TC	3	I would be able to trust if autonomous vehicle will consistently perform under a variety of circumstance	Choi and Ji (2015)
TC	4	It is an important factor how well it could feel what is happening around it in order to trust autonomous vehicle	Choi and Ji (2015)

Table 4. Questionnaires of perceived ease of use variables for interpersonal construct.

Factor	Number	Queries	Reference
PEU	1	Learning to operate autonomous vehicle would be easy for me	Modified based on Davis et al. (1989)
PEU	2	I would find it easy to get autonomous vehicle to do what I want to do	Modified based on Davis et al. (1989)
PEU	3	Interacting with autonomous vehicle would not require a lot of my mental effort	Modified based on Davis et al. (1989)
PEU	4	Learning to use autonomous vehicles will be easy for me	Modified based on Davis et al. (1989)
PEU	5	It will be easy for me to become skillful at using autonomous vehicles	Modified based on Davis et al. (1989)

Table 5. Questionnaires of perceived usefulness variables for interpersonal construct.

Factor	Number	Queries	Reference
PU	1	Using autonomous vehicle will increase my productivity	Choi and Ji (2015)
PU	2	Using autonomous vehicle will increase my driving performance	Choi and Ji (2015)
PU	3	Using autonomous vehicle would enhance my effectiveness while driving	Choi and Ji (2015)
PU	4	Using autonomous vehicles will be useful in meeting my driving needs	Choi and Ji (2015)
PU	5	Autonomous vehicles will let me do other tasks, such as eating, watch a movie, be on a cell phone on my trip	Modified based on Davis et al. (1989)
PU	6	Using autonomous vehicles will decrease my accident risk	Modified based on Davis et al. (1989)
PU	7	Using autonomous vehicles will relieve my stress of driving	Modified based on Davis et al. (1989)
PU	8	I find autonomous vehicles to be useful when I'm impaired (e	Modified based on Davis et al. (1989)
PU	9	Using driverless vehicles can improve my living and working efficiency	Modified based on Davis et al. (1989)
PU	10	Using driverless vehicles can increase my living and working productivity	Modified based on Davis et al. (1989)
PU	11	I find that driverless vehicles are useful	Modified based on Davis et al. (1989)
PU	12	Driverless cars can be trusted to carry out journeys effectively"	Modified based on Davis et al. (1989)
PU	13	Autonomous vehicles decrease my problems while driving	Gold et al. (2015)
PU	14	Autonomous vehicles enable me to manage useful activities while driving	Gold et al. (2015)
PU	15	Autonomous vehicles save time that I would have lost driving manually	Gold et al. (2015)
PU	16	Autonomous vehicles increase road safety	Arndt (2011)
PU	17	Autonomous vehicles prevent traffic violations	Arndt (2011)
PU	18	Autonomous vehicles support the driver to detect hazards in time	Arndt (2011)
PU	19	Autonomous vehicles contribute to reduce crash risk	Arndt (2011)
PU	20	Autonomous vehicles distract from detecting hazards in time	Arndt (2011)

2.2.2 System feature

Compared to "Interpersonal," which represents the facts caused by an individual's trait, "System Feature" refers to the constructs related to machine-related factors. The "System Feature" refers to the knowledge or thoughts gained from using or recognizing a particular technology or system. The construct seems to be developed after experiencing autonomous vehicles. The functions, brands, and system characteristics of autonomous vehicles are associated with this construct. For example, a particular brand name of a vehicle is considered a practical factor to be accepted more by public people. Besides, the functions in terms of system transparency could affect trust in autonomous vehicles. Brand of vehicle (Table 6), Situation management (Table 7), and System Transparency (Table 8) were used for the "System Feature" constructs. With these variables, the hypothesis for "System Feature" in structural relation was determined to observe other constructs' relations, including trust.

H3: System Feature has a positive effect on Behavioral Intention

H4: System Feature has a positive effect on Trust

Table 6. Questionnaires of brand variables for system feature construct.

Factor	Number	Queries	Reference
BR	1	I trust the car's capabilities because it was created by Google	Carlson et al. (2014)
BR	2	I trust the car's capabilities because it was created by a small, upstart company	Carlson et al. (2014)
BR	3	How would you rate your overall level of trust in a traditional automaker (e	Carlson et al. (2014)
BR	4	How would you rate your overall level of trust in a Silicon Valley tech company (e	Carlson et al. (2014)
BR	5	My trust in a fully autonomous system similar to cars would decrease if it was created by a lesser-known company	Carlson et al. (2014)
BR	6	My trust in a fully autonomous system similar to cars would decrease if it was created by a more established company such as Google	Carlson et al. (2014)
BR	7	My trust in a driverless car will be based on the car manufacturer's reputation for safety and reliability	Carlson et al. (2014)

Table 7. Questionnaires of system transparency variables for system feature construct.

Factors	Number	Queries	Reference
ST	1	I would be able to trust if autonomous vehicle acts consistently and its behavior can be forecast	Choi and Ji (2015)
ST	2	I would be able to trust if I can form a mental model and predict future behavior of autonomous vehicle	Choi and Ji (2015)
ST	3	I would be able to trust if I can predict what autonomous vehicle will act in a particular way	Choi and Ji (2015)

Table 8. Questionnaires of situational management variables for system feature construct.

Factor	Number	Queries	Reference
SM	1	I would be able to trust if autonomous vehicle provides alternative solutions	Choi and Ji (2015)
SM	2	I would be able to trust if I can control the behavior of autonomous vehicle	Choi and Ji (2015)
SM	3	I would be able to trust if autonomous vehicle will provide adequate, effective, and responsive help	Choi and Ji (2015)
SM	4	It is an important factor how well it could anticipate what is going to be about to happen in order to trust autonomous vehicle	Choi and Ji (2015)

2.3.3 Risk perception

Much research revealed the hostile relations between perceived risk (Table 9) and trust. Similarly, a higher level of trust could decrease risk perception while using autonomous vehicles (Kim and Peterson, 2017). For this reason, risk perception has been considered an important construct that was expecting the level of trust. The construct "Risk Perception" referred to a person's recognition of risks by various factors and consists of sub-factors, including perceived risk and perceived privacy risk. While the facts confirmed that risk has an essential role in forming trust, in this study, it is expected that the relationship with not only behavioral intention and trust, but interpersonal and system features could be explained. This study contains two types of risks related to safety issues, such as car accidents, and the other one describing privacy issues (Table 10) that people were worried about (Schoettle and Sivak, 2014). To investigate the effects of risk perception on trust and constructs, hypotheses were suggested.

H5: Risk perception has a negative effect on behavioral Intention

H6: Risk perception has a negative effect on Trust

Table 9. Questionnaires of perceived risk variables for risk perception construct.

Factor	Number	Queries	Reference
PR	1	Autonomous vehicle would lead to a financial loss for me	Choi and Ji (2015)
PR	2	Autonomous vehicle might not perform well and create problems	Choi and Ji (2015)
PR	3	Using autonomous vehicle would be risky	Choi and Ji (2015)
PR	4	I am worried about the general safety of such technology	Choi and Ji (2015)
PR	5	I'm worried that the failure or malfunctions of autonomous vehicles may cause accidents	Choi and Ji (2015)
PR	6	Autonomous vehicles is vulnerable for new hazards like hacker attack and issues with data safety	Choi and Ji (2015)

Table 10. Questionnaires of perceived privacy risk variables for risk perception construct.

Factor	Number	Queries	Reference
PPR	1	I am concerned that autonomous vehicles will collect too much personal information from me	Zhang et al. (2019)
PPR	2	I am concerned that autonomous vehicles will use my personal information for other purposes without my authorization	Zhang et al. (2019)
PPR	3	I am concerned that autonomous vehicles will share my personal information with other entities without my authorization	Zhang et al. (2019)
PPR	4	When I use new technology, I am worried about my privacy exposure	New Item
PPR	5	When I use new technology, I am worried about my personal information leakage	New Item
PPR	6	When I use new technology, the fact that it knows me a lot makes me uncomfortable	New Item
PPR	7	I am usually worried about my privacy	New Item
PPR	8	Because of personal information leaks, it is cautions for me to use devices with the Internet connected	New Item

2.2.4 Behavioral intention

Behavioral intention indicates that the degree to which an individual is willing to use technology. In other words, it is used to demonstrate the actual usage of technology. As Table 11 shows, people are likely to use technology before they genuinely trust it. In this study, the behavioral intention was considered the prior stage before human trust. It is also thought that without enough behavioral intention toward autonomous vehicles, humans cannot trust the vehicle. To figure out the relations between behavioral intention and trust, the following hypotheses have been proposed.

H7: Behavioral Intention has a positive effect on Trust

Table 11. Questionnaires of behavioral intention variables for behavioral intention construct.

Factor	Number	Queries	Reference
BI	1	I intend to use autonomous vehicle in the future	Choi and Ji (2015)
BI	2	I expect that I would use autonomous vehicle in the future	Choi and Ji (2015)
BI	3	I plan to use autonomous vehicle in the future	Choi and Ji (2015)
BI	4	Autonomous vehicles is not available for my vehicle type	Gold et al. (2015)
BI	5	I will consider the use of autonomous vehicles	Gold et al. (2015)
BI	6	I will purchase autonomous vehicles for my next car	Gold et al. (2015)

2.2.5 Trust

Lee and See (2004) demonstrate trust as a critical element that led to human-automation interaction. To understand how people trust a particular technology, research has been conducted to find factors influencing user trust and a model for understanding trust forming. It is crucial to have the appropriate definition of trust because overtrust or a low level of trust may misuse or refuse to use technology. Trust is known to contain people's beliefs to intention while forming the trust (Carter and Belanger, 2005). Thatcher et al. (2010) argued that trust has dimensions to assess trust. According to this definition, trust is defined with functionality, situational factors, and interpersonal factors. This study examines which factors influence users to trust the most while using an autonomous vehicle. As Table 12 contains, nine variables were used to ask people to collect data regarding overall trust in autonomous vehicles.

Table 12. Questionnaires of overall trust variables for trust construct.

Factor	Number	Queries	Reference
OT	1	Driverless cars have enough safeguards to make me feel comfortable using it	Modified Davis (1993)
OT	2	"In general, driverless cars provide a robust and safe mode of transport	Modified Davis (1993)
OT	3	I trust driverless cars to keep my best interests in mind	Modified Davis (1993)
OT	4	I am confident in autonomous vehicles	Modified Davis (1993)
OT	5	Autonomous vehicles provide security	Modified Davis (1993)
OT	6	Autonomous vehicles have integrity	Modified Davis (1993)
OT	7	Autonomous vehicles are dependable	Choi and Ji (2015)
OT	8	Autonomous vehicles are reliable	Choi and Ji (2015)
OT	9	Overall, I can trust autonomous vehicle	Choi and Ji (2015)

2.3 Participants

An online-based questionnaire was distributed to participants throughout the U.S. From October 2020 to February 2121, participants were invited to complete the survey. Only adults had a driving experience and valid driving licenses and were eligible to participate in the survey. One hundred ninety-five participants completed the survey. On average, participants' age was 31.1 years old (SD=8.08) and had 9.27 years (SD=8.55) driving experience. As shown in Table 13, the property of gender was almost the same, and most participants had at least a college degree (87.2%). Most participants lived in urban and suburban areas (93.3%). One hundred thirty-one people (67.2%) are employed and working—the 40 people (20.5%) of students participated in the survey. A total of 320 surveys were collected. However, 125 samples were removed for various reasons. For example, if the answer is stopped without completing it to the end, if all responses are answered with one option, the answer was ridiculous (for example, the participant writes his age at 125 years). For this reason, a total of 195 of the participants' survey responses received online were selected. A total of 9 questions were used in demographic question (see Appendix A).

Table 13. Participants demographic information.

	Frequency	Percentage
Gender		
Female	95	48.7%
Male	98	50.3%
Other	2	1%
Education		
Less than high school	4	2.1%
Highschool graduate	21	10.7%
Some college	35	17.9%
2 years degree	13	6.7%
4 years degree	78	40.0%
Master’s degree	32	16.4%
Doctorate	11	5.6%
Occupation		
Employed Full time	123	63.1%
Employed Part time	8	4.1%
Student	40	20.5%
Retired	1	0.5%
Unemployed looking for work	9	4.6%
Unemployed not looking for work	11	5.6%
Accident		
0	88	45.1%
1	48	24.6%
2	27	13.8%
3	11	5.6%
≥4	19	9.7%
Living Area		
Urban Area	96	49.2%
Suburban Area	86	44.1%
Rural Area	5	2.6%
Other	3	1.5%

2.4 Variables Selection for Structural Equation Modeling

The variable selection process was necessary to investigate significant factors for creating a structural equation model. Using a statistical method, variables connected to constructs were conducted to filter out with high statistical value so that variables could be analyzed and used by structural evacuation modeling. Through this process, it was expected that relevant variables with survey questions were determined and devoted to creating a better model.

2.4.1 Factor analysis

Before conducting factor analysis, reliability statistics were executed to get Cronbach's alpha value. It is determined that sample data is reliable with over 0.5 Cronbach's Alpha value from reliability statistics. With the sample data for this study, it is observed that Cronbach's Alpha value is 0.967. Besides, Anti-Image Matrices was conducted to delete irrelevant variables. Anti-Image Matrices produced a measure of sample adequacy (MSA) loading value. It is recommended that, according to MSA, variables that are smaller than 0.5 in MSA should be deleted. Eighteen variables were deleted by the Anti-Image Matrices method. After sorting variables, factor analysis was conducted. According to factor analysis, variables that were expected to be tested for interpersonal such as self-reported, perceived usefulness, and perceived ease of use, were collected in factor 1. In factor 2, variables that represented overall trust were collected. Perceived Risk was indicated in factor 3. With this repeated process, 17 variables were excepted for the final model. Table 14 indicates the variables found by factor analysis. Table 14 listed the variables representing each construct, not all variables. It was used to eliminate 18 non-significant variables and understand the relationship in variables.

Table 14. Factor loadings from factor analysis

	Latent Variables					
Variables	1 (Interpersonal and Behavioral Intention)	2 (Overall Trust)	3 (Risk perception)	4 (Risk Perception)	5 (System Feature 1)	6 (System Feature 2)
SR1	0.541					
SR2	0.555					
PU10	0.837					
PU11	0.663					
PU14	0.591					
AT1	0.75					
AT6	0.628					
PEU2	0.66					
PEU5	0.646					
BI1	0.742					
BI2	0.727					
BI3	0.724					
OT1		0.585				
OT2		0.712				
OT3		0.632				
OT4		0.713				
OT5		0.621				
PPR5			0.904			
PPR3			0.886			
PR5				0.594		
PR6				0.506		
ST2					0.674	
ST3					0.658	
ST4					0.616	
SM1					0.613	
SM2					0.595	
BR1						0.502
BR4						0.63

2.4.2 Correlation analysis

This study was conducted to find factors influencing user trust. For this reason, the correlation analysis was used to filter relevant factors among sample data. Overall trust section, which indicated user opinions toward autonomous vehicles, for example, “I can trust autonomous vehicle, consisted of nine questions. With these questions, correlation analysis was conducted with other 12 factors, including behavioral intention. It was expected that irrelevant factors could be deleted according to the larger than 0.3 in coefficient with a significant p-value by looking at the correlation analysis results. As a result, it was found that 53 variables correlated more than 0.3

with the variables of trust (see Appendix C).

2.4.3 Summary of variable selection

In this study, the survey consisted of one hundred and twenty-two questions. Since not all variables are relevant to this study's facts, the variable selection was needed to have a signature model. A total of 114 queries were prepared for the survey of this study (see Appendix B). The present study's queries were primarily collected from previous studies to identify the latent variables and underlying factors of human trust in general human-in-the-loop automation and autonomous vehicles. The survey was conducted across the U.S through an online survey tool, and a total of 195 survey responses were collected after screening out outliers and meaningless data. A series of statistical analyses, including correlation analysis and factor analysis, revealed that 51 queries in the entire query set are significantly related and affective to human trust.

CHAPTER 3

STRUCTURAL EQUATION MODELING

3.1 Variables for Completed Model

Fifty-one variables were determined to develop a structural equation model through statistical methods, including correlation. As mentioned above, this study categorized variables which have been used to expect user trust in automation and autonomous vehicle into interpersonal factors and system feature. Therefore, interpersonal included five factors (Self-Reported, Attitude, Perceived Usefulness, Perceived ease of use, and Technical Competence) in forty-two questions. Construct of System feature contains three factors (Brand, System Transparency, and Situation Management). Also, Risk perception factors have Perceived risk with two questions and Perceived privacy risk with one question. Structural equation modeling was conducted with all factors and variables relevant to the study.

3.2 Modeling Results

Fifty-one variables were determined to develop a structural equation model through statistical methods, including correlation. This study categorized variables which have been used to expect user trust in automation and autonomous vehicle into “Interpersonal” constructs and “System Feature” and “Risk perception”. “Interpersonal” included five factors (Self-Reported, Attitude, Perceived Usefulness, Perceived ease of use, and Technical Competence) with forty-two variables. “System feature” contains three factors (Brand, System Transparency, and Situation

Management). “Risk perception” has perceived risk with two variables and Perceived privacy risk with one variable. Structural equation modeling was conducted with all factors and variables relevant to the study. The fit measures of completed model revealed that the final model fitted the data properly: $\chi2$ (94, n=195) = 233.371, RMSEA = 0.087, CFI = 0.933, TLI = 0.903. As shown in Figure 4, it was found that brand was not a latent factor influencing system feature with a low value in correlation with 0.085 p-values.

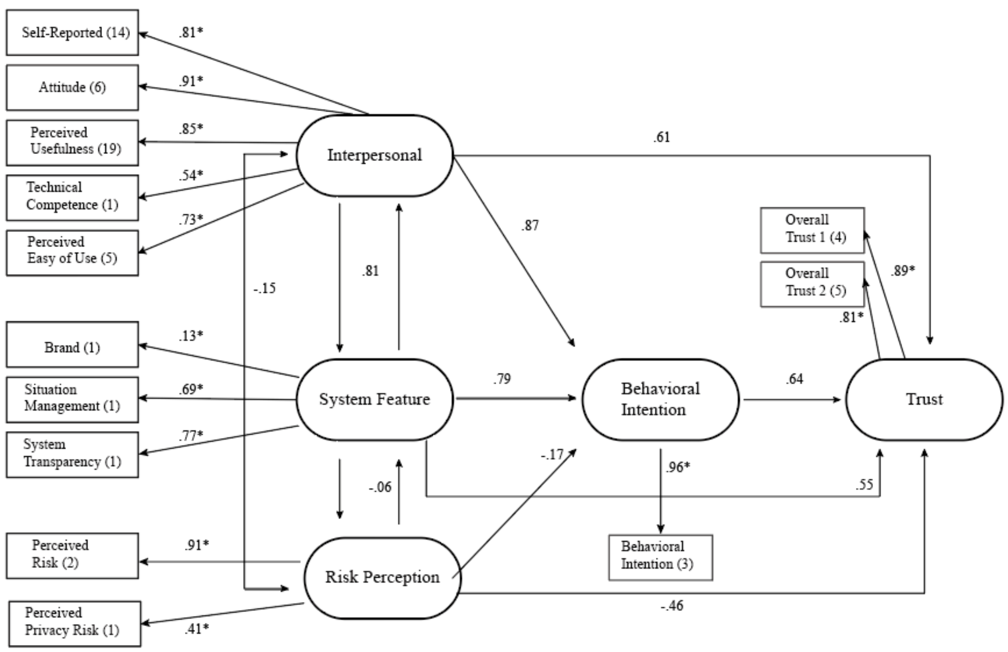

Figure 4. The completed structural relations model for user trust in autonomous vehicles.

As Table 15 shows, it was found that “Risk Perception” negatively affected all other constructs. In particular, “Risk Perception” had a significant negative impact on “Trust.” (β =-.46, $p<0.05$). It was confirmed that “Behavioral Intention” was related to “Trust” (β =.64, $p<0.05$). Constructs of “Interpersonal” and “System Feature” was determined that both constructs significantly influenced “Trust” (β =.61, $p<0.05$, β =.55, $p<0.05$, respectively) as well as “Behavioral Intention” (β =.87, $p<0.05$, β =.79, $p<0.05$). However, in the case of “Risk Perception,” it was true that the construct negatively affects other constructs, but it did not significantly support the hypotheses with other constructs except “Trust”. Confirmatory Factor Analysis (CFA) was executed after the structural equation model with 51 variables was created (See in Appendix E). Among the variables that made up factors, it was determined that the three variables (Technical Competence, Privacy Risk, and Brand) were not significant based on the results of the Composite Reliability value. All other variables have proven to have significant values for constructing the structure.

Table 15. Result of hypothesis testing.

Hypotheses	Coefficients	t-value	Supported?
H1: IP→BI	.87	5.05	Yes
H2: IP→TR -	.61	2.23	Yes
H3: SF→BI	.55	5.23	Yes
H4: SF→TR	.79	1.72	Yes
H5: RP→BI	-.17	-.44	No
H6: RP→TR	-.46	-5.05	Yes
H7: BI→TR	.64	2.85	No

Construct names: IP :Interpersonal; SF: System Feature; RP: Risk Percepetion; BI: Behavioral Intention; TR: Trust

Table 16 shows that how the variables were use and other measure of the same constructs. Among variables that made up factors, it was confirm that the cluster of all variables had a significant Cornbach’s alpha which is lager than 0.5.

Table 16. Convergent validity of variables.

Measure	Number of Items	Mean	S.D.	Cronbach's alpha
Interpersonal				
Self-Reported	14	4.87	1.39	0.865
Attitude	6	4.75	1.31	0.725
Perceived Usefulness	19	4.81	1.43	0.955
Perceived Ease of use	5	5.08	1.31	0.932
Technical Competence	1	5.6	1.03	
System Feature				
Brand	1	4.16	1.42	
Situation Management	1	5.27	1.04	
System Transparency	1	5.43	1.23	
Risk Perception				
Perceived Risk	2	5.21	1.24	0.763
Perceived Privacy Risk	1	5.02	1.59	
Behavioral Intention				
Behavioral Intention	3	5.19	1.34	0.959
Overall Trust				
Overall Trust 1	5	4.44	1.31	0.911
Overall Trust 2	4	4.15	1.49	0.937

CHAPTER 4

DISCUSSION & CONCLUSION

4.1 Discussion of SEM Results

This study aimed to investigate three main objectives: 1) Variables with questions used to ask user trust in previous research related to figure out factors influencing user acceptance in automation and autonomous vehicle were evaluated; 2) Sorted variables were categorized into four constructs which were "Interpersonal," "System feature," "Risk perception" and "Behavioral Intention" in order to observe the relations in "Trust"; and 3) a modified structural equation model indicating relations among factors and its effect on behavioral intention and trust in autonomous vehicles. A total of 114 variables with questionnaires were collected from more than eight previous research and tested to create a survey with latent factors. It was found that most of the variables significantly influenced user acceptance and trust except for some variables such as a brand of vehicle. By conducting the statistical test to select latent variables to use, few methods, including factor and analysis, correlations were applied. It is determined that 51 variables were selected with significant statistical values. Fifty-one (51) variables in 12 factors were categorized into four different constructs for a structural model. However, through the confirmatory factor analysis (CFA), three factors, which are Technical Competence in "Interpersonal," Brand in "System Feature," and Perceived Privacy Risk in "Risk Perception," were confirmed that there were no significant values to be included in the structure.

"Interpersonal" construct, which represented human dispositional statements, consisted of Self-Reported, Attitude, Perceived Ease of use, Perceived Usefulness, and Technical Competence. The construct of "Interpersonal" represents intrinsic human traits such as attitude, belief, expectation, and personality. This construct also involves the individual's expectation of technology, characteristics, educational environment, and background. In general, the "Interpersonal" describes personal features that have already been developed before recognizing autonomous vehicles. Among the "Interpersonal" construct, the attitude had the most effect on the constructs while technical competence scored the lowest in weighted value. It was confirmed that "Interpersonal" constructs had more influence on "Behavioral intention" and "Trust" in autonomous vehicles than "System Feature. Furthermore, "Interpersonal" affects "Behavioral intention" and "Trust" the most. Observing the model, "Risk perception" negatively influenced "Trust" and "Behavioral intention" even in "Interpersonal and" "System feature" in correlation analysis results.

"System Feature" has consisted of Brand of vehicles, System Transparency, and Situational Management. The "System Feature" refers to the knowledge or thoughts gained from using or recognizing a particular technology or system. The construct seems to be developed after experiencing autonomous vehicles. The functions, brands, and system characteristics of autonomous vehicles are associated with this construct. In "System Feature," situational management, which was extracted from the questions such as "I would be able to trust if autonomous vehicle provides alternative solutions," had the most effect on "System Feature."

However, in the case of "Risk Perception," it was confirmed that the construct negatively affects other constructs, but it did not significantly support the hypotheses with other constructs except "Trust."

It was found that "Behavioral intention" had been much affected than "Trust" by "Interpersonal" and "System Feature." Similarly, "Trust" in the model was identified to be positively influenced by constructs, while "Risk Perception" had a negative relation with "Trust."

4.2 Implementations

The results may suggest that understanding the “Interpersonal” characteristics is essential to improve the level of trust of autonomous vehicles. Especially the subfactors “attitude” and “perceived usefulness” in the construct of “Interpersonal" are revealed to be most effective to the “Trust.” Practically, the suggestions propose that enhancing "Interpersonal” can be an excellent solution for people to trust autonomous vehicles. This also may propose that increasing user trust level can be effectively achieved by providing potential users with education on autonomous vehicles' benefits. "Behavioral intention" and "Trust" could be increased by reducing risk variables and enhanced by motivating "Interpersonal factors toward autonomous vehicles. As "Behavioral intention" could make people trust autonomous vehicles, this indicates that "Behavioral intention" might be prioritized to secure to reach a sufficient level of trust in the vehicle for people. These findings proposed that trust is affected by "Interpersonal" most. It can also be used for designing to improve user acceptance in various stages of vehicle design. This study can be applied to develop an autonomous vehicles' adoption model at an early stage of adopting autonomous vehicles. Besides, the sorted questionnaires could be used for future surveys to investigate the relations between technology and user trust.

4.3 Limitation

It is expected that the model could be more reliable and robust with more sufficient samples. The survey respondents were not perfectly collected with quality survey data since it was distributed through an online survey. An in-person survey could be an option to address this problem. The model clearly does not include all relevant variables which have been confirmed to significantly influence user trust in previous research.

4.4 Future Study

It is expected that research conducted with participants who experience AVs should be recommended to understand better user trust in autonomous vehicles. Further study is expected to study other latent factors that may affect user trust while using autonomous vehicles so that research could provide more reliable and realistic factors which could be applied to various experiences design. Lastly, it is expected that the presented model might be implied for other domains to study user acceptance on a particular technology or machines.

APPENDICES

APPENDIX A: DEMOGRAPHIC QUESTIONNAIRES

Number	Questionnaire
1	What is your age?
2	What is your gender?
3	What is the highest level of school you have completed or the highest degree you have received?
4	Please describe your occupation.
5	Please describe your income.
6	Please select the option that better describe where do you live?
7	Do you have a valid U.S driver license?
8	How many years have you been driving?
9	How many times have you had car accidents?

APPENDIX B: VARIABLE QUESTIONNAIRES

#	Factor	Factor #	Questionnaires
1	SR	1	I am very interested in using new devices or technologies
2	SR	2	When I find out that new technologies make my life easier, I quickly replace my lifestyle with them
3	SR	3	I feel comfortable learning new and up-to-date technologies
4	SR	4	I believe that more technology makes human life more comfortable
5	SR	5	I think technology is more reliable than people
6	SR	6	I tend to trust the machine perfectly when taking an elevator or riding a roller coaster
7	SR	7	I feel comfortable on a plane or boat as a transportation
8	SR	8	I think that I get a lot of help from machines or technology in my daily life
9	SR	9	I believe that there will be many technologies that will make people comfortable in the future
10	SR	10	I think I know how to drive very well
11	SR	11	I am likely to use the various functions of the vehicle I own
12	SR	12	I believe that I can drive myself safely than an autonomous vehicle
13	SR	13	I have heard a lot of autonomous and/or self-driving vehicles
14	SR	14	I think I can drive safer than the vehicle in Autonomous driving mode
15	SR	15	I am familiar with autonomous vehicles
16	SR	16	It is an important factor that to know what percentage of cars in 2020 they would like to be autonomous like this one
17	SR	17	Driving without accidents is mainly a matter of luck
18	SR	18	Accidents usually happen because of unexpected events that occur during driving
19	SR	19	It is difficult to prevent accidents when the driving conditions are difficult, such as darkness, rain, a narrow road with many turns.
20	SR	20	I would like to drive without a preplanned route and without a schedule
21	SR	21	I think I would enjoy the experience of driving very fast on a steep road
22	SR	22	I do not have patience for people who drive cars
23	AT	1	Using autonomous vehicles is a good idea
24	AT	2	I am wary of autonomous vehicles
25	AT	3	Using autonomous vehicles is a wise idea
26	AT	4	Autonomous vehicles are deceptive
27	AT	5	My trust in driverless cars will be based on the reliability of the underlying technologies
28	AT	6	Using autonomous vehicles is pleasant
29	AT	7	I feel assured that the government will be protect me from problems from using driverless vehicles
30	AT	8	It is an important factor how smart the car is in order to trust autonomous vehicle
31	AT	9	I am suspicious of autonomous vehicles intent action, or outputs

32	AT	10	Autonomous vehicles behave in an underhanded manner
33	AT	11	Autonomous vehicles actions will have a harmful or injurious outcome
34	PU	1	Using autonomous vehicle will increase my productivity
35	PU	2	Using autonomous vehicle will increase my driving performance
36	PU	3	Using autonomous vehicle would enhance my effectiveness while driving
37	PU	4	Using autonomous vehicles will be useful in meeting my driving needs
38	PU	5	Autonomous vehicles will let me do other tasks, such as eating, watch a movie, be on a cell phone on my trip
39	PU	6	Using autonomous vehicles will decrease my accident risk
40	PU	7	Using autonomous vehicles will relieve my stress of driving
41	PU	8	I find autonomous vehicles to be useful when I'm impaired (e
42	PU	9	Using driverless vehicles can improve my living and working efficiency
43	PU	10	Using driverless vehicles can increase my living and working productivity
44	PU	11	I find that driverless vehicles are useful
45	PU	12	Driverless cars can be trusted to carry out journeys effectively"
46	PU	13	Autonomous vehicles decrease my problems while driving
47	PU	14	Autonomous vehicles enable me to manage useful activities while driving
48	PU	15	Autonomous vehicles save time that I would have lost driving manually
49	PU	16	Autonomous vehicles increase road safety
50	PU	17	Autonomous vehicles prevent traffic violations
51	PU	18	Autonomous vehicles support the driver to detect hazards in time
52	PU	19	Autonomous vehicles contribute to reduce crash risk
53	PU	20	Autonomous vehicles distract from detecting hazards in time
54	PR	1	Autonomous vehicle would lead to a financial loss for me
55	PR	2	Autonomous vehicle might not perform well and create problems
56	PR	3	Using autonomous vehicle would be risky
57	PR	4	I am worried about the general safety of such technology
58	PR	5	I'm worried that the failure or malfunctions of autonomous vehicles may cause accidents
59	PR	6	Autonomous vehicles is vulnerable for new hazards like hacker attack and issues with data safety
60	BR	1	I trust the car's capabilities because it was created by Google
61	BR	2	I trust the car's capabilities because it was created by a small, upstart company
62	BR	3	How would you rate your overall level of trust in a traditional automaker (e
63	BR	4	How would you rate your overall level of trust in a Silicon Valley tech company
64	BR	5	My trust in a fully autonomous system similar to cars would decrease if it was created by a lesser-known company
65	BR	6	My trust in a fully autonomous system similar to cars would decrease if it was created by a more established company such as Google

66	BR	7	My trust in a driverless car will be based on the car manufacturer's reputation for safety and reliability
67	PEU	1	Learning to operate autonomous vehicle would be easy for me
68	PEU	2	I would find it easy to get autonomous vehicle to do what I want to do
69	PEU	3	Interacting with autonomous vehicle would not require a lot of my mental effort
70	PEU	4	Learning to use autonomous vehicles will be easy for me
71	PEU	5	It will be easy for me to become skillful at using autonomous vehicles
72	SM	1	I would be able to trust if autonomous vehicle provides alternative solutions
73	SM	2	I would be able to trust if I can control the behavior of autonomous vehicle
74	SM	3	I would be able to trust if autonomous vehicle will provide adequate, effective, and responsive help
75	SM	4	It is an important factor how well it could anticipate what is going to be about to happen in order to trust autonomous vehicle
76	ST	1	I would be able to trust if autonomous vehicle acts consistently and its behavior can be forecast
77	ST	2	I would be able to trust if I can form a mental model and predict future behavior of autonomous vehicle
78	ST	3	I would be able to trust if I can predict what autonomous vehicle will act in a particular way
79	TC	1	I would be able to trust if autonomous vehicle is free of error
80	TC	2	I would be able to trust if I can depend and rely on autonomous vehicle
81	TC	3	I would be able to trust if autonomous vehicle will consistently perform under a variety of circumstance
82	TC	4	It is an important factor how well it could feel what is happening around it in order to trust autonomous vehicle
83	BI	1	I intend to use autonomous vehicle in the future
84	BI	2	I expect that I would use autonomous vehicle in the future
85	BI	3	I plan to use autonomous vehicle in the future
86	BI	4	Autonomous vehicles is not available for my vehicle type
87	BI	5	I will consider the use of autonomous vehicles
88	BI	6	I will purchase autonomous vehicles for my next car
89	PPR	1	I am concerned that autonomous vehicles will collect too much personal information from me
90	PPR	2	I am concerned that autonomous vehicles will use my personal information for other purposes without my authorization
91	PPR	3	I am concerned that autonomous vehicles will share my personal information with other entities without my authorization
92	PPR	4	When I use new technology, I am worried about my privacy exposure
93	PPR	5	When I use new technology, I am worried about my personal information leakage
94	PPR	6	When I use new technology, the fact that it knows me a lot makes me uncomfortable
95	PPR	7	I am usually worried about my privacy
96	PPR	8	Because of personal information leaks, it is cautions for me to use devices with the Internet connected
97	OT	1	Driverless cars have enough safeguards to make me feel comfortable using it
98	OT	2	In general, driverless cars provide a robust and safe mode of transport

99	OT	3	I trust driverless cars to keep my best interests in mind
100	OT	4	I am confident in autonomous vehicles
101	OT	5	Autonomous vehicles provide security
102	OT	6	Autonomous vehicles have integrity
103	OT	7	Autonomous vehicles are dependable
104	OT	8	Autonomous vehicles are reliable
105	OT	9	Overall, I can trust autonomous vehicle

APPENDIX C: VARIABLES SELECTION – CORRELATION

Variables	OT1	OT2	OT3	OT4	OT5	OT6	OT7	OT8	OT9	OT10
SR1	.237**	.180*	.281**	.359**	0.085	.176*	.269**	.277**	0.073	.222**
	0.001	0.012	0	0	0.235	0.014	0	0	0.315	0.002
	194	195	194	194	195	194	192	195	193	194
SR2	.330**	.249**	.263**	.412**	.256**	.260**	.347**	.347**	.157*	.270**
	0	0	0	0	0	0	0	0	0.029	0
	194	195	194	194	195	194	192	195	193	194
SR3	.225**	.208**	.313**	.363**	.147*	.222**	.297**	.306**	0.121	.272**
	0.002	0.004	0	0	0.04	0.002	0	0	0.094	0
	194	195	194	194	195	194	192	195	193	194
SR4	.277**	.238**	.318**	.368**	.272**	.220**	.366**	.331**	0.107	.292**
	0	0.001	0	0	0	0.002	0	0	0.138	0
	194	195	194	194	195	194	192	195	193	194
SR5	.258**	.287**	.338**	.373**	.301**	.360**	.436**	.412**	.171*	.311**
	0	0	0	0	0	0	0	0	0.018	0
	194	195	194	194	195	194	192	195	193	194
SR6	.212**	.360**	.313**	.330**	.424**	.452**	.408**	.482**	.364**	.451**
	0.003	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
SR7	.288**	.373**	.342**	.339**	.390**	.466**	.452**	.513**	.376**	.514**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
SR8	.221**	.298**	.341**	.365**	.256**	.350**	.359**	.413**	0.133	.342**
	0.002	0	0	0	0	0	0	0	0.066	0
	192	193	192	192	193	192	190	193	191	192
SR9	.261**	.341**	.349**	.395**	.247**	.382**	.422**	.423**	.166*	.363**
	0	0	0	0	0.001	0	0	0	0.022	0
	191	192	191	192	192	191	189	192	190	191
SR10	0.072	0.055	0.067	.166*	-0.017	0.054	0.109	0.065	-0.093	0.008
	0.319	0.444	0.357	0.021	0.812	0.459	0.132	0.366	0.198	0.914
	193	194	193	193	194	193	191	194	192	193
SR11	.186**	.160*	.243**	.283**	0.082	0.094	.144*	.151*	0.023	0.106

	0.009	0.025	0.001	0	0.255	0.193	0.046	0.035	0.752	0.14
	194	195	194	194	195	194	192	195	193	194
SR12	-0.066	-.147*	-0.066	-0.002	-0.136	-0.097	-0.031	-.151*	-.212**	-.198**
	0.365	0.042	0.363	0.974	0.06	0.181	0.67	0.036	0.003	0.006
	192	193	192	192	193	192	190	193	191	192
SR13	.169*	0.131	.232**	.283**	0.087	0.134	.263**	.249**	0.082	.185**
	0.019	0.067	0.001	0	0.228	0.062	0	0	0.256	0.01
	194	195	194	194	195	194	192	195	193	194
SR14	-0.051	-0.106	-0.029	-0.019	-0.1	-.155*	-0.065	-.155*	-.173*	-.201**
	0.478	0.14	0.688	0.793	0.166	0.031	0.368	0.03	0.016	0.005
	194	195	194	194	195	194	192	195	193	194
SR15	0.135	0.056	.145*	.250**	.169*	.166*	.150*	.147*	0.108	0.136
	0.06	0.435	0.044	0	0.018	0.021	0.038	0.04	0.134	0.059
	194	195	194	194	195	194	192	195	193	194
SR16	.203**	.181*	.220**	.263**	0.101	0.092	.164*	.181*	0.071	.144*
	0.005	0.012	0.002	0	0.161	0.203	0.023	0.011	0.326	0.046
	193	194	193	194	194	193	191	194	192	193
SR17	0.061	0.126	0.137	.241**	.269**	.343**	.367**	.287**	.308**	.304**
	0.397	0.08	0.057	0.001	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
SR18	.212**	0.124	.180*	.270**	0.086	0.013	0.096	0.075	-0.043	0.053
	0.003	0.084	0.012	0	0.232	0.861	0.188	0.299	0.558	0.465
	193	194	193	193	194	193	191	194	192	193
SR19	.220**	0.109	.168*	.175*	0.088	-0.038	0.077	0.08	-0.034	0.001
	0.002	0.13	0.019	0.015	0.223	0.598	0.29	0.265	0.638	0.987
	194	195	194	194	195	194	192	195	193	194
SR20	0.072	0.123	0.11	0.092	.146*	0.075	.144*	0.109	.189**	0.107
	0.318	0.086	0.129	0.203	0.042	0.299	0.047	0.131	0.009	0.139
	194	194	193	193	194	193	191	194	192	193
SR21	.185**	.237**	.299**	.273**	.289**	.310**	.393**	.339**	.320**	.309**
	0.01	0.001	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
SR22	.198**	0.109	0.065	0.048	.202**	0.014	0.115	0.088	0.057	0.045
	0.006	0.13	0.366	0.512	0.005	0.846	0.112	0.221	0.435	0.534
	193	194	193	193	194	193	191	194	192	193

AT1	.475**	.417**	.481**	.522**	.353**	.339**	.395**	.391**	.201**	.368**
	0	0	0	0	0	0	0	0	0.005	0
	194	195	194	194	195	194	192	195	193	194
AT2	-0.114	-.170*	-0.129	-0.131	-0.135	-.254**	-.225**	-.243**	-.264**	-.260**
	0.114	0.017	0.072	0.069	0.061	0	0.002	0.001	0	0
	194	195	194	194	195	194	192	195	193	194
AT3	.433**	.307**	.409**	.444**	.351**	.270**	.323**	.316**	.154*	.325**
	0	0	0	0	0	0	0	0	0.032	0
	193	194	193	193	194	193	191	194	192	193
AT4	-0.113	-.241**	-.161*	-.178*	-0.118	-.211**	-.216**	-.281**	-0.042	-.280**
	0.117	0.001	0.025	0.013	0.102	0.003	0.003	0	0.562	0
	194	195	194	194	195	194	192	195	193	194
AT5	.339**	.299**	.331**	.356**	.187**	.222**	.232**	.270**	-0.035	.198**
	0	0	0	0	0.009	0.002	0.001	0	0.627	0.006
	193	194	193	193	194	193	191	194	192	193
AT6	.460**	.419**	.489**	.555**	.418**	.369**	.446**	.411**	.292**	.424**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	191	194	192	193
AT7	.312**	.272**	.282**	.354**	.352**	.157*	.162*	0.128	.213**	.183*
	0	0	0	0	0	0.029	0.025	0.076	0.003	0.011
	193	194	193	193	194	193	191	194	192	193
AT8	.215**	.221**	.246**	.321**	.151*	.280**	.279**	.297**	0.066	.226**
	0.003	0.002	0.001	0	0.036	0	0	0	0.364	0.002
	194	195	194	194	195	194	192	195	193	194
AT9	-0.084	-.166*	-.143*	-.178*	-.152*	-.236**	-.181*	-.270**	-.195**	-.284**
	0.243	0.02	0.046	0.013	0.034	0.001	0.012	0	0.007	0
	194	195	194	194	195	194	192	195	193	194
AT10	-0.071	-.236**	-.168*	-.198**	-0.113	-.257**	-.224**	-.301**	-0.14	-.321**
	0.328	0.001	0.019	0.006	0.118	0	0.002	0	0.052	0
	193	194	193	193	194	193	191	194	192	193
AT11	-0.101	-.304**	-.224**	-.245**	-.278**	-.338**	-.287**	-.412**	-.295**	-.445**
	0.159	0	0.002	0.001	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU1	.360**	.342**	.379**	.392**	.350**	.307**	.350**	.341**	.236**	.329**
	0	0	0	0	0	0	0	0	0.001	0

	193	194	193	193	194	193	191	194	192	193
PU2	.253**	.249**	.298**	.288**	.250**	.240**	.279**	.283**	.164*	.176*
	0	0	0	0	0	0.001	0	0	0.023	0.014
	193	194	193	193	194	193	192	194	192	193
PU3	.275**	.280**	.364**	.405**	.291**	.365**	.364**	.373**	.277**	.326**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	192	194	192	193
PU4	.370**	.369**	.335**	.442**	.334**	.422**	.389**	.406**	.210**	.315**
	0	0	0	0	0	0	0	0	0.004	0
	192	193	192	192	193	192	190	193	191	192
PU5	.373**	.384**	.423**	.393**	.399**	.362**	.375**	.325**	.238**	.308**
	0	0	0	0	0	0	0	0	0.001	0
	194	195	194	194	195	194	192	195	193	194
PU6	.444**	.495**	.512**	.608**	.520**	.488**	.531**	.592**	.387**	.558**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU7	.493**	.419**	.407**	.480**	.465**	.360**	.423**	.493**	.254**	.432**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	192	194	192	193
PU8	.339**	.387**	.375**	.443**	.354**	.386**	.404**	.404**	.260**	.341**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU9	.431**	.412**	.421**	.454**	.373**	.335**	.426**	.411**	.229**	.369**
	0	0	0	0	0	0	0	0	0.001	0
	193	194	193	193	194	193	191	194	192	193
PU10	.435**	.441**	.428**	.503**	.369**	.321**	.422**	.419**	.237**	.383**
	0	0	0	0	0	0	0	0	0.001	0
	194	195	194	194	195	194	192	195	193	194
PU11	.403**	.451**	.454**	.537**	.370**	.350**	.474**	.482**	.224**	.400**
	0	0	0	0	0	0	0	0	0.002	0
	193	194	193	193	194	193	191	194	192	193
PU12	.426**	.426**	.456**	.560**	.462**	.435**	.433**	.429**	.297**	.408**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU13	.436**	.434**	.443**	.507**	.384**	.278**	.383**	.422**	.201**	.381**

	0	0	0	0	0	0	0	0	0.005	0
	194	195	194	194	195	194	192	195	193	194
PU14	.342**	.339**	.340**	.450**	.330**	.313**	.369**	.322**	.215**	.320**
	0	0	0	0	0	0	0	0	0.003	0
	193	194	193	193	194	193	191	194	192	193
PU15	.409**	.442**	.420**	.486**	.383**	.391**	.446**	.445**	.256**	.392**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	192	194	192	193
PU16	.501**	.511**	.501**	.619**	.541**	.465**	.548**	.581**	.386**	.552**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU17	.356**	.443**	.452**	.537**	.382**	.533**	.557**	.567**	.332**	.541**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
PU18	.401**	.464**	.503**	.524**	.430**	.478**	.538**	.576**	.318**	.515**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	191	194	192	193
PU19	.462**	.480**	.486**	.556**	.416**	.488**	.582**	.596**	.360**	.573**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	191	194	192	193
PU20	0.077	0.012	0.018	0.075	-0.003	-0.03	0.041	-0.096	-0.087	-0.135
	0.285	0.866	0.805	0.302	0.968	0.683	0.574	0.181	0.23	0.061
	194	195	194	194	195	194	192	195	193	194
PR1	0.079	-0.03	0.029	0.064	-0.01	-0.072	-0.066	-0.12	-0.087	-.152*
	0.275	0.677	0.687	0.375	0.892	0.318	0.365	0.094	0.227	0.035
	194	195	194	194	195	194	192	195	193	194
PR2	-.193**	-.315**	-.195**	-.194**	-.181*	-.336**	-.245**	-.306**	-.379**	-.373**
	0.007	0	0.007	0.007	0.011	0	0.001	0	0	0
	194	195	194	194	195	194	192	195	193	194
PR3	-.166*	-.308**	-.295**	-.347**	-.296**	-.471**	-.363**	-.448**	-.388**	-.502**
	0.021	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	191	194	192	193
PR4	-.239**	-.315**	-.245**	-.353**	-.316**	-.396**	-.291**	-.354**	-.392**	-.442**
	0.001	0	0.001	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194

PR5	-.205**	-.278**	-.220**	-.238**	-.342**	-.327**	-.235**	-.289**	-.441**	-.375**
	0.004	0	0.002	0.001	0	0	0.001	0	0	0
	194	195	194	194	195	194	192	195	193	194
PR6	-.194**	-.247**	-0.107	-.172*	-.256**	-.290**	-.227**	-.269**	-.268**	-.317**
	0.007	0.001	0.14	0.017	0	0	0.002	0	0	0
	192	193	192	192	193	192	190	193	191	192
BR1	.272**	.427**	.421**	.411**	.384**	.318**	.386**	.402**	.385**	.465**
	0	0	0	0	0	0	0	0	0	0
	192	193	192	192	193	193	190	193	191	192
BR2	0.093	.201**	.179*	.259**	.224**	.301**	.324**	.269**	.311**	.271**
	0.197	0.005	0.013	0	0.002	0	0	0	0	0
	192	193	192	192	193	192	190	193	191	192
BR3	.321**	.251**	.170*	.278**	.164*	0.115	0.14	.155*	0.007	.152*
	0	0	0.018	0	0.023	0.11	0.053	0.031	0.924	0.035
	193	194	193	193	194	193	191	194	192	193
BR4	.365**	.338**	.313**	.277**	.299**	0.101	0.123	.197**	0.118	.225**
	0	0	0	0	0	0.161	0.09	0.006	0.103	0.002
	192	193	192	192	193	192	190	193	191	192
BR5	.188**	.150*	0.019	0.06	0.078	-0.066	-0.08	-0.01	-0.071	-0.038
	0.009	0.036	0.794	0.405	0.279	0.36	0.27	0.885	0.33	0.596
	193	194	193	193	194	193	191	194	192	193
BR6	-0.138	-0.019	-0.041	-0.001	0.092	.144*	0.133	0.087	.182*	0.087
	0.055	0.791	0.573	0.988	0.201	0.045	0.067	0.227	0.011	0.225
	194	195	194	194	195	194	192	195	193	194
BR7	.239**	.195**	.197**	.260**	0.132	0.028	0.036	0.049	-0.072	0.02
	0.001	0.006	0.006	0	0.065	0.702	0.621	0.495	0.322	0.784
	194	195	194	194	195	194	192	195	193	194
PEU1	.364**	.268**	.467**	.435**	.275**	.256**	.344**	.334**	.148*	.284**
	0	0	0	0	0	0	0	0	0.04	0
	194	195	194	194	195	194	192	195	193	194
PEU2	.312**	.270**	.433**	.371**	.264**	.214**	.270**	.247**	0.116	.228**
	0	0	0	0	0	0.003	0	0	0.108	0.001
	194	195	194	194	195	194	192	195	193	194
PEU3	.372**	.320**	.458**	.433**	.337**	.239**	.251**	.277**	.164*	.271**
	0	0	0	0	0	0.001	0	0	0.023	0

	194	195	194	194	195	194	192	195	193	194
PEU4	.356**	.291**	.404**	.421**	.287**	.271**	.344**	.333**	0.128	.297**
	0	0	0	0	0	0	0	0	0.075	0
	194	195	194	194	195	194	192	195	193	194
PEU5	.336**	.307**	.424**	.392**	.236**	.240**	.321**	.316**	0.137	.296**
	0	0	0	0	0.001	0.001	0	0	0.058	0
	194	195	194	194	195	194	192	195	193	194
SM1	.368**	.251**	.322**	.330**	0.14	0.138	.149*	.189**	0.038	.177*
	0	0	0	0	0.051	0.056	0.039	0.008	0.599	0.014
	193	194	193	193	194	193	191	194	192	193
SM2	.208**	.211**	.253**	.352**	0.115	.184*	.226**	.190**	0.026	.177*
	0.004	0.003	0	0	0.109	0.01	0.002	0.008	0.718	0.014
	194	195	194	194	195	194	192	195	193	194
SM3	.214**	.240**	.252**	.347**	0.101	.159*	.192**	.178*	-0.011	.196**
	0.003	0.001	0	0	0.16	0.027	0.008	0.013	0.884	0.006
	194	195	194	194	195	194	192	195	193	194
SM4	.222**	.222**	.296**	.345**	0.087	0.114	.181*	.192**	-0.003	.198**
	0.002	0.002	0	0	0.229	0.114	0.012	0.007	0.971	0.006
	193	194	193	193	194	193	191	194	192	193
ST1	.345**	.351**	.391**	.426**	.268**	.334**	.388**	.391**	0.14	.354**
	0	0	0	0	0	0	0	0	0.052	0
	194	195	194	194	195	194	192	195	193	194
ST2	.411**	.326**	.366**	.445**	.261**	.191**	.242**	.239**	0.052	.247**
	0	0	0	0	0	0.008	0.001	0.001	0.472	0.001
	194	195	194	194	195	194	192	195	193	194
ST3	.296**	.333**	.297**	.365**	.212**	.144*	.179*	.205**	0.028	.207**
	0	0	0	0	0.003	0.045	0.013	0.004	0.697	0.004
	194	195	194	194	195	194	192	195	193	194
TEC1	.235**	.181*	.271**	.193**	0.137	0.067	0.058	0.091	-0.096	0.093
	0.001	0.011	0	0.007	0.057	0.35	0.426	0.207	0.183	0.198
	194	195	194	194	195	194	192	195	193	194
TEC2	.330**	.318**	.315**	.345**	.213**	.180*	.199**	.151*	0.051	.198**
	0	0	0	0	0.003	0.012	0.006	0.036	0.483	0.006
	193	194	193	193	194	193	191	194	192	193
TEC3	.348**	.339**	.340**	.418**	.249**	.249**	.265**	.292**	0.071	.308**

	0	0	0	0	0	0	0	0	0.328	0
	194	195	194	194	195	194	192	195	193	194
TEC4	.264**	.244**	.225**	.253**	0.083	0.116	0.052	0.103	-0.08	0.108
	0	0.001	0.002	0	0.248	0.108	0.471	0.154	0.268	0.137
	193	194	193	193	194	193	191	194	192	193
BI1	.524**	.453**	.510**	.586**	.424**	.385**	.426**	.436**	.252**	.461**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
BI2	.458**	.425**	.486**	.541**	.378**	.363**	.394**	.405**	.234**	.406**
	0	0	0	0	0	0	0	0	0.001	0
	194	195	194	194	195	194	192	195	193	194
BI3	.553**	.483**	.549**	.634**	.455**	.416**	.450**	.466**	.284**	.486**
	0	0	0	0	0	0	0	0	0	0
	193	194	193	193	194	193	191	194	192	193
BI4	-0.067	-.186**	-.189**	-.214**	-0.085	-.206**	-.205**	-.287**	-.260**	-.310**
	0.353	0.009	0.009	0.003	0.241	0.004	0.004	0	0	0
	193	194	193	193	194	193	191	194	192	193
BI5	.538**	.513**	.556**	.621**	.434**	.419**	.489**	.487**	.266**	.475**
	0	0	0	0	0	0	0	0	0	0
	194	195	194	194	195	194	192	195	193	194
BI6	-0.069	-.162*	-0.132	-.197**	0.031	-0.055	-0.063	-0.118	0.019	-.153*
	0.338	0.024	0.067	0.006	0.663	0.447	0.389	0.101	0.79	0.034
	193	194	193	193	194	193	191	194	192	193
BI7	.421**	.330**	.399**	.430**	.364**	.159*	.191**	.242**	.238**	.266**
	0	0	0	0	0	0.026	0.008	0.001	0.001	0
	194	195	194	194	195	194	192	195	193	194
PPR1	0.012	-.167*	-0.111	-0.092	-.266**	-.253**	-.219**	-.273**	-.306**	-.316**
	0.867	0.021	0.124	0.206	0	0	0.002	0	0	0
	192	193	192	192	193	193	190	193	191	192
PPR2	0.057	-0.123	-0.045	-0.06	-.192**	-.231**	-.150*	-.213**	-.181*	-.222**
	0.432	0.087	0.538	0.405	0.007	0.001	0.038	0.003	0.012	0.002
	193	194	193	193	194	193	191	194	192	193
PPR3	0.067	-0.095	0.011	-0.017	-.144*	-.260**	-.150*	-.243**	-.168*	-.252**
	0.353	0.187	0.882	0.813	0.044	0	0.038	0.001	0.019	0
	194	195	194	194	195	194	192	195	193	194

PPR4	0.087	-0.118	-0.056	-0.016	-.177*	-.241**	-.166*	-.204**	-.194**	-.234**
	0.232	0.103	0.44	0.83	0.014	0.001	0.022	0.004	0.007	0.001
	192	193	192	192	193	192	190	193	191	192
PPR5	0.105	-0.087	0.008	0.046	-.159*	-.235**	-.143*	-.213**	-.243**	-.231**
	0.144	0.229	0.91	0.521	0.026	0.001	0.049	0.003	0.001	0.001
	194	195	194	194	195	194	192	195	193	194
PPR6	0.09	-0.083	-0.051	-0.015	-.142*	-.217**	-.146*	-.202**	-.251**	-.262**
	0.211	0.248	0.48	0.836	0.047	0.002	0.044	0.005	0	0
	194	195	194	194	195	194	192	195	193	194
PPR7	.147*	-0.051	0.014	0.045	-0.089	-.166*	-0.096	-0.116	-.215**	-.180*
	0.041	0.481	0.848	0.532	0.214	0.021	0.183	0.107	0.003	0.012
	194	195	194	194	195	194	192	195	193	194
PPR8	0.063	-0.108	-0.053	-0.04	-.154*	-.238**	-.192**	-.246**	-.254**	-.303**
	0.384	0.132	0.46	0.582	0.031	0.001	0.008	0.001	0	0
	194	195	194	194	195	194	192	195	193	194

APPENDIX D: VARIABLES SELECTION – FACTOR ANALYSIS

	1	2	3	4	5	6	7	8	9
PU10	0.837	0.229	0.098	0.018	-0.081	-0.067	0.015	0.1	-0.124
PU11	0.835	0.225	0.057	0.111	-0.137	0.12	0.057	0.012	0.056
PU9	0.824	0.192	0.098	0.013	-0.049	-0.127	0.005	0.175	-0.099
PU1	0.818	0.083	-0.014	0.15	0.037	-0.045	0.042	0.025	-0.014
PU14	0.786	0.088	-0.021	0.1	0.053	0.023	0.123	0.107	-0.039
PU15	0.785	0.229	0.092	0.098	-0.049	0.039	0.08	0.07	-0.017
AT1	0.75	0.158	-0.014	0.349	-0.066	0.098	0.05	-0.212	0.03
BI1	0.742	0.291	0.053	0.305	0.031	0.079	0.035	-0.2	-0.087
PU13	0.736	0.266	0.045	0.058	0.097	-0.086	-0.019	-0.064	-0.158
BI3	0.727	0.356	0.097	0.252	0.063	0.09	0.033	-0.199	-0.099
BI5	0.724	0.369	0.098	0.307	-0.014	0.056	0.023	-0.097	-0.01
PU3	0.722	0.159	-0.02	0.109	0.113	0.062	-0.037	0.049	0.19
AT3	0.719	0.092	-0.007	0.291	0.078	-0.018	-0.009	-0.246	-0.099
PU4	0.715	0.176	-0.013	0.174	-0.01	0.026	-0.052	0.184	-0.078
PU8	0.714	0.206	-0.014	-0.036	0.027	-0.014	0.04	0.171	-0.041
BI2	0.714	0.254	0.024	0.325	0.07	0.07	0.039	-0.174	-0.119
SR8	0.711	0.068	-0.109	0.135	-0.233	0.207	0.13	0.033	0.234
PU12	0.705	0.295	-0.082	0.132	-0.001	0.11	0.04	-0.083	-0.03
PEU4	0.699	0.09	0.072	0.201	-0.1	0.303	0.082	-0.084	0.064
SR9	0.689	0.11	-0.106	0.207	-0.254	0.232	0.194	0.046	0.217
PEU1	0.686	0.096	0.011	0.121	-0.012	0.393	0.092	-0.061	0
PU5	0.683	0.134	-0.122	0.048	0.063	-0.006	0.093	0.134	-0.066
PEU3	0.677	0.162	0.062	0.016	0.131	0.185	-0.02	-0.084	-0.1
PU16	0.663	0.5	0.053	0.02	0.011	-0.078	0.079	-0.033	-0.127
PU7	0.662	0.321	-0.035	0.048	0.007	-0.116	-0.108	0.081	-0.043
PEU2	0.66	0.086	0.009	0.167	0.058	0.311	0.088	-0.119	0.046
PEU5	0.646	0.116	0.14	0.227	-0.073	0.297	0.018	-0.167	0.052
AT6	0.628	0.251	-0.045	0.322	0.183	0.229	-0.118	-0.203	-0.127
SR3	0.619	0.025	0.081	0.205	-0.183	0.461	0.094	-0.133	0.098
PU6	0.594	0.516	0.036	0.038	-0.004	-0.039	-0.004	0.013	-0.136
SR4	0.592	0.097	-0.088	0.248	-0.065	0.312	0.156	-0.002	0.113

PU18	0.591	0.459	-0.114	0.1	-0.118	0.066	0.072	0.033	0
AT5	0.569	0.1	-0.014	0.309	-0.165	0.2	0.167	-0.042	0.042
SR2	0.555	0.128	0.061	0.183	0.032	0.349	-0.006	-0.033	0.191
PU17	0.555	0.412	-0.114	0.139	-0.18	0.108	0.156	0.035	0.121
SR5	0.553	0.242	0.01	0.067	0.103	0.238	0	0.205	-0.001
PU19	0.542	0.534	-0.031	-0.003	-0.108	0.013	0.028	0.016	-0.103
SR1	0.541	0.035	0.136	0.206	-0.205	0.473	0.089	-0.147	0.16
SR13	0.528	0.041	0.158	0.053	-0.128	0.513	0.163	-0.125	-0.001
AT8	0.497	0.138	-0.1	0.393	0.019	0.07	-0.046	-0.008	0.165
PU2	0.477	0.219	0.047	0.024	0.286	-0.043	-0.139	0.082	0.04
SR16	0.416	0.037	0.128	0.234	0.051	0.282	-0.1	0.023	0.055
BI7	0.379	0.288	0.15	0.101	0.339	0.102	-0.278	-0.305	-0.127
SR19	0.37	0.078	0.15	0.038	0.292	0.028	0.044	-0.119	0.323
OT10	0.309	0.777	-0.162	0.123	-0.171	0.001	-0.154	-0.11	-0.013
OT8	0.399	0.773	-0.129	0.022	-0.168	0.078	-0.16	0.086	0.07
OT7	0.393	0.759	-0.095	0.044	-0.081	0.118	-0.009	0.124	0.059
OT4	0.415	0.713	-0.015	0.177	-0.043	0.102	-0.059	-0.111	-0.099
OT2	0.31	0.712	-0.076	0.174	-0.115	-0.076	-0.072	-0.053	-0.061
OT6	0.345	0.687	-0.187	0.094	-0.079	0.063	-0.142	0.124	-0.003
OT9	0.171	0.641	-0.137	-0.104	-0.018	0.004	-0.251	-0.149	-0.089
OT3	0.407	0.632	0	0.169	-0.031	0.032	-0.045	-0.197	-0.028
OT5	0.355	0.621	-0.179	0.056	0.032	-0.111	-0.124	-0.041	-0.094
OT1	0.347	0.585	0.049	0.171	-0.043	-0.07	-0.08	-0.157	-0.084
BR1	0.059	0.53	-0.189	0.005	0.192	-0.036	-0.036	0.109	-0.205
BR2	-0.055	0.433	0.024	-0.2	0.333	0.06	-0.197	0.269	-0.292
PPR5	0.078	-0.049	0.904	0.08	0.007	-0.061	0.102	-0.046	0.047
PPR3	-0.073	-0.008	0.886	0.005	0.118	0.07	0.082	-0.039	-0.008
PPR4	0.047	-0.048	0.874	0.007	0.035	0.018	-0.002	-0.04	0.094
PPR2	-0.046	-0.025	0.871	0.039	0.133	0.063	0.038	0.013	-0.018
PPR1	-0.002	-0.117	0.827	0.095	0.143	0.05	0.04	0.03	0.095
PPR8	0.016	-0.02	0.815	-0.033	0.22	0.058	0.123	0.047	-0.046
PPR7	0.019	0.064	0.812	-0.059	0.074	0.04	-0.025	0.126	0.048
PPR6	0.073	-0.083	0.807	-0.069	0.183	0.015	0.099	0.103	-0.028
PR6	0.076	-0.192	0.443	0.055	0.15	-0.057	0.11	0.009	0.412
ST2	0.431	0.24	0.012	0.674	-0.027	0.014	0.151	0.03	-0.068

TEC3	0.499	0.186	-0.006	0.662	-0.034	-0.025	0.08	-0.033	0.035
ST3	0.448	0.206	-0.013	0.658	-0.032	0.028	0.106	0.021	-0.057
SM3	0.44	0.029	0.018	0.645	-0.187	-0.007	0.041	-0.076	0.01
ST1	0.478	0.239	-0.003	0.616	-0.115	0.078	0.096	0.066	0.083
SM4	0.416	0.058	0.137	0.613	-0.223	0.036	0.179	0.006	0.18
SM2	0.431	0.094	0.129	0.595	-0.069	0.191	0.073	-0.002	0.044
TEC4	0.434	-0.04	0.077	0.548	-0.125	-0.001	0.056	-0.099	0.149
TEC2	0.38	0.215	0.128	0.53	0.185	-0.137	0.021	-0.136	-0.072
SM1	0.44	0.124	0.15	0.51	0.001	0.181	-0.021	-0.01	0.088
BR6	-0.064	0.073	-0.033	-0.355	0.264	0.124	-0.043	0.296	-0.029
AT10	-0.03	-0.155	0.097	-0.023	0.728	-0.076	0.055	-0.046	0.196
AT11	-0.153	-0.227	0.278	-0.006	0.699	0.071	-0.002	0.108	0.047
AT4	-0.131	-0.104	0.155	-0.124	0.673	0.06	0.008	0.058	-0.056
AT9	-0.12	-0.063	0.105	-0.154	0.655	0.012	0.196	-0.137	0.141
PU20	0.148	0.03	0.069	0.095	0.649	0.068	0.14	-0.057	-0.117
AT7	0.187	0.212	0.028	0.152	0.52	-0.052	-0.026	-0.121	-0.336
BI6	-0.296	-0.067	0.195	-0.278	0.479	0.145	-0.189	0.369	-0.003
AT2	-0.047	-0.095	0.134	-0.071	0.473	-0.036	0.124	0.074	0.31
PR2	-0.149	-0.204	0.33	0.054	0.451	-0.005	0.025	0.306	0.327
PR3	-0.222	-0.323	0.231	0.022	0.445	-0.103	0.166	0.215	0.355
BI4	-0.149	-0.249	0.332	0.155	0.414	0.121	0.027	0.302	0.165
SR12	0.05	-0.094	0.041	-0.017	0.277	0.731	0.201	0.074	0.134
SR10	0.319	0.016	0.052	0.15	-0.021	0.671	0.208	-0.019	-0.052
SR14	0.074	-0.11	0.023	-0.02	0.379	0.614	0.233	0.135	-0.012
SR11	0.367	0.106	0.174	0.087	-0.084	0.536	-0.057	-0.165	-0.098
SR15	0.312	-0.036	0.18	0.011	-0.007	0.502	-0.013	0.068	-0.299
PR5	-0.02	-0.253	0.172	0.074	0.174	0.072	0.319	0.14	0.594
PR4	-0.137	-0.251	0.372	-0.047	0.284	-0.097	0.218	0.15	0.506
SR18	0.246	0.161	-0.042	0.287	0.338	0.296	0.076	-0.099	0.378
SR20	0.069	0.093	0.076	-0.138	0.203	0.022	-0.124	0.067	0.051
SR21	0.255	0.241	-0.057	-0.152	0.079	0.18	0.114	0.042	-0.141
SR22	0.135	0.092	0.091	-0.13	0.376	-0.099	0.032	0.2	-0.158
SR6	0.226	0.327	-0.167	-0.009	-0.039	0.089	0.004	0.187	-0.123
SR7	0.321	0.308	-0.218	0	-0.254	0.181	0.087	0.028	-0.065
BR4	0.243	0.222	-0.219	0.018	0.208	-0.068	0.062	-0.023	0.034

BR7	0.36	0.071	-0.012	0.283	0.074	-0.086	0.11	-0.012	0.215
SR17	0.262	0.231	-0.121	-0.202	0.35	-0.041	-0.016	0.115	0.024
BR5	0.15	0.001	-0.033	0.149	0.073	-0.024	-0.02	-0.079	0.029
BR3	0.074	0.368	0.023	0.258	0.045	0.026	0.095	0.001	-0.125

APPENDIX E: CONFIRMATORY FACTOR ANALYSIS (CFA) FOR STRUCTURAL MODEL

	Factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	SR	1															
2	AT	0.751	1														
3	PU	0.695	0.781	1													
4	PEU	0.6	0.673	0.624	1												
5	TEC	0.446	0.501	0.464	0.4	1											
6	BR	0.097	0.108	0.1	0.087	0.064	1										
7	SM	0.495	0.556	0.515	0.444	0.33	0.095	1									
8	ST	0.551	0.619	0.573	0.494	0.367	0.105	0.541	1								
9	BI1	0.688	0.772	0.715	0.617	0.459	0.104	0.531	0.591	1							
10	BI2	0.652	0.732	0.678	0.585	0.435	0.098	0.503	0.56	0.881	1						
11	BI3	0.659	0.74	0.685	0.591	0.439	0.099	0.509	0.566	0.89	0.844	1					
12	PR1	-0.14	-0.157	-0.146	-0.126	-0.093	-0.009	-0.048	-0.054	-0.152	-0.144	-0.145	1				
13	PR2	-0.105	-0.118	-0.11	-0.095	-0.07	-0.007	-0.036	-0.041	-0.114	-0.108	-0.11	0.627	1			
14	PPR	-0.063	-0.071	-0.066	-0.057	-0.042	-0.004	-0.022	-0.024	-0.069	-0.065	-0.066	0.377	0.284	1		
15	OT1	0.454	0.509	0.472	0.407	0.303	0.068	0.348	0.387	0.558	0.529	0.535	-0.382	-0.288	-0.173	1	
16	OT2	0.41	0.46	0.427	0.368	0.273	0.061	0.315	0.35	0.505	0.478	0.483	-0.345	-0.26	-0.156	0.728	1
Mean		5.272	5.097	4.866	5.215	5.598	4.162	5.27	5.431	5.179	5.195	5.085	4.979	5.451	5.021	4.429	4.138
SD		1.39	1.31	1.43	1.31	1.03	1.42	1.04	1.23	1.46	1.12	1.34	1.22	1.59	1.24	1.31	1.49
C.R		0.769	0.842	0.722	0.737	0.297	0.018	0.785	0.802	0.929	0.835	0.851	0.831	0.773	0.17	0.806	0.957

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