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The interplay of trustworthiness and perceived risk and their influence on consumer's acceptance of self-service technology innovations

The case of Digipost by Posten Norge AS

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This master thesis is one of a series of papers and reports published by the Center for Service Innovation (CSI). Centre for Service Innovation (CSI) is a coordinated effort by NHH to focus on the innovation challenges facing the service sector and involves 20 business and academic partners. It aims to increase the quality, efficiency and commercial success of service innovations and to enhance the innovation capabilities of its business and academic partners. CSI is funded through a significant eight year grant from the Research Council of Norway and has recently obtained status as a Centre for Research-based Innovation (SFI).

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Abstract

This paper looks at factors influencing consumer's attitude formation in the light of adopting a new self-service technology (SST). Previous research has shed light on the importance of trustworthiness and risk, however, the literature does not account for the multidimensionality of these constructs or lacks understanding of how they operate on different levels. Similarly, self-efficacy was previously found to be an important antecedent for attitude formation towards SST, but is rarely included in the analysis. To bridge this gap, we examine data on a sample of Norwegian consumers and their attitude towards Digipost, the digital mailbox service of Posten Norge. We test direct effects of different dimensions of trustworthiness, perceived risk and self-efficacy on attitude towards the SST innovation. The results suggest that all factors contribute to attitude formation towards SST in some way, with time risk exhibiting the strongest influence. Managers are therefore recommended to place particular emphasis on controlling for the differences the antecedents that cause resistance in adapting SST innovations.

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1. Introduction

Across all studies related to trust and trusting behaviour, the interplay of trust and risk is one of the most interesting subjects, not only for researchers, but also for firms of all industries. Rapid advancements in information technology during the past two decades have made online channels an important tool to facilitate communication with the customer, hence fuelling the debate as to what role the perceived trustworthiness of a firm plays on consumer's intention to buy or use a service. On the one hand, this development has led companies to put an increased focus on customer service and retention, as other firm's offerings are just a click away (Luo, Chen, Ching, & Liu, 2010). On the other hand, benefits that stem from these services might be outweighed by an increase in potential risks that consumers face as continuously growing amounts of data are collected and stored online (Hong & Thong, 2013). As new online and offline channels become available for companies, it is increasingly important to create a deeper understanding of influences on consumer behaviour with regards to online channels. This thesis aims at shedding light on the effects of a firm's trustworthiness, perceived risk and self-efficacy of consumers, placing particular emphasis on the multidimensional operationalization of trustworthiness and perceived risk.

Of particular interest in the literature discussing trust is the model developed by Mayer, Davis & Schoorman (1995), which views trust as a dyadic relationship in an organizational setting consisting of ability, benevolence and integrity. We argue that Mayer et al. (1995)'s model is not only applicable in pure organizational settings, but is further valid in a company to consumer setting. While most of this research examines the influences of risk paired with trust in an online context, it fails to account for the effect of perceived trustworthiness on a firm level. This thesis aims to bridge this gap by incorporating the direct effect of a firm's trustworthiness, measured through ability, benevolence and integrity into a conceptual model. Basing our analysis on this model will contribute to a deeper understanding of the variables that constitute trusting behaviour, and ultimately, usage intention.

This study is based on a survey conducted among customers of Posten, the Norwegian postal service, who have not yet adopted the self-service "Digipost", which was introduced in 2011 (Benediktsson, 2011). Digipost is a digital mailbox service, which is described as a secure, spam-free inbox folder that allows the user to receive important business mail online

(CrawfordTechnologies, 2014). The relationship between trustworthiness and risk related to online self-service technologies (SSTs) has been studied previously by other researchers (Harridge-March, 2006; D. J. Kim, Ferrin, & Rao, 2008; McKnight, Cummings, & Chervany, 1998); however, many of these studies fail to account for differences in self-efficacy. High self-efficacy has been found to positively influence consumer attitude towards SST (Yang, Liu, & Ding, 2012). Other studies also confirm the influence of self-efficacy on internet banking (Khraim, Shoubaki, & Khraim, 2011) as well as online transactions (Akhter, 2014). It is therefore safe to say that self-efficacy is a relevant predictor for variance related to the acceptance of new SST innovations. By incorporating self-efficacy in the model, we aim to get a better understanding of how attitude formation is created.
Hence, this thesis addresses the following research question:

What are the significant direct effects of the dimensions of perceived risk in an online self-service, a firm's trustworthiness and consumers' self-efficacy on attitude towards SST?

1.1. Purpose of this study

This thesis will contribute to the existing literature in four ways. First and foremost, our research is aimed at deepening the understanding of the influence of perceived risk in an online channel and trustworthiness on a firm level on consumer attitude as we examine the different dimensions as individual latent constructs, rather than a unidimensional factor. It is safe to say that a vast amount of literature exists on the relationship between risk, trust and attitude (Jarvenpaa, Tractinsky, & Saarinen, 2000; K. Kim & Prabhakar, 2000; Stewart, 1999). However, many studies primarily focus on trustworthiness in the online channel, thereby neglecting the effect of firm trustworthiness that is already established offline (Schlosser, White, & Lloyd, 2006). By testing two variables (perceived risk and trustworthiness) that operate on different levels in isolation as well as part of a single conceptual model, we aim to contribute to the existing research by offering more insight into how online and offline factors influence consumer attitude.

Secondly, it is important to distinguish between trust and trustworthiness, as using these constructs interchangeably may lead to conceptual errors (Hardin, 2002). According to Mayer et al. (1995), a firm's trustworthiness depends on ability, integrity and benevolence of a firm and previous research has confirmed the importance of trustworthiness for companies operating

in an online setting (Gefen, 2000). Although most studies do recognize the multidimensionality of trustworthiness, previous models incorporate trustworthiness as one variable in the analysis; thereby ignoring variations in the effect of the three different dimensions (Schlosser et al., 2006). Therefore, one contribution of our research is to address this issue by accounting for the individual influence of the three dimensions, which is frequently mentioned but often neglected in the literature (W. R. Clark, Scholder Ellen, & Boles, 2010). Through this process we aim to build upon the research of Mayer et al. (1995) as well as Schlosser et al. (2006) and deepen the understanding on the multidimensionality of trustworthiness.

Thirdly, a significant amount of research exists on the development of trust in an online setting; however, the majority of studies focuses on the consumer's intention to buy or the likelihood of adopting online banking services (Harridge-March, 2006; Huang, Schrank, & Dubinsky, 2004; D. J. Kim, Ferrin, & Rao, 2008; Korgaonkar & Karson, 2007) (Aldás-Manzano, Lassala-Navarré, Ruiz-Mafé, & Sanz-Blas, 2009a, 2009b). The trend towards a multi-channel strategy that involves online services is coupled with the need for credibility and the involvement of sensitive personal data (Sunnika & Bragge 2009); suggesting that future research will be necessary to include other types of online services. Furthermore, previous studies tend to neglect the effect of individual user characteristics, such as demographics or online self-efficacy, on attitude formation (Kirk, Chiagouris, Lala, & Thomas, 2015) and focus instead on differences in attitude related to the product category (Lee, Rao, Nass, Forssell, & John, 2012; J. W. Lian & Lin, 2008). As Posten has a very diverse consumer base and online services are a result of relatively recent developments, it is reasonable to assume that individual characteristics will influence decision making to some degree. Incorporating this variable into the model will therefore add value to understanding the motives behind attitude formation.

Finally, previous research (e.g. Vijayasarathy (2004)) has shown a strong link between consumer attitude and intentions to use. Hence, another contribution of this study is to offer practical implications for Posten Norge AS, and companies operating in a similar environment- as to what circumstances influence consumer's intention to adopt a new online service.

1.2. Posten

Posten Norge AS is a Norwegian company providing postal and logistic services to private, as well as business customers in the Nordic Region. The company is

headquartered in Oslo and currently has around 200.000 employees all over Norway (Posten Norge AS, 2015). In 2014, Posten Norge had an operating profit of NOK 933 million, around 15% of which stems from monopoly sales (such as letters weighing less than 50gram) (Posten Norge AS, 2014b).

Posten Norge offers two types of services named Posten and Bring. Posten is targeted towards private customers in the Norwegian market and constitutes the daily mail distribution through 1,400 sales sites within Norway. Similarly, Bring serves corporate customers in the mail and logistics services area in the Nordics (Posten Norge AS, 2014a). In 2011, the company introduced a service called "Digipost", a digital mailbox, to help improve the user experience of Posten Norge's customers and is considered a SST innovation.

1.3. Digipost

Digipost was established in 2011 as Posten Norge's digital mailbox service. Digipost is available for private and business customer and allows them to receive and store bills, notices and other sensitive documents in a secure online location (Palmer, 2013). In the US market, DMS services are offered by independent providers such as Volly and Zumbox; however, in Europe those services are usually provided by the national postal service provider (CrawfordTechnologies, 2014). This is also the case for Norway where Posten Norge's Digipost was selected as the public sector's digital mail supplies, marking an important step in the trend towards the usage of DMS (Posten Norge AS, 2015).

DMS brings substantial benefits in terms of convenience and cost savings to its users and may be coupled with additional features such as integrated payment systems or due date reminders (CrawfordTechnologies, 2014). Digipost users therefore benefit not only from an increase in range of services and convenience but they are further provided with a high security platform for transfer and storage of sensitive information (Posten Norge AS, 2014). However, in 2014, only 300.000 people were actively using Digipost even though the service is available to every Norwegian resident over the age of 15 (Posten Norge AS, 2014). We believe that possible reasons for consumer's reluctance to adapt Digipost may be that privacy concerns and other risks connected to usage of the service raise the level of perceived risk involved. Hence, this thesis aims to analyse the direct effects of potential risks that may arise through the usage of

Digipost, the perceived trustworthiness of Posten Norge AS and individual consumer characteristics on consumer attitude.

2. Literature Review

A considerable amount of existing literature is dedicated to analysing the relationship of trust versus risk that is associated with online interactions between companies and consumers. In particular, special attention has been drawn to analysing this relationship in the context of online shopping (Harridge-March, 2006; Huang, Schrank, & Dubinsky, 2004; D. J. Kim, Ferrin, & Rao, 2008; Korgaonkar & Karson, 2007), internet banking (Aldás-Manzano, Lassala-Navarré, Ruiz-Mafé, & Sanz-Blas, 2009a, 2009b) and online security enhancements (Lee, Rao, Nass, Forssell, & John, 2012; Tsiakis, 2012). For the purpose of this paper it is therefore crucial to examine existing contributions to the literature on trust and risk dimensions and evaluate the conclusions made by other scholars. Hence, we dedicate the next section of this paper to, first, reviewing trust and risk individually followed by the different relationships between them. Second, we discuss the importance of individual consumer characteristics, and finally attitude.

2.1. Trust

Trust is the essence of social exchange (Blau, 1964) and an important concept in many study areas. Not limited to organizational studies it is used in many areas ranging from communication (Giffin, 1967), to game theory (Milgrom & Roberts, 1992) and risk management (Earle, 2010). Trust plays a key role in situations where risk taking is involved but the outcome of the situation is uncertain. (Deutsch, 1960; Ratnasingham, 1998; Rousseau, Sitkin, Burt, & Camerer, 1998) In our research, as consumers are engaging in a new form of postal service, which is different from the traditional paper-based mailing service and presents several sources of risk connected to its online nature, it is safe to say that the presence of trust will be highly influential on consumer attitude.

There seems to be a general consensus among scholars that trust is a multidimensional construct. (Earle, 2010) There are several ways to approach the dimensions of trust. Mayer et al. (1995) say that trustworthiness and trust propensity are both antecedents to trust. Moorman, Zaltman, & Deshpande (1992) further state that trust has both a cognitive and a behavioural

aspect. However, Earle (2010) argues that, at the end of the day, the dimensions of trust reflect the two fundamental dimensions of social judgement (Fiske, Cuddy, & Glick, 2007): social-relational (intentions of the other) and abilities (what the other is capable of).

A widely held and broad definition of trust, based on a cross-disciplinary collection of scholarly writing by Rousseau et al. (1998), suggests: "*Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another*" (p.395) According to Mayer et al. (1995), trust is described as the intention to accept vulnerability to a trustee based on positive expectations that build up from antecedents such as *trustworthiness* (characteristics of the trustee) and *trust propensity* (a dispositional willingness to rely on others, personal characteristics of the trustor) and results in risk taking behaviour in a relationship, i.e. engaging in a trusting action (Mayer et al., 1995; Schlosser et al., 2006). In their research, Rousseau et al (1998) found that the willingness to be vulnerable and confident expectations are the key points of all definitions of trust across all articles they reviewed. Mayer et al.'s (1995) integrative model of organizational trust is shown in *Figure 1*. In an organizational context, their model is highly recognized and one of the most frequently cited articles (Rousseau et al. 1998). For the purpose of our research we integrate the key variables in Mayer et al.'s (1995) model, alongside with other variables, to study direct effects on consumer attitude.

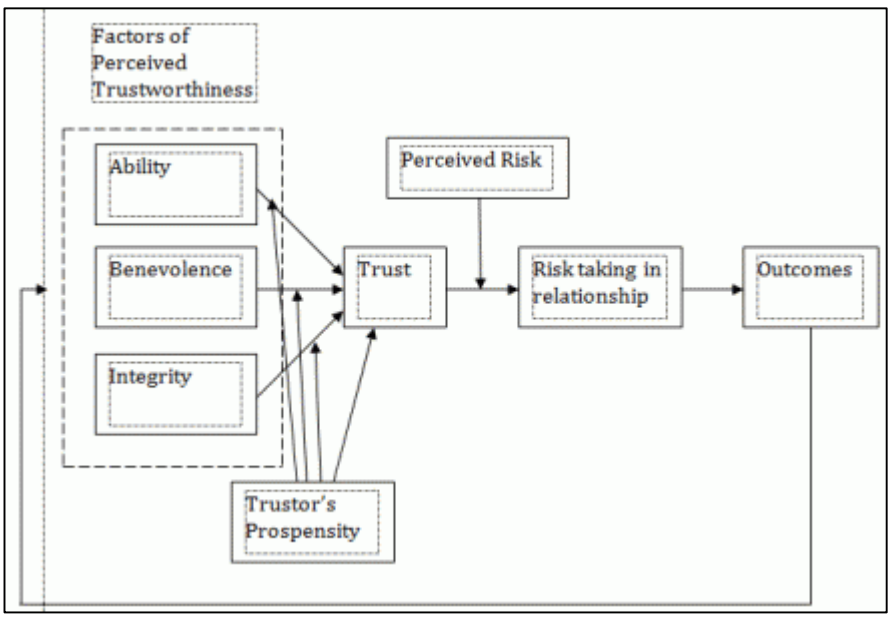


Figure 1. Mayer et al. (1995, p.715): An Integrative Model of Trust

2.1.1. Antecedents of trust

In their model, Mayer et al. (1995) found that the antecedents of trust are the attributes of the trustee party (his/her *perceived trustworthiness)* and the attributes of the trustor party (his/her *propensity to trust*) meaning that a trustor before engaging in a trust relationship already has a certain tendency to trust other people derived from his/her personality. The higher it is, the higher the trust for the trustee prior to available data on him/her. These two factors lead to trust itself (Mayer et al., 1995).

Another approach is that, as mentioned before, trust is both a *cognitive aspect* and a *behavioural aspect*. (P. H. Kim, Ferrin, Cooper, & Dirks, 2004; Moorman et al., 1992; Schlosser et al., 2006) The cognitive aspect is *trusting beliefs*, "sentiment, or expectation about an exchange partner's trustworthiness" (Moorman et al., 1992, p. 315). The behavioural aspect is *trusting intentions* "a willingness to make oneself vulnerable to another in the presence of risk" (P. H. Kim et al., 2004, p. 105). In Mayer et al.'s (1995) model, trusting beliefs appear as perceived trustworthiness and trusting intentions are the outcome (i.e. the willingness to be vulnerable).

When it comes to what influences trusting behaviour, there does not seem to be a consensus among researchers. According to Mayer et al. (1995), the willingness to be vulnerable is influenced by trustworthiness of the trustee on the one hand, and the propensity to trust of the trustor on the other hand (Mayer et al., 1995). Some argue that both of them should be present in order for trust to exist (Moorman et al., 1992; Schlosser et al., 2006).

Others say that the presence of trusting beliefs, trustworthiness, is enough to establish a trusting relationship. (e.g. Mayer et al., 1995; Morgan & Hunt, 1994) For instance, Morgan and Hunt (1994) argue that trusting beliefs are sufficient to measure trust because they implicitly imply that trusting intentions will follow. Even if the influence of trustworthiness on trust has been confirmed by various researchers (e.g. Colquitt et al., 2007; Colquitt & Rodell, 2011; Hassan & Semerciöz, 2010), Colquitt et al. (2007) found that the relationship between trust and trust propensity, although significant, was rather weak once trustworthiness was established.

Hence, the impact of trust propensity on the willingness to be vulnerable becomes less important once the dimensions of trustworthiness are in place (J. A. Colquitt et al., 2007). Alternatively, a different structure would suggest to see trust propensity as an antecedent to trustworthiness (McKnight et al., 1998) with a direct and an indirect effect on trust (J. A. Colquitt et al., 2007).

Following the above mentioned we have chosen perceived trustworthiness as a predictor of trust in a firm, to use in our research model. Further research should be conducted to investigate whether differences in propensity to trust will have a significant influence on the results.

2.1.2. Conceptualization of trustworthiness

Trust can be conceptualized as a general belief that the specific other party can be trusted; (Gefen, 2000; Hosmer, 1995; Moorman et al., 1992) including specific beliefs about ability, benevolence and integrity as the antecedents of trust (Jarvenpaa, Tractinsky, & Saarinen, 2006; Mayer et al., 1995). Following this approach, in their study, Mayer et al. (1995) offer a conceptualization of trust that incorporates various dimensions of antecedents into a general belief. Their model is used to describe a trust relationship between two individuals in an intra-organizational context; however, it has been successfully applied across a variety of different outsets- for instance- to examine the influence of trustworthiness in a buyer-to-supplier relationship between two firms (Bell, Oppenheimer, & Bastien, 2002) or to measure a company's trustworthiness as perceived by consumers (Fennis & Stroebe, 2014). In line with the latter study, one part of this thesis is dedicated to examining the effect of firm trustworthiness on consumers, therefore we will follow Mayer et al.'s (1995) approach to conceptualise trustworthiness of a company.

After having studied a significant amount of previous literature on trust, Mayer et al. (1995) found that there are three main antecedent factors that are present in most of the studies and can describe the degree of perceived trustworthiness. These factors; namely ability, benevolence and integrity; are described as follows:

"*Ability is a group of skills, competencies, and characteristics that enable a party to have an influence within some specific domain*." (Mayer et al., 1995, p.717) For example the trustee can be highly competent in a technical area- but not in keeping contact with partners- therefore, he/she can only be trusted in that specific domain. Hence, trust is domain specific.
Integrity shows "*the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable*." (Mayer et al., 1995, p.719) Acceptability is a key element in integrity as a trustee can show high adherence to principles that are rejected by the trustor; in this case trust will not be present between the parties.

"*Benevolence is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric profit motive*." (Mayer et al., 1995, p.718) An example for benevolence is a mentor-mentee relationship, where the mentor wants to help the mentee even if there is no extrinsic reward for the mentor.

Mayer et al. (1995) further argue that the three dimensions can be separated, although all factors should be present to some extent in order to create trust between two parties. We therefore choose to initially incorporate all three dimensions with equal importance in the analysis. Therefore, when testing the hypothesis, we will evaluate if and how ability, integrity and benevolence differ in their effect on attitude and risk perception for the sample group.

2.1.3. Trustworthiness in an online environment

The importance of trustworthiness becomes undeniable as studies show a direct positive link between trust and intentions to buy online (Gefen, 2002a; McKnight et al., 1998). Consumers will be less likely to use online services if they do not trust the provider (Bradach & Eccles, 1989; Gefen, 2000; Reichheld & Schefter, 2000). The immediate threat to online commerce is customers' perceptions (Hoffman, Novak, & Peralta, 1999; Rust, Kannan, & Peng, 2002). Perceptions of risk involved in online services by customers usually deviate from that of security experts, resulting in avoidance of actually safe services (Dunn, 2004). Therefore, in online commerce trust is particularly important because it helps consumers to build appropriate expectations of the service that they will get (Gefen, 2000) as well as lessens the perceived threat of an opportunistic behaviour of online service providers, such as masquerading, misuse and unauthorized distribution of personal information (Bradach & Eccles, 1989). Moreover, studies found that online trust can further be influenced by the design of the website (Schlosser et al., 2006), the brand name of a webstore (Ha, 2004), word-of-mouth communication about the brand (Ha , 2004; Alam & Yasin, 2010), perceived privacy/security of the website (Ha , 2004; Alam & Yasin, 2010; Hoffman et al., 1999; Schlosser et al., 2006), good previous online experience (Ha , 2004; Alam & Yasin, 2010), quality information and brand reputation (Alam & Yasin, 2010), and perceived risk (e.g. Hoffman et al., 1999; Jarvenpaa et al., 1999).

2.2. Risk

When examining trust, a complementary discussion about risk becomes inevitable (Earle & Siegrist, 2008; Jacoby & Kaplan, 1972; D. J. Kim, Ferrin, & Rao, 2008; Mayer et al., 1995;

Mitchell, 1999; Schlosser et al., 2006; Sitkin & Pablo, 1992). According to Bauer (1960), who studied risk in the context of consumers' behaviour, (perceived) risk consists of two parts, uncertainty and consequences. While uncertainty describes the probability of an unfavourable outcome, consequence is described as the importance of a loss (Chen, Lee, & Wang, 2012). Furthermore, prior research suggests that risk, similar to trust, is multidimensional, which causes many problems when trying to operationalize or measure it (Haimes, 2009; Stone & Grønhaug, 1993).

Advances in communication technologies have led to an even greater diversity of risk, as new online channels can become a potential source of risk. Pezderka and Sinkovics (2011) divide the most commonly identified sources of risk into three groups: traditional international business risks, which stem from risk factors in the physical work; operational risks, which have an impact on physical entities as well as online ones and, finally, online media risks, which are exclusively relevant for firms with an online presence. It is argued that, although their importance varies, all three dimensions influence the level of risk involved in online transactions. For Digipost, risk dimensions from all three groups will be relevant as Posten Norge AS has an offline, as well as an online, presence that has a potential to influence its customers.

2.2.1. Perceived risk

Haimes (2009) defines risk as a "measure of the probability and severity of consequences" (p.1647); however, he also states that risk is hard to measure as a concept. As risk lacks measurability and therefore objectivity in risk factors is hard to obtain, perceived (or subjective) risk is commonly used as a measurement. According to D. J. Kim, Ferrin, & Rao (2008), perceived risk is defined as a consumer's expectations about the potentially negative outcome of a transaction. The influence of perceived risk in decision making has been empirically tested, among others through analysing decision makers in lotteries (Jia, Dyer, & Butler, 1999). Perceived risk is a more useful construct in measuring risk, as consumers strive to reduce uncertainty rather than maximize utility (Mitchell, 1999). Consequently, the more a customer is exposed to perceived risk, the lower the probability of a purchase (Lim, 2003).

2.2.2. Conceptualization of risk

In order to explain the effect that trust has on an action involving a relatively high level of perceived risk it is necessary to conceptualize the two constructs. Previous literature shows risk

as multidimensional (Haimes, 2009); therefore in order to conceptualize it as a variable, scholars have identified seven dimensions of risk (Jacoby & Kaplan, 1972; Keller, 2013; Kwon & Lennon, 2009; Huang, Schrank & Dubinsky, 2009; Harridge-March, 2006; Lim, 2003), which are described as follows:

Time (loss) risk implies that the new product or service will result in opportunity costs for the customer (Jacoby & Kaplan, 1972) For example, Mohamed, Hassan, & Spencer (2011) found time loss risk to be strongly connected to the intention of using online education software. Performance (or functional) risk refers to the possibility that the product does not function as intended (Jacoby & Kaplan, 1972). A study by Lutz & Reilly (1974) shows that performance risk plays a significant role in the information acquisition phase of the purchasing process. In relation to online services, performance risk also refers to malfunctions of the website or server breakdowns (Littler & Melanthiou, 2006; Yiu, Grant, & Edgar, 2007). Psychological risk means that the use of a product or service can influence the psychological well-being of the customer (Jacoby & Kaplan, 1972). For instance, L. S. L. Chen's (2010) research found that the presence of psychological risk (e.g. potential harm to the self-image) has a significant negative impact on the frequency of online gaming usage. Financial risk is present if the consumer fears that something that possesses a monetary value is at risk (Jacoby & Kaplan, 1972), for example the study conducted by Korgaonkar & Karson (2007) concluded that financial and psychological risks have the biggest influence in online purchase situations. Finally, social risk is related to the possibility that the consumer's social environment might react negatively towards the new service or good (Jacoby & Kaplan, 1972). For instance, a study conducted by Aldás-Manzano et al. (2009b) shows that approval of societal networks has an impact on consumer's likelihood to adopt online banking usage. Additionally, two risk dimensions are particularly important when dealing with online transactions. Although they are highly inter-related constructs, a clear theoretical distinction can be made (Flavián & Guinalíu, 2006). Privacy relates to unauthorized sharing of personal information, unsolicited contacts from the online retailer and/or undisclosed tracking of shopping behaviour, whereas security relates to potentially malicious individuals who breach technological data protection devices to acquire consumers' personal, financial or transaction-oriented information (Miyazaki & Fernandez, 2001). Lastly, in an online environment, risks related to internet fraud such as breaches of security regulations and privacy violations are well documented (Scott, 2004). In the context of this study, on the one hand, privacy risk entails that a customer's personal data might be misused or stolen. On the other hand, security risk implies that the use of Digipost itself might be unsafe as the service could

be subject to data theft from a third party. The relationship between privacy and security risk is further explained by Flavián & Guinalíu (2006), who argue that privacy can only be protected through suitable security measures. Therefore it should be noted that although privacy and security risk are inter-related constructs, a clear theoretical distinction between them is possible (Flavián & Guinalíu, 2006).

2.2.3. Risk in an online setting

Research has shown that operating in an online setting is significantly more challenging for firms, as consumers experience a higher level of perceived risk online than in a traditional in-store setting (Kwon & Lennon, 2009). For example, previous research shows that a consumer's perceived risk is substantially higher in an online shopping context when compared to a traditional shopping environment (Huang et al., 2004). Among other influences, this is due to the fact that online purchases cannot be physically inspected or compared by the customer prior to the purchase (Cox & Rich, 1964). Given the nature of Digipost, it can be assumed that perceived risk in the online channel will play a significant role on the consumer's attitude.

Generally, it is said that security is considered as an especially critical factor associated with the success of e-commerce. (Arnum, 1995; Ratnasingham, 1999) Consumers perceive higher levels of risk in online transactions when they consider security to be insufficient (Ratnasingham, 1999). In an online retailing context security covers consumers' perceptions about the security of the transaction and of financial information, providing financial information and revealing personal data (Limbu, Wolf, & Lunsford, 2011). The most common examples of security concerns are misuse of personal data and data theft (Bradach & Eccles, 1989). In internet banking, the adoption of online banking services is highly dependent on perceived web security (Cheng, Lam, & Yeung, 2006). Perceived privacy and security risks are also significantly influences for the choice of the shopping channel as they can become a barrier to performing Internet banking transactions (Gerrard & Cunningham, 2003; Hewer & Howcroft, 1999; Polatoglu & Ekin, 2001). Due to the similarity between Digipost and other online self-services, such as online banking, we expect to find security and privacy risk to be particularly important to consumer attitude.

A great amount of previous studies has been conducted on ways to reduce consumers' perceived risk online. In order to mitigate the negative influence of perceived risk on consumers, companies have developed certain tactics that thrive on the relationship between brand trust

and consumer loyalty (Matzler, Grabner-Kräuter, & Bidmon, 2008). Apart from creating brand trust, other techniques are available for companies to mitigate online risk. One way to reduce technology and performance related risks is to enhance security standards and emphasise website security through advertisements (Lim, 2003). Furthermore, companies that deliver online goods and services should also stress the importance of communication and after-sales services (Lim, 2003). However, advanced security standards are not always beneficial, as Lee et al. (2012) found a trade-off between enhanced security and convenience which depends on the financial risk factors and the method of authentication involved.

2.3. The relationship between risk and trust

For the purpose of this study, it is most suitable to follow the line of research of K. Kim & Prabhakar (2000) that assume perceived risk and trustworthiness as independent predictors, as we are interested in looking at how the different dimensions of each construct differ in their influence on attitude towards SST. Moreover, this view is more adequate as we explicitly look at variables on different levels (i.e. a firm's trustworthiness and perceived risk in the online channel), which makes it more reasonable to assume that these constructs have an individual influence attitude towards SST. Furthermore, given that this thesis underlies certain time and resource constraints, assuming direct effects makes it possible for us to add other variables, such as self-efficacy, to the model without substantially increasing complexity. However, it should be noted that the relationship between trust and risk has been modelled differently throughout the literature.

Lim (2003) grouped these relationships into four types of relations identified by researchers, which are shown in *Figure 2*. In case (A) a study by Stewart (1999), the effects of trust in the web-site and the perceived risk in the transaction channel is examined with the willingness to purchase online. Risk is found to be a moderating factor on the relation between trust and willingness to purchase online. In case (B) by K. Kim & Prabhakar (2000), consumers' adoption of internet banking is examined. Their study suggests that there is a balance between trust and perceived risk and if the level of trust exceeds that of perceived risk, consumers will adopt a trusting behaviour. Cheung and Lee (2000), in case (C) describe trust as an antecedent of perceived risk. An empirical study of their model by Borchers (2001) suggests that consumers' trust of online vendors negatively influences perceived risk in online shopping. An opposing

view is that of Mitchell's (1999), case (D), which considers perceived risk to be an antecedent of trust and their relation to be non-recursive.

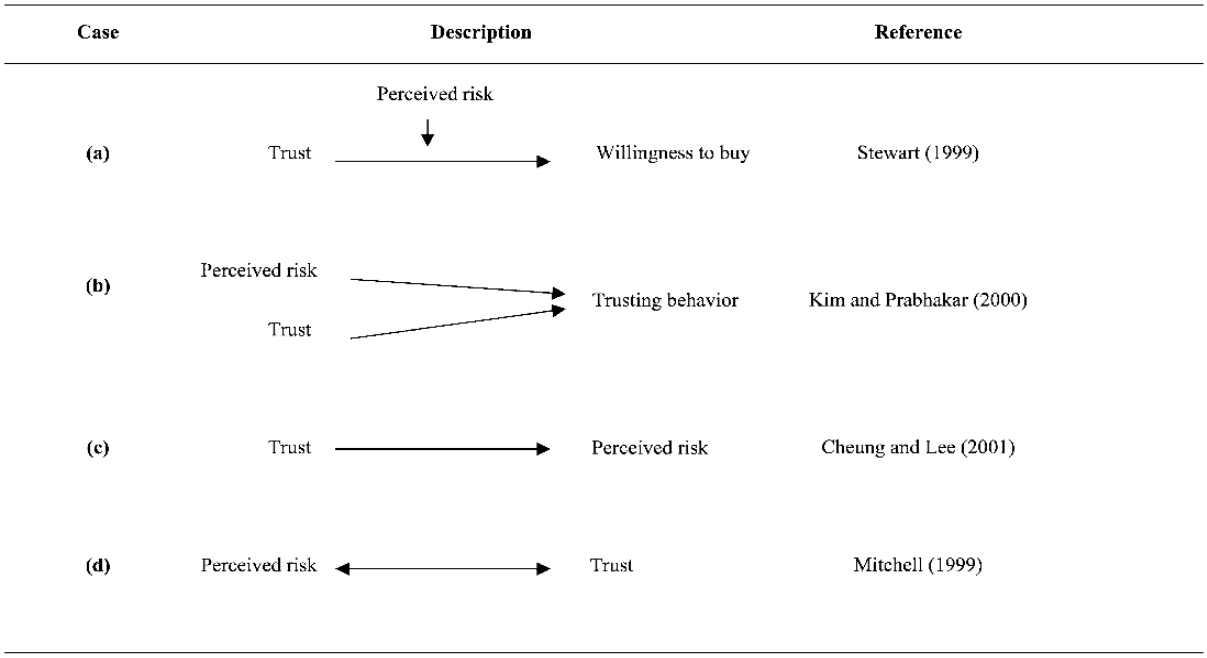


Figure 2. Different relationships between trust and risk (Lim, 2003)

As shown in *Figure 2.,* a substantial body of the literature suggests interaction effects of some sort between perceived risk and trustworthiness. Deutsch (1960) notes that risk is an essential component in the conceptualization of trust. If an action could be undertaken with complete certainty and without any risk, trust would not be needed (Lewis & Weigert, 1985). Therefore it appears logical that the need for trustworthiness becomes more crucial in high risk situations. The interaction between trust and perceived risk confirms that in a situation where low risk is present, trust is not so essential to loyalty. However, in the case of high perceived risk, a strong basis of trust is needed for the development of loyalty to prevent customers from shifting to another bank (Aldás-Manzano, Lassala-Navarré, Ruiz-Mafé, & Sanz-Blas, 2009). When analysing the role of satisfaction, trust, frequency of use and perceived risk as antecedents of consumer loyalty to banking websites, Aldas-Manzano, Ruiz-Mafe, Sanz-Blas and Lassala-Navarré (2011) found that an individual's loyalty to a banking website is strongly linked to the levels of trust and perceived risk. A sufficient level of trust may outweigh perceived risk; therefore trust should be always more dominant for success in online commerce (Grabner-Kräuter & Kaluscha, 2003). We recognize the importance of research that is dedicated to examining the relationship between perceived risk and trustworthiness, nevertheless in this study we focus on comparing the role of these two constructs as independent predictors. We

will however account for the importance of examining other potential relationships at a later point in the discussion (see *Chapter 5.6 Further analysis).*

2.4. Individual consumer characteristics

Attitude is not only affected by the perceptions of the external party's actions but also depends on their personality and individual characteristics. As for example Mayer et al. (1995) found, perceived trustworthiness is not the only factor affecting trust but also the varying degrees of *propensity to trust* of each person.

In an online environment one of the most important characteristics is Internet self-efficacy, which refers to people's believes about their ability to perform and competently handle situations (Bandura, 1994) in an online environment. Self-efficacy has a strong influence on how people choose to behave and can therefore directly affect the decision making process (Bandura, 1994). Self-efficacy has a positive effect on Internet usage in a variety of situations. For example, a study by Akhter (2014) shows that general high self-efficacy has a direct positive effect on the number of internet transactions. Similarly, Tan and Teo (2000) found that greater self-efficacy in using internet banking services will significantly affect the intentions to adopt such services.

Apart from self-efficacy, other variables such as differences in demographics among the sample group, can have an influence on consumer attitude (Kirk et al., 2015). A study by Román (2010) found evidence that the negative effect of perceived deceptive practices by online retailers were considerably more significant on consumers that were older, with a higher level of education and female. Similarly, Lian & Yen (2014) discovered that age has a significant impact on consumer's attitude towards online shopping, with older people experiencing a higher level of risk relative to the younger sample group; however, their study did not find any gender related differences in risk perception. Whereas, Teo (2001) also confirmed the difference in gender, males were more prone to use Internet for purchasing than females. Thus, we will account for discrepancies in risk perception and attitude due to demographical differences in form of control variables in the analysis.

2.5. Attitude

"Brand attitudes are the consumers' overall evaluations of a brand and often form the basis for brand choice." (Keller, 2013, pp. 117)

Therefore, attitude is a central concept of marketing that relates to judgements and feelings about the brand. (Keller, 2013)

As demonstrated in the research of Ajzen & Fishbein (1977), attitude influences behaviour. In line with their research, numerous studies support that a positive consumer attitude is a crucial influence on intentions to buy or use (e.g. Matos, Ituassu & Rossi, 2007; Kirk, Chiagouris, Lala, & Thomas, 2015); a case in point is the study by Vijayasarathy (2004) who found that consumer's intentions to adapt online shopping were strongly influenced by their previous attitude towards it. Among other resources, perceived risk, trustworthiness and Internet self-efficacy are well recognized as antecedents to consumer attitude. For example McCole, Ramsey, & Williams (2010) found that trust in a vendor not only positively influences attitude towards online purchasing but further becomes more important with higher security and privacy concerns. This is in line with findings from other researchers suggesting that overall online purchase satisfaction leads to a positive attitude and repeat online purchase (Abdul-Muhmin, 2010) and that satisfaction with previous online purchases leads to increase in trust (Martín, Camarero, & José, 2011). Moreover, perceived deception of online retailers has a stronger negative effect on consumer satisfaction if they have a more positive attitude towards the internet (Román, 2010). When it comes to measuring consumer perception, the distinction between different kinds of risks is crucial as these may be perceived independently from one another and can therefore lead to different reactions among consumers (Matzler et al., 2008). When studying the influence of moderating variables on perceived risk, Nepomuceno et al. (2014) found that, for example, it is more critical to control security concerns than privacy concerns as security risk has a stronger influence on perceived risk despite both factors frequently interacting with each other in reality. This views further supports the arguments that testing the influence of risk and trust dimensions individual will deliver more actionable results than a general measure.

From the previous review, it is clear that a great amount of research has been conducted regarding interaction effects between perceived risk and trustworthiness; however, the majority

of literature still lacks a clear understanding of (a) the effect of trustworthiness on a brand/company level and (b) variations in the influence of different dimensions of both variables. What is more, relatively little research has been conducted on (c) the influence of consumer's individual characteristics on their attitude towards online services. Taking these shortcomings into account, the conceptual model we introduce in the next chapter incorporates variables on two an individual level (perceived risk and characteristics) and a firm level (trustworthiness). In the analysis we take a closer look on the effect that these variables have on attitude.

3. Hypothesis & Research Model

Following *Chapter 2***,** we propose the following hypothesis based on existing theoretical and empirical implications from the trust and risk literature. Perceived risk has been identified as having negative influence towards online behaviour (D. J. Kim et al., 2008). It has a negative influence on consumer attitude, which has a negative effect on the willingness to buy (Jarvenpaa et al., 2000). Stewart (1999) examined trust transfer across hypertext links from physical to virtual stores, based on the cognitive balance theory (Heider, 1958), and found that risk lessens the effect of trust on the willingness to buy. We assume that the analysis of potential users of Digipost will yield comparable results to studies of other online self-services; for example, according to Tan and Teo (2000), perceived risk has a significant and negative direct effect on consumers' adoption of Internet banking. Following Jacoby & Kaplan's (1972) categorisation of risk dimensions, we propose that for the underlying data:

H1a: *Perceived time risk will negatively influence attitude towards using the SST.*
H1b: *Perceived functional risk will negatively influence attitude towards using the SST.*
H1c: *Perceived psychological risk will negatively influence attitude towards using the SST.*
H1d: *Perceived privacy risk will negatively influence attitude towards using the SST.*
H1e: *Perceived financial risk will negatively influence attitude towards using the SST.*
H1f: *Perceived social risk will negatively influence attitude towards using the SST.*
H1g: *Perceived security risk will negatively influence attitude towards using the SST.*

In contrast with studies on traditional international business research, the e-business literature is particularly concerned with so-called online media risks (Pezderka & Sinkovics, 2011) stemming from privacy and security concerns. In a study by Scott (2004) respondents ranked security and privacy risk, alongside profitability, as their highest concerns among 16 risk dimensions. Empirical studies further highlight the influence of security and privacy risk in relation to self-service technologies. For instance, a study by Aldás-Manzano et al. (2009) who examined perceived risk in the context of online banking, concludes that security risk is one of the strongest inhibitors for consumers to adopt online banking. Furthermore, according to a study by Aladwani (2001), potential online banking customers ranked internet security and customers' privacy as the most important future challenge banks face. Taking our case as an example, Digipost is an online mailing service where customers receive sensitive information

via Internet. Therefore, we find it logical to think that the risk of online theft and unauthorized personal information disclosure is the greatest threat. Hence we suggest that:

***H2**: Among all seven dimensions of perceived risk, privacy and/or security risk will have the strongest influence, i.e. the highest partial effect, on attitude towards using the SST.*

Furthermore, a study by D. J. Kim et al. (2008) suggests that the presence of trust increases online purchase intentions in two ways. First, indirectly, as the negative effect that is caused by perceived risk on purchase intentions is reduced through the influence of trustworthiness (D. J. Kim et al., 2008). Second, both trust and trustworthiness also directly and positively influences purchase intentions (Stewart, 1999). Consequently, consumers are also not likely to adapt a new online service if they do not trust the provider in the first place (Bradach & Eccles, 1989; Gefen, 2000; Reichheld & Schefter, 2000). Based on the work of these scholars, we expect to find that consumer's that perceive Posten Norge AS as being trustworthy will further have a positive attitude towards Digipost. Hence, we expect to find the following effects within the sample group:

***H3a:** Perceived integrity of the firm will have a positive effect on attitude towards using the SST.*
***H3b:** Perceived ability of the firm will have a positive effect on attitude towards using the SST.*
***H3c:** Perceived benevolence of the firm will have a positive effect on attitude towards using the SST.*

Individual consumer characteristics, in particular self-efficacy, were shown to have an influence on attitude and decision making process. (Bandura, 1994) General high self-efficacy has a direct positive effect on the number of internet transactions (Akhter, 2014), and adoption of banking services (Tan & Teo, 2000). Consequently:

***H4:** Internet self-efficacy will positively influence attitude.*

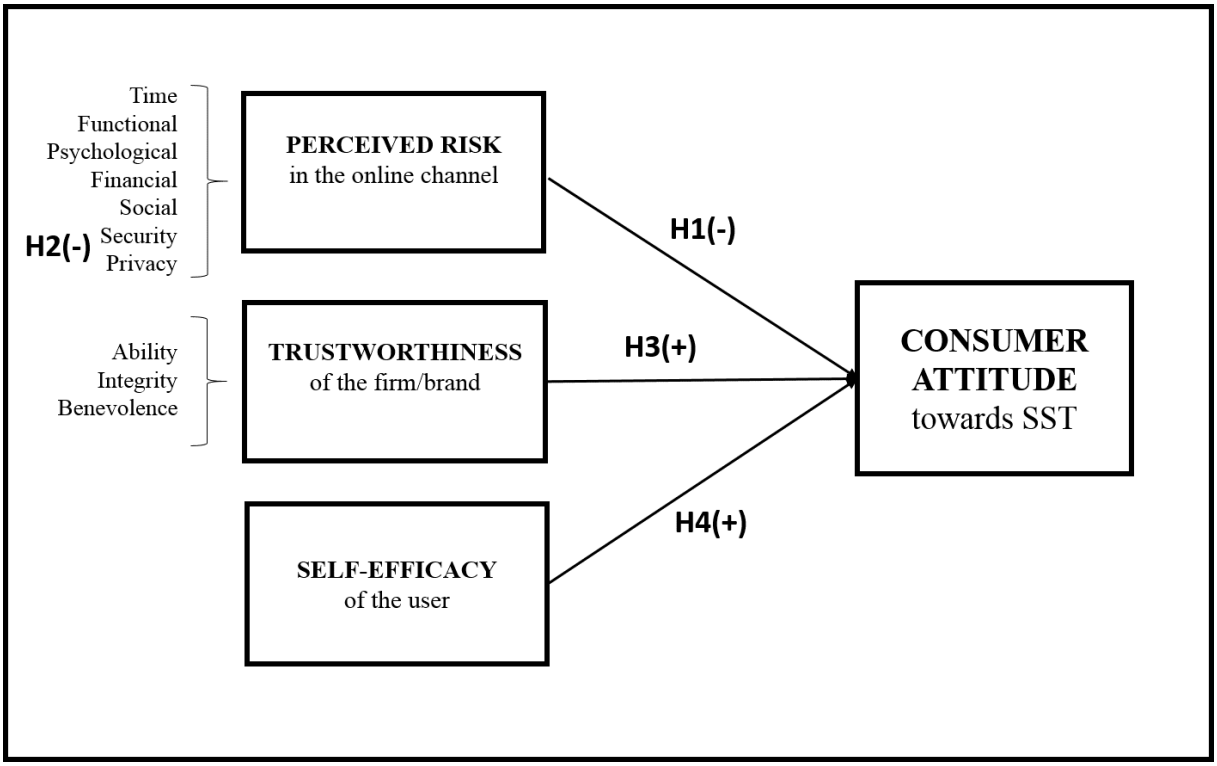


Figure 3. Conceptual Research Model

These hypotheses are visualised in the conceptual model in *Figure 3,* where perceived risk relates to risk associated with the online channel, whereas trustworthiness is connected to the perception of the firm or brand. On the left side of the model, the first group of independent variables, perceived risk, is made up of seven risk dimensions: time risk, financial risk, performance risk, psychological risk, social risk, privacy risk and security risk. We propose that perceived risk has a direct influence on consumer attitude towards Digipost *(H1),* with security and privacy risk having the most significant effect *(H2).* Hence, attitude is treated as the dependent variable in this model. The second group of independent variables is trustworthiness**,** consisting of the perceived ability, integrity and benevolence in Posten Norge AS, which we also expect to have a direct influence on attitude *(H3)***.** Thirdly, we also expect self-efficacy to have a direct effect on attitude towards SST *(H4).*

The conceptual model we use for analysis is somewhat similar to the approach of K. Kim & Prabhakar (2000) which was introduced in *Chapter 2.3.* (Figure 2, (Lim, 2003)), except that we treat self-efficacy as an additional independent variable and look at attitude as the outcome. What is more, K. Kim & Prabhakar (2000) use a two-dimensional operationalisation of trust (commitment and excessive advantage) and risk (negative consequences and relative advantage). Our study therefore contributes to the literature by examining the individual layers

of these multidimensional constructs. After describing our research approach in *Chapter 4. The Methodology* we will continue with testing the hypothesis and the validity of the model in *Chapter 5. Analysis.*

4. The Methodology

This study is a CSI research project and a suitable methodological approach was chosen by the CSI research team. In this section of the paper we will present the research methodology, i.e. the plan according to which the analysis was conducted (Pallant, 2010). The structure of the methodology section of our paper will be the following: We discuss the research design *(Ch. 4.1),* the methods employed *(Ch. 4.2)* and the measures *(Ch. 4.3)* that were used to collect data.

4.1. Choice of research design

The aim of this study is to document an occurrence that is actually taking place, therefore a descriptive research approach (Burns & Burns, 2008) was adopted. Given that our study is based on survey data, a quantitative study paired with a deductive approach was found to be the most suitable. Regarding this case, a deductive approach is especially relevant because there has been a lot of previous research on the relationship between perceived risk and trust; thus, it is highly important that we examine previous research and experiments, to take existing results into account.

Adapting a descriptive approach based on quantitative data poses several limitations and challenges to our research. Firstly, researchers found that quantitative research methods generally lack a considerable level of flexibility when collecting and analysing data (Bansal & Corley, 2012). Secondly, it can be argued that variables such as perceived risk, trustworthiness and attitude are rather qualitative and, therefore, unsuitable for a quantitative analysis. However, there are several factors that, we believe, justify the choice of research design. Firstly, the aim of this thesis is to document the relationship between three groups of independent variables (perceived risk, trustworthiness and internet self-efficacy) and a dependant variable (attitude) as outlined in the conceptual model in *Chapter 3*. To achieve this it is necessary to make generalisations from a large data set, which makes a descriptive analysis the most suitable alternative (Burns & Burns, 2008). Secondly, to ensure consistency in measurement we address the issue of examining rather subjective phenomena through relying on existing scales, which have been tested and validated in previous studies (see *4.3.2*).

4.2. Choice of method

Within quantitative research techniques, a survey design was chosen by the CSI research team as the means to answer the research question. The reason for this choice is that a survey design allows us to generalize from a sample to make inferences about characteristics, attitudes and behaviour of a population (Babbie, 1990). More precisely, a *cross-sectional survey* design was chosen as the most suitable type of data collection in our case due to the economy of the design and fast turnaround in data collection (Creswell, 2003).

4.3. Data collection and sampling

The research instrument that was employed to obtain the information was a traditional e-mail survey that was administered by Posten AS. According to previous research, internet surveys offer considerable advantages in terms of faster responses, cost savings and access to a unique population (Wright, 2005) and this method is therefore regarded as suitable to gather information for this study. Posten recruited respondents by e-mailing a sample of 3000 customers who were not registered as users of Digipost. The survey was distributed December 12th 2014. Posten also sent out a reminder about the survey to customers on the 14th of January 2015. From this random sample of 3000 customers, a total number of 214 respondents completed the survey, which constitutes a response rate of approximately 7.13%.

4.3.1. Respondent's profile

Of the respondents, 42.5% were female and 57.5% were male, the average age of whom was 46 years. The vast majority of survey participants had an educational level higher than high school (86.5%), with 39.2% having one to four years of higher education and 42.2% more than four years. The survey was completed by Posten Norge customers from all parts of Norway, however, geographically the three areas with the highest response rate are Oslo (18.7%), Akershus (14.0%) and Hordaland (12.1%).

Detailed descriptive statistics and frequency tables about the respondent's profile are shown in *Appendix 10.2.*

4.3.2 Research instruments

The survey was conducted in Norwegian language (Bokmål) and afterwards translated into English for research purposes. The complete survey includes 44 questions from which we chose

the ones that we decided to implement in our analysis. A detailed list of the questions used is included in the translated version of the questionnaire can be found in *Appendix 10.1*.

The constructs used in this study were adapted from previous studies (L. S.-L. Chen, Lee, & Wang, 2012; Jarvenpaa et al., 2000; Schlosser et al., 2006) and measured by 7-point Likert scales, ranging from 1 (”I completely disagree.”) to 7 (“I completely agree.”). *Perceived risk*, namely time, functional, psychological, privacy, financial, social and security risk, are measured following the methods employed by Chen et al. (2012) and Stone & Grønhaug (1993). In these studies, each risk dimension is conceptualized through three 7-point Likert scale questions. Similarly, the dimensions of *trustworthiness*; ability, integrity and benevolence; are operationalized by following the method employed by Schlosser et al. (2006) and (Hwang, 2014). *Self-efficacy* was measured on a three items scale based on Yim, Chan, & Lam (2012) which focus on customers’ perception of their skills and abilities for effective system usage. The fact that the reliability of these research instruments has been widely acknowledged in previous studies strengthens the validity of this research (Trochim, 2006).

4.3.3. Data analysis method

The Statistical Package for Social Science (SPSS) was used to analyse the collected survey data, as it is a popular and widely employed tool to obtain descriptive statistics and test statistical inferences (IBM.Corporation, 2012). Additionally, we applied STATA Data Analysis and Statistical Software to do formal tests for assumptions where it was needed. Analysing the data was conducted in a three step process which is explained as follows.

Step 1 initially entails that we conduct *data screening and preparation*. We will also conduct a *factor analysis* to identify the most important underlying constructs for further analysis and test their internal consistency through *Cronbach’s Alpha scores* (Pallant, 2010)

In **Step 2** we use *descriptive statistics* in order to develop a better understanding of the components we extracted in Step 1; specifically we will look into means, standard deviation and skewness of the data. Furthermore we will perform *independent sample t-tests* to evaluate whether there are any differences among age groups and gender in the responses.

During **Step 3** we use multiple regression analysis to predict the relationship between risk, trustworthiness and individual characteristics on attitude. We start with an assessment of the

conditions that must be fulfilled for the regression to yield reliable results. Furthermore we use standard multiple regression to look at partial effects of the independent variables on attitude and the model as a whole. Then, a sequential multiple regression was used to see what role the different groups of independent variables play in the model if added separately. We started by regressing attitude on the risk variables first, then we included the trustworthiness variables and in a final step internet self-efficacy. The reason for our choice of order is that we are interested, primarily the effect of perceived risk in the service on attitude and how trustworthiness and self-efficacy contribute to it.

5. Analysis

In this section, we will first prepare and screen the data for analysis (*Chapter 5.1*) and run principal component analysis for factor reduction (*Chapter 5.2*). Afterwards we will present basic descriptive statistics (*Chapter 5.3*) and findings from independent t-tests (*Chapter 5.4*). Finally, we will test the model as a whole through conducting a series of standard and sequential multiple regression analysis (*Chapter 5.5*) and, finally, lay the ground for further analysis by applying the process macro (*Chapter 5.6*).

5.1. Data screening and preparation

We received the data from Posten after it had been directly loaded into SPSS from the survey programme, therefore, by default, no errors shall be detected. Nevertheless, we ran an initial screening which found no missing data in any of the variables.

As a second step we checked for careless responses. As mentioned before, the survey was filled out on a purely motivational basis, no reward was offered and the survey had a moderate number (44) of questions. Therefore, we do not expect a high amount of careless responses (Meade & Craig, 2012). However, checking for careless responses is an important part of the screening process as it may cause spuriousness within group variability and lower reliability of our results (M. E. Clark, Gironda, & Young, 2003). Careless responses can be treated by implementing preventions measures into the survey or applying post hoc test. Our survey did not contain prevention measures; therefore, we applied two post hoc tools: response pattern and outliers (Meade & Craig, 2012). To check for strings of identical responses, we computed "occurrence" as a new variable for each value on the Likert scale (1-7) for the first 40 questions. The cases that had a string of 30 or more identical responses (75%) were four cases in total. We checked whether their elimination brought our data set closer to normality, but we have not found a significant difference between the two data sets, only a few thousandth difference. Therefore, we decided to keep these cases as they do not have a significant effect on normality and decreasing the number of cases lowers the strength of our results (Pallant, 2010).

Furthermore, we wanted to check for inconsistency between the answers. We computed the standard deviations of our variables: risk, trustworthiness and attitude. The number of cases that

answered the risk, trustworthiness and attitude questions identically is: 9, 20 and 100 respectively. Even if there are overlaps between the groups, a significant amount of people answered the same type of questions identically which cannot necessarily mean careless.

5.1.1. Sample size

Sample size plays a key role in science since the aim of guiding a research is to obtain results that can be generalized, otherwise the study has little scientific value (Pallant, 2010). As indicated in *Ch 4.3 Data collection and sampling*, the survey was carried out by Posten AS resulted in a sample group with 214 respondents. According to Tabachnick and Fidell (2013), a sample size of 300 cases is deemed "comfortable", however, a smaller size that has at least 150 cases might also be suitable if the factor loadings are sufficiently high (i.e. > .80). They further argue that there is no common rule of thumb for estimating the minimum sample size, but that it rather depends on individual aspects of the underlying variables and design of the study. Following these recommendations we consider our sample as sufficient in size. A sufficiently large sample size is a prerequisite for the application of many statistical tests, e.g. independent sample t-test, as it strengthens the power of the test and minimises the risk for Type 1 and 2 error to occur (Pallant, 2010).

5.1.2. Construct abbreviations

Throughout the analysis, the following abbreviations are used for the different constructs:

Construct name	Abbreviation
Time risk	TIR
Functional risk	FUR
Social Risk	SOR
Psychological risk	PYR
Financial risk	FIR
Privacy risk	PRR
Security risk	SER
Ability	ABI
Integrity	INT
Benevolence	BEN
Self-efficacy	SEF
Attitude	ATT

Table 1. Names and Abbreviations of Constructs

5.2. Factor reduction and construct validation

In order to summarize patterns of correlations and reduce the number of observations we conducted a principal component analysis (PCA), which assesses all variances in the original variables and transforms them into a smaller number of linear combinations (Pallant, 2010). We choose PCA over factor analysis as we are interested in obtaining an empirical summary of the data rather than a theoretical solution (Tabachnick & Fidell, 2013). All 12 variables consisting of a total of 37 items were included in the initial analysis. This approach is necessary to not only determine the number and nature of factors that should be extracted for further analysis but also to test whether the concepts we derived from existing literature are present within our data set (Tabachnick & Fidell, 2013). As discussed in the literature review, the different dimensions of risk stem from very different sources and we do not expect the dimensions to be relevant in this context. Afterwards, we use Cronbach's Alpha to assess internal consistency.

5.2.1. Assumptions and limitations for principal component analysis

Prior to performing a PCA we need to assess the suitability of the underlying data set. Pallant (2010) suggests two indicators as necessary for the general applicability of factor analysis: a sufficiently large sample size and strength of the relationships between the variables.

The issue of sample size has been discussed in *5.1 Data screening and preparation*. To check the correlation among the variables, following Pallant (2010), we employ Bartlett's test of sphercity (Bartlett, 1954) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970), both generated by SPSS when conducting the PCA, to test the factorability of our data. Bartlett's test of sphericity suggests a value of $p<.05$ to be significant (Bartlett, 1954), the KMO requires a minimum of .6 on a scale of 0 to 1 (Kaiser, 1970), otherwise factor analysis would not be considered a suitable measure to analyse the underlying data (Tabachnick & Fidell, 2013). Conducting both tests for non-users of Digipost generates a Bartlett's test value of $p=.000$ and a KMO measure of .911 (see *Appendix 10.3.1.*) for our data. We can therefore assume that the variables are sufficiently correlated and the use of factor analysis is appropriate (Burns & Burns, 2008).

Furthermore, the aim of principal component analysis is to explain variation across items with a few underlying components, therefore we need to limit the amount of components that are

retained for the analysis (Burns & Burns, 2008). As a first indication this is accomplished through Cattell's scree test (Cattell, 1966) which plots the eigenvalues of each factor on a curve where only these factors are significant that are plotted on or above the spot where the curve levels out (Burns & Burns, 2008). Alternatively, we can also look at the eigenvalues of each factor and, following Kaiser's criterion, select the ones greater than 1 as common factors (Burns & Burns, 2008). The result for Cattell's scree test for the data sample can be found in *Appendix 10.3.2*. The result shows that seven components have an eigenvalue above 1 and make up for 79.11% of cumulative eigenvalues (see *Appendix 10.3.3).* We will review the choice on the number of components in *5.2.4 Discussion of principal component analysis.*

5.2.2. Results of principal component analysis

A principal component analysis with oblique rotation was performed through IBM SPSS on 37 items. The resulting pattern matrix for PCA can be found in Table 2. below, the abbreviations we used were outlined in *Chapter 5.1.2*. We choose to rotate the pattern matrix using oblique rotation (Direct Oblimin) as this technique allows for a wider range of factor inter-correlations (Tabachnick & Fidell, 2013). As a result, six factors were extracted.

	Component						
	1	2	3	4	5	6	7
TIR1	0.007	-0.026	-0.030	0.821	0.096	0.043	-0.055
TIR2	-0.052	-0.012	0.002	0.799	0.080	0.077	-0.183
TIR3	-0.053	-0.004	-0.018	0.747	0.061	-0.054	-0.303
FUR1	0.423	-0.050	0.012	0.361	-0.018	0.336	0.086
FUR2	0.465	-0.078	0.063	0.273	0.001	0.393	0.042
FUR3	0.504	-0.048	0.075	0.163	0.010	0.363	-0.035
PYR1	0.139	0.039	-0.045	0.115	0.030	0.727	-0.109
PYR2	-0.011	0.035	-0.064	-0.042	0.021	0.925	-0.089
PYR3	-0.024	-0.031	-0.084	-0.061	0.080	0.902	-0.019
PRR1	0.794	-0.011	0.012	-0.025	-0.072	0.124	-0.115
PRR2	0.594	0.009	-0.137	0.261	0.014	-0.129	0.013
PRR3	0.831	0.019	0.041	-0.030	-0.011	0.074	-0.084
FIR1	0.057	-0.062	-0.118	0.215	0.630	-0.028	0.013
FIR2	0.222	-0.015	-0.141	0.239	0.386	0.147	-0.004
FIR3	0.208	-0.066	-0.048	0.277	0.476	0.093	0.066
SOR1	-0.024	0.022	-0.001	0.004	0.921	0.022	0.033
SOR2	0.012	0.005	-0.039	0.008	0.878	0.007	-0.029
SOR3	0.012	0.017	0.008	-0.133	0.918	0.017	-0.071
SER1	0.815	-0.042	0.050	-0.049	0.125	0.009	-0.069
SER2	0.872	-0.057	-0.002	-0.153	0.082	0.018	-0.046
SER3	0.865	0.028	0.037	-0.078	0.118	0.002	-0.043

INT1	-0.003	0.049	0.700	-0.145	-0.025	-0.012	0.148
INT2	0.042	-0.052	0.887	0.045	-0.099	-0.109	0.063
INT3	0.034	-0.048	0.887	0.043	-0.115	-0.088	0.040
ABI1	-0.071	0.065	0.048	-0.118	0.047	-0.038	0.815
ABI2	-0.098	0.018	0.095	-0.042	-0.042	-0.081	0.778
ABI3	-0.055	0.063	0.060	-0.076	-0.073	-0.034	0.818
BEN1	-0.068	0.043	0.054	-0.052	-0.043	-0.072	0.831
BEN2	-0.082	0.745	0.321	0.108	0.025	0.010	-0.044
BEN3	-0.043	0.841	0.217	-0.009	0.086	0.014	-0.080
SEF1	-0.023	0.866	0.166	-0.025	0.023	0.026	-0.075
SEF2	0.042	0.904	-0.157	-0.027	-0.060	-0.075	0.026
SEF3	0.061	0.933	-0.134	-0.039	-0.050	-0.061	-0.029
ATT1	0.027	0.925	-0.164	-0.042	-0.044	-0.063	-0.042
ATT2	-0.013	0.812	-0.066	-0.015	0.016	0.093	0.165
ATT3	-0.032	0.754	-0.086	0.028	-0.045	0.080	0.219
ATT4	-0.016	0.777	-0.104	0.010	0.020	0.010	0.170

Table 2. Pattern matrix of principal component analysis
Extraction Method: Principal Component Analysis
Rotation Method: Oblimin with Kaiser Normalization

5.2.3. Internal consistency of constructs

Additionally, we generate Cronbach's Coefficient Alpha for all items on the scale to ensure that they are measuring the same underlying attributes (Pallant, 2010). Generally, a minimum level of .7 is required to guarantee internal consistency of the items (Nunnally, 1978). In Table 3 all Cronbach's Alpha for the constructs identified in factor analysis are presented. From this we can see that all constructs we employ are internally consistent, with a Cronbach's Alpha value above .85. Generally, most concepts consist of 3 items, with the exception of attitude (4 items) and privacy risk (6 items).

Construct	Cronbach's Alpha
TIR	.939
PYR	.946
SOR	.926
PSR	.928
FUR	.943
FIR	.868
INT	.922
ABI	.981
BEN	.932
SEF	.902
ATT	.963

Table 3. Cronbach's Alpha scores

5.2.4. Discussion of principal component analysis

One of the primary concerns of PCA and factor analysis is that there is no external criteria against which the solutions can be tested (Tabachnick & Fidell, 2013). As it was previously described, the items we used in the questionnaire to conceptualise constructs have been tested in other research (Mayer et al., 1995; Schlosser et al., 2006; Yim et al., 2012) therefore the strong loadings on certain factors confirm previous theories and validate the constructs we employ. Individual cross-loadings will be discussed in the following paragraphs.

First and foremost, we find that **privacy risk** and **security risk** as well as **functional risk** all load together on the first component, however, factor loadings for **functional risk** are relatively low (between .472 and .589) and therefore not significant. Following Lee et al. (2012), it is plausible to assume that repeated website malfunction will raise concerns among consumers about their privacy and security of their data. Thus, this finding is not surprising given that the theory suggests a relationship among those three variables. However, for the purpose of this study we are more interested in examining the risk that are associated with privacy and security concerns, assuming that Digipost has been sufficiently tested since its launch in 2011 and has, therefore, taken precautionary measures to avoid website malfunction. Hence **functional risk** is deemed to be a less important concern in this context and dropped from further analysis. Following the cross-loadings between the other two constructs, we suggest that all **privacy risk** and **security risk** items are part of a larger construct. In this context, Flavián & Guinalíu (2006) point out that although a clear theoretical distinction is possible, both constructs are frequently used interchangeably in consumer's minds as a distinction is not relevant to achieve the desired outcome (i.e. to protect consumer's privacy). Similarly, companies often address both issues together when making efforts to enhance privacy protection through improved security measures (Flavián & Guinalíu, 2006). We therefore choose to treat privacy and security risk as one single construct to represent the consumer's concern that their personal data might be misused and security systems are not sufficient to avoid misuse. Assessing the internal consistency of this overall factor **privacy/security risk** (PSR) shows that the collective Cronbach's Alpha is relatively higher (.928) than if the two risk dimensions are viewed separately (.848 for **privacy risk** and .944 for **security risk**).

Secondly, when running an initial PCA with all items, we found that all items constituting integrity, ability and benevolence load together on the second factor, which is in contrast to the findings from Mayer et al. (1995) who describe each dimension as a distinct construct. We find

two reasons to explain these findings. Firstly, since PCA is used to identify underlying constructs in a larger number of items (Pallant, 2010) and all three variables belong to the construct of "trustworthiness" (Mayer et al., 1995) it seems logical that all three variables are strongly interrelated relative to the other variables in the analysis. Secondly, we might not be able to identify distinctive patterns among the trust dimensions due to quality issues with the data. To test these assumptions we ran a second PCA exclusively on all three dimensions of trustworthiness and we discovered that **ability** and **benevolence** load together on the first component, explaining 73.23% of variance and integrity loads on the second factor, explaining 10.51% (see *Appendix 10.3.5.*). When looking at the internal consistency of the ability/benevolence construct, deleting any of the variables only leads to a marginal improvement of Cronbach's alpha, therefore we conclude that the underlying data suggests that ability and benevolence are the same construct. However, this conclusion is not consistent with conceptual discussions in the literature (J. A. Colquitt et al., 2007; Jarvenpaa et al., 2000). Previous research suggests that trust is made up of both, a behavioural (ability) and a believe (integrity and benevolence) component (W. R. Clark et al., 2010; Fiske et al., 2007), meaning that **ability** and **benevolence** are both components of the same construct but have different underlying motives. Furthermore, as Mayer et al. (1995) clearly show in their research it makes sense to distinguish between attributes that are related to Posten's competences (ability) and its goodwill (benevolence). One possible explanation for this finding in our analysis could again be related to the quality of the data, seeing as we already discussed the issue of multicollinearity previously in this paper. To avoid problems connected to the different antecedents and consequences of ability and benevolence, we choose to retain only one of them for further analysis. Of the two dimensions, pursuing the analysis with ability this will help us to keep the distinction between a cognitive ("will-do") and a behavioural ("can-do") dimension of trustworthiness (Moorman et al., 1992). We therefore choose to extract both **integrity** and **ability** from the PCA to represent both components as part of trustworthiness.

Moreover, the pattern matrix shows some cross-loadings between **financial risk** and **social risk** suggesting that they are both part of a larger construct. This assumption is backed by a Cronbach alpha score of 0.911 if all variables are included. Taking a closer look at the items that constitute **financial risk**, it becomes apparent that all cross-loadings are relatively week. Since the usage of Digipost is free of charge for customers of Posten AS, i.e. there is no monetary value at stake when using the service (Posten Norge AS, 2014) it is reasonable to assume that **financial risk** is not going to be a primary concern for customers. Furthermore, we argue that the item with

the highest cross-loading (FIR1: Q.6.1= *"I think I can lose money by using Digipost")* is formulated very generic and might therefore be interpreted so that the possibility of losing money leads to disapproval by one's peer group. Following these arguments we choose to exclude **financial risk** from further analysis, as it is not directly applicable to this study, and keep **social risk**.

Finally, we obtain the information that **time risk, self-efficacy**, **psychological risk** as well as **attitude** can be treated as independent constructs, with high factor loadings on individual components. However, looking at the results of the scree plot in *Appendix 10.3.2,* the eigenvalues of **psychological risk** and **attitude** have relatively little explanatory value on the total variance, therefore we need to assess whether we retain these factors for further analysis. On one hand, in the case of **attitude** we argue that it is substantial to retain this factor, as it is the dependent variable in our model and will therefore be needed for further analysis. On the other hand, the effect of psychological risk on attitude in an online setting is well-documented in the literature, for instance Korgaonkar and Karson (2007) found that it is one of the strongest inhibitors to online purchasing. Given the importance of psychological risk for other self-service technologies in the literature, we choose to retain **psychological risk** for further analysis.

Following the PCA we therefore continue the analysis with eight components; seven of which are independent variables: **time risk**, **psychological risk**, **social risk**, **privacy and security risk**, **integrity**, **ability**, **self-efficacy** and one dependent variable: **attitude**.

5.3. Descriptive statistics

After defining the variables that we use in regression analysis and moderation analysis, we start by introducing some basic descriptive statistic concepts as these are not only useful to organize large data sets, but also for the identification of underlying patterns (Burns & Burns, 2008). Furthermore, in *Chapter 2* we discovered that differences in demographics can lead to differing risk perceptions across the sample group (Román, 2010). For further analysis it is therefore important to examine whether the sample group we analyse possesses the same mean and standard deviation, i.e. is actually one unified group, or is separated into different groups with different risk perceptions.

	Mean	SD	Skewness	Kurtosis
TIR	3.84	1.730	0.286	-0.790
PYR	2.97	1.743	0.829	-0.153
SOR	2.25	1.462	1.246	1.098
PSR	3.84	1.599	0.249	-0.828
INT	5.27	1.378	-0.935	0.549
ABI	4.69	1.574	-0.597	-0.295
SEF	5.30	1.481	-0.980	0.690
ATT	4.03	1.619	-0.123	-0.414

Table 4. Descriptive statistics for constructs identified in PCA

Table 4 presents descriptive statistics for all constructs that were extracted from the principal component analysis is *Chapter 5.2*. As all items were measured using a 7-point Likert scale, the median being a value of "4", we can observe that all items that constitute a risk dimension score slightly below that value, whereas the items that belong to a trust dimension score above that value. First, when looking at the scores for means and standard deviations **time risk** and **privacy/security risk** are the most highly ranked. This is an indication that partly supports the assumptions we made in Hypothesis 2. What is more, the two trustworthiness dimensions that we retained for analysis both score above the average value, although it is evident that Posten AS scores higher on **integrity** than on **ability**. The relatively high mean score for **self-efficacy** further indicates that participants are confident in their abilities to work efficiently with Digipost.

In the next step it is also important to look at the distribution of the constructs. According to Burns & Burns (2008) skewed frequency distributions occur when factors tend to be stronger on one side of the scale. A negatively skewed distribution suggests a cluster of scores at the high-end of the graph (Pallant, 2010). A positively skewed distribution means that scores are clustered at the low end of the graph (Pallant, 2010), which is the case for the risk variables, shown in *Table 4*. When assessing the skewedness of the trustworthiness variables, the result indicates that respondents generally rated Posten fairly high in terms of integrity (s= -.935) and ability (s= -.597). What is more, the skewedness of **attitude** is negative as well with s=-.123 for the computed variable (when examining each variable constituting **attitude** individually the same result was achieved).

To further assess the normality of the distribution we conduct a Kolmogorov-Smirnov test for all variables. The results (see *Appendix 10.6.)* are highly significant (far below the 5% level of significance)**.** This suggests that all variables differ from normal distribution. However, following the central limit theorem (CLT), any distribution of independent random variables with a given mean and standard deviation can be approximately normal distributed provided that the sample size is sufficiently large (i.e. more than 30 cases) (Burns & Burns, 2008), our sample is considered sufficient in size (200+) so that non-normality will not have a significant impact on statistical inference following the CLT. We will conduct a more thorough analysis of the linearity and outliers of the data sample when testing the assumptions for multiple regression in *Chapter 5.5.1*.

Controlling for differences in demographics

In order to examine whether differing sub-populations within our sample group can be detected, i.e. whether the inclusion of demographic variables will have any meaningful effect on our results, we will analyse participants age and gender by first presenting some descriptive statistics and then comparing means and standard deviations by employing *independent sample t-tests*. As mentioned above, 123 of respondent were male and 91 were female. We performed t-tests for each of the dimensions in perceived risk separately, the results can be found in *Appendix 10.4*. We chose to control for the dimensions of risk as theory suggest that perceived risk for different demographic groups causes differences in attitude (J.-W. Lian & Yen, 2014; Román, 2010; Teo, 2001).

5.4. Independent sample t-test

To explore the existence of different means between male and female participants, as well as age, we employ *independent sample t-tests*. To assess differences among age groups divide participants into two predetermined age groups: Group 1= all participants up to 40 years (N=89) and Group 2= 41 years and over (N=125). In general, we found Age Group 2 to be relatively less risk averse on all dimensions of perceived risk, however, the differences were small. In the next section we will explore these differences further by using independent sample t-tests.

As with most statistical techniques, the use of independent-sample t-tests requires a set of underlying assumptions on the data to be significant. The preconditions for conducting a t-test assume that the dependent variable is measured on an interval level, random sampling of the

population, independence of observations, normal distribution of the data and homogeneity of variances (Pallant, 2005b). Most of these assumptions were already discussed in previous chapters *4.3 Data Collection and Sampling* as well as *5.2 Descriptive Statistics.* Although we know from the discussion above that our sample group does not fulfil the requirements for normal distribution, a sufficiently large sample size makes the use of a t-test justifiable (Burns & Burns, 2008). Homogeneity of variances is tested when conducting the analysis by generating the Levene score (Pallant, 2005b).

Summary of findings for independent-sample t-test

Firstly, when testing for different means in risk perception among gender, we found that male and female survey respondents have significantly different mean scores on social risk (t(212)= -2.373; p=.019). This indicates that female respondents believe more strongly than the male participants that the usage of Digipost will not be viewed as negative by their peer group. What is more, results from the independent sample t-test indicated a significant difference in means between males and females on security risk perception (t(212)= -2.35; p=.020). As seen in *Appendix 10.4*, security risk also has the highest mean score of all risk dimensions among male respondents (it is also the only item with a mean score above 4). This suggests that male respondents perceive Digipost as less secure and less safe to use than female respondents. These results are in contrast to findings from previous studies, which suggest that female participants are more risk averse compared to males (Román, 2010; Teo, 2001). However, it is important to note that risk aversion is a personal and individualistic trait, which is not necessarily knitted to gender. We conclude that differences in gender will not have an influence on the outcome of this analysis. Therefore, we choose not to include it as control variable.

The results of comparing the means and standard deviations for different age groups showed no clear pattern as to which of the two groups is more risk averse. Furthermore, no significant difference between Group Age 1 and Group Age 2 could be found regarding any of the risk dimensions (see *Appendix 10.5*). This is surprising, given that other studies did find significant differences in risk perceptions among study participants of different age groups (Román, 2010), however, this might again be due to the particular sample that we are dealing with. We concluded that different age groups of participants are not likely to cause variability in risk perceptions. Therefore, we will not include it as a control variable in further analysis.

5.5. Regression analysis with IBM SPSS

The following chapters deal with regression analysis that we conducted using IBM SPSS for statistical data analysis. We start the analysis with a comprehensive discussion on the assumptions for using regression analysis (*Chapter 5.5.1*) and then conduct a series of standard (*Chapter 5.5.2*) and sequential multiple (*Chapter 5.5.3*) regression analysis. Furthermore, we control for isolated regression effects of perceived risk and trustworthiness.

5.5.1 Assumptions

In our analysis we use multiple regression analysis, with the Ordinary Least Squares (OLS) estimates method, to test our hypotheses. The aim of the OLS regression is to minimize the sum of squared residuals, the part of the variation in the dependent variable that is not explained by the model. In order to do that, it is important that the assumptions of OLS are satisfied as they can influence unbiasedness and/or efficiency of the results. Unbiased results mean that the estimator on average hits the true population parameter. If results are biased the estimates can show an opposite effect (negative instead of positive, and vice versa) and/or they can largely deviate from the true population parameter (be a lot larger or smaller). Efficiency means that the smaller the estimated variance, the more precise are the OLS estimates. They are not far from the true population parameter. If the estimates are inefficient, statistical inference is affected. (Wooldridge, 2009)

When guiding a multiple regression analysis five (+one) assumptions should be met to reach the Best Linear Unbiased Estimator (BLUE). Assumption 1-4 accounts for unbiasedness and Assumption 5 assures efficiency of the estimates (Wooldridge, 2009). When checking for assumptions we used the results of a standard multiple regression test in SPSS, and standard multiple regression tests and additional tests in STATA of the following model:

$$ATT= \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI + \beta_7 SEF$$

Assumption 1: Linearity

We assume a linear relationship between the independent variables and the dependent variable. However, the dependent and independent variables can be defined to incorporate many forms of nonlinearities, for example, the variables can be used in logged form.

The multiple regression model can be stated as follows:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} + u_i,$$

where $\beta_0, \ldots, \beta_k$ are k+1 unknown population parameters, and *u* is an unobserved random error term (Wooldridge, 2009).

Based on *Chapter 2 Literature review*, we assume that there is a linear relationship between our explanatory variables and explained variable. Furthermore, we have no reason to believe that non-linear terms should be included, such as a squared term, as we do not expect the independent variables to have an increasing or decreasing marginal effects. However, functional form specification will be discussed further in *Assumption 4* and *Discussion on functional form.*

Assumption 2: Random sampling

Random sampling means that we assume a random sample of size *n*, $\{(x_{i1}, \ldots, x_{ik}, y_i) : i = 1, .., n\}$ where each unit from the sample has equal probability of being in the sample. The violation of this assumption leads to sample selection problems, where the sample is not representative (Wooldridge, 2009). As discussed in *Chapter 4.3. Data collection and Sampling*, a random sample of 3000 people were emailed from the non-users of Posten. However, from the 3000 people 214 respondents answered the questionnaire. We think that the main drivers for participation in the survey were motivation, interest and helpfulness. The assumption of random sampling is therefore violated. However, we do not believe that it would lead us to biased results. On the contrary, if Posten had made it obligatory for its customers to fill out the survey, careless responses could have given us controversial results, for further discussion of careless responses, see *Chapter 5.1 Data screening and preparation.*

Assumption 3: No perfect collinearity

In the sample (and in the population), none of the independent variables are constant, and there are no exact linear relationships among the independent variables. Meaning that there is variation in the values of the independent variables, and there are no exact linear relationships among the independent variables, they are not perfectly correlated with each other. From the standard errors, *Appendix 10.8.1*, we can see that there is variance in the explanatory variables. As for perfect collinearity, we can inspect the correlation tables, perfect collinearity would be a correlation of 1 or -1 between the variables (see Table 6 in *Chapter 5.5.2 Standard multiple*

regression). There is no perfect collinearity between any of our independent variables, this is hardly any time the case (Wooldridge, 2009).

However, a problem arises when there is a high correlation between the variables, and it is called multicollinearity. This is not a violation of Assumption 3, still it has to be discussed. Multicollinearity occurs at .7 or higher correlation between variables that inflates the size of error terms and weakens the analysis (Tabachnick and Fidell, 2013). The consequence of multicollinearity is that it increases the variance of the coefficient estimates and, therefore, make them sensitive to minor changes in the model. It weakens statistical inference and causes unbiasedness. The only way to overcome multicollinearity is by dropping variables. However, in that case, we risk omitted variable bias which is explained in Assumption 4 (Wooldridge, 2009).

Another measure to inspect multicollinearity is R_j^2. R_j^2 represents the goodness of fit when we run a regression of the explanatory variable that we think causes multicollinearity on the other explanatory variables. A problem might arise if R_j^2 is large, close to one, it means that one explanatory is well explained by the others. A high value of R_j^2 can cause a large variance in the coefficient. At the same time, a small sample size has the same effect on variance.

This measure can be inspected from the VIF (variance inflation column) column in the coefficients table of the regression output in Appendix 10.8.1: $VIF_j=1/(1-R_j^2)$. If R_j^2 is close to one, the VIF values are large. Sometimes a value of 10 is chosen to be an indicator of VIF being large. As the literature does not give an absolute number which would indicate multicollinearity, or a clear explanation on whether it is a severe problem or not we will be conscious about it when discussing our results, even if our VIF values are less than 2 (Wooldridge, 2009). From the correlations in Table 6 in *Chapter 5.5.2 Standard multiple regression*, we see that ability highly correlates with integrity .69 and psychological risk also highly correlates with privacy/security risk .63 which might give rise to multicollinearity. The correlation between psychological and privacy/security risk is supported by the study of Stone and Grønhaug (1993), who found that psychological risk correlates with all the other dimensions of risk, since experiencing risk causes psychological discomfort for the individual in any case.

Assumption 4: Zero conditional mean

The expected value of the error term is the same for all possible values of x_i, meaning that the error term does not correlate with one or more of the independent variables.

$$E(u|x_1, x_2, \ldots, x_k) = 0$$

This is called the zero conditional mean assumption, *u* is mean independent of *x*.
Here, we assume that there is no additional factor that accounts for the variation in the value of the dependent variable apart from our independent variables. If this assumption is violated no causal relationships can be derived, as there are additional factors in the error term that are responsible for the changes in the value of the dependent variable.
However, this assumption can only hold in the case of controlled experiments. In the case of observational data, we cannot capture a causal relationship, since there might be other factors affecting the dependent variables, and not only the ones that we controlled for. In our case, we work with observational data, therefore, we do not want to derive causal effects. We are only interested in the relationship between the independent and the dependent variables (Wooldridge, 2009).

Furthermore, the violation of this assumption leads to endogeneity, correlation between x_j and *u*, and it leads to biased results. The causes of endogeneity are omitted variable bias (when we do not include a potential explanatory variable in the model), functional form misspecification (the variables in the equation are not in the right algebraic form), measurement errors, or simultaneity (one or more of the explanatory variables and the explained variable is jointly determined, typically through an equilibrium mechanism). We can exclude measurement errors and simultaneity.
To check for functional form misspecification we used the RESET test. The RESET test is used to test whether the model we use is the correct one, or whether it has functional form misspecification, (there should be additional nonlinearities included). The RESET test uses powers of the fitted values.

$$y = \beta_0 + \beta_1 x_1 + \ldots + \beta_k x_k + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + u,$$

The null hypothesis of the test is that no nonlinear combination of the explanatory variables should be significant in the model above. In other words, our model is the correct one. The alternative hypothesis is that another model wold be more preferable. We tested this in STATA (*Appendix 10.7.1*) and the results indicate that H_0 should not be rejected, there is no functional form misspecification. . For further discussion on functional form specification see *Assumption 1* and *Discussion on functional form* (Wooldridge, 2009).

Omitted variable bias is almost always a problem in observational data, as stated before. When it comes to the possible factors that can affect the dependent variable, in our case attitude towards a service, the list is endless (Wooldridge, 2009). Omitted variable bias can be always

used to criticize research results, since in observational data, there can always be factors that were not controlled for. For example the design of the website is one factor that can affect trust in the website as it was shown in the literature, and it can be argued that it directly affects attitude as well. However, we think that our independent variables cover the main factors that can influence consumer attitude.

Assumption 5: *Homoscedasticity*

The error term has constant variance given any value of the explanatory variable. If the assumption does not hold the error term exhibits heteroscedasticity.

$$\text{Var}\,(u|x_1; x_2;\ldots; x_k) = \sigma^2$$

Heteroscedasticity leads to inefficiency. The variance of the estimates is affected, thus, statistical inference is affected. We may conclude that a coefficient is statistically significant while it is not and the other way around (Wooldridge, 2009). If the assumption is met, the distribution of the residuals is normal and they have constant variance for all levels of the DV, meaning that no clear pattern can be observed on the scatterplot (*see Appendix 10.8.3*). From the inspection of the scatterplot we think that heteroscedasticity is not a major problem in our data. However, we made a formal test to strengthen our argument. We used the Breusch-Pagan (BP) post estimation test in STATA. The Breusch-Pagan/Cook-Weisberg tests the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables. The error term is unknown, therefore, we use its predicted value, the residuals. First we ran the regression, the whole model, and then we applied the test. Following our results (see Appendix 10.7.3), we cannot reject the null hypothesis. Thus, according to the BP test, we do not violate Assumption 5, our residuals are homoscedastic.

Assumption 6: Normality of u

The population error term is independent of the explanatory variables $x_1; x_2;\ldots; x_k$ AND is normally distributed with mean zero and variance σ^2.

$$u \sim \text{Normal}(0; \sigma^2)$$

The error term is independently and identically distributed. The consequence of the assumption is that the distribution of the OLS estimator will be normally distributed and its mean is the unknown population parameter.

$$\hat{\beta}_j \sim \text{Normal}(\beta_j; \text{Var}\,(\hat{\beta}_j))$$

Assumption 6 is stronger than 4 and 5 combined.

In practice, the normal distribution of the residuals is rarely met. It is due to the fact that normal distribution is a continuous distribution and many measurement scales produce discrete data, as the 7-point Likert scales used by us (Hayes, 2013). Simulation research shows that only the most severe violations of normality have an effect on the validity of the regression, if the sample size is big enough (e.g. Duncan & Layard, 1973; Edgell & Noon, 1984; Havlicek &Peterson 1977; Hayes, 1996).

In Assumption 5, we proved that the residuals are independent from the explanatory variables. From *Appendix 10.8.2*, we can see that the residuals are close to normally distributed.

Summary of assumptions of regression

Assumption 1: Linearity	Assumption is met.	✓
Assumption 2: Random sampling	Assumption is violated but it is not a concern.	✓
Assumption 3: No perfect collinearity	Assumption is met but some concern.	×
Assumption 4: Zero conditional mean	Assumption is violated but it is not a concern.	✓
Assumption 5: Homoscedasticity	Assumption is met.	✓
Assumption 6: Normality of *u*	Assumption is violated but it is not a concern.	✓

Table 5. Summary of assumptions of the multiple regression

Discussion of functional form

So far we kept our results in a level-level model, meaning that the interpretation of the results would be, for example, what is the effect of a one unit change in the time risk variable on attitude in units of the Likert-scale. However, in our case, it would seem more reasonable to log transform the variables to inspect the change in the variables in percentage, for instance how a 1% change in time risk affects attitude in %. However, transforming the variables to logged variables lowered the quality of our data and led to the violation of several assumptions.

The conclusions on Assumption 1-3 stayed unchanged, yet problems arose in Assumption 5 and 6.

For Assumption 4 we ran a RESET test to check whether the log-log model fits the data better. The null hypothesis of the test was supported at 5% level of significance, meaning that there is

a better functional form to test our model, than the log-log model. See the results in Appendix 10.7.2.

Furthermore, inspecting the scatterplot of residuals and fitted values (*see Appendix 10.8.4*), we find a pattern, for higher levels of the fitted values and the residuals take higher values as well. We ran the BP-test again that turned out to be significant this time which indicates the presence of heteroscedasticity (*see Appendix 10.7.4*). Moreover, by inspecting the histogram of the residuals, it deviates more from normal distribution than in the case of a level-level model.

Therefore, based on the RESET test and the BP test, we decided to use a level-level model that satisfies better our assumptions.

5.5.2 Standard multiple regression

A standard multiple regression was performed between attitude towards Digipost as a dependent variable and perceived risk, trust and self-efficacy as independent variables:

$$ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI + \beta_7 SEF$$

Analysis was performed using IBM SPSS. The sample size *n* is 214. The results of the multiple regression is presented in Table 6, based on Tabachnick and Fidell (2013). It displays the correlations between the variables, the unstandardized regression coefficients (B), and the semi partial correlations (sr^2).

	ATT	***TIR***	***PYR***	***SOR***	***PSR***	***INT***	***ABI***	***SEF***	***B***	***sr^2***
TIR	-.64								**-.38****	.12
PYR	-.50	.43							-.11	
SOR	-.42	.44	.47						-.01	
PSR	-.54	0.44	.63	.46					**-.20****	.02
INT	.34	-.17	-.10	-.09	-.23				.10	
ABI	.34	-.19	-.09	-.05	-.25	.69			**.15***	.01
SEF	.39	-.32	-.38	-.44	-.23	.17	-.01		**.17****	.02
Mean	4.03	3.84	2.97	2.25	3.84	5.27	4.69	5.31		
SD	1.62	1.73	1.74	1.46	1.60	1.38	1.57	1.48		

Table 6. Standard multiple regression of risk, trust and self-efficacy on consumer attitude
$p < .05$, ** $p < .01$

Interpretation of R^2

R^2 is .565, this means that the model explains 56% of the variation in ATT. R^2 is significantly different from zero with F (7, 206) = 38.083 at a 1% level of significance. With every additional independent variable the value of R^2 raises regardless whether it is a good or bad explanatory variable. The adjusted R^2 is a measure to overcome this issue, and to be able to compare regression models with the same dependent variable. R^2 is adjusted with the degrees of freedom, here it is .549.

Interpretation of semi partial correlations

From the semi-partial correlation column (sr^2) we can further see the amount of R^2 that stems from unique sources. (Tabachnick&Fidell, 2013) time risk uniquely explains 12% of the total variance in attitude, and this tells us that if time risk was not included in the model R^2 would drop by the same percent. The same interpretation applies for privacy/security risk, ability and self-efficacy, with 2%, 1% and 2% respectively.

Interpretation of coefficients- Results of hypotheses tests

Three of the regression coefficients were found to be statistically significant at 1% level of significance – time risk, privacy/security risk and self-efficacy - and one coefficient was found to be significant at 5% level of significance – ability -. The significance of these variables is further confirmed by their 95% confidence intervals not containing zero (see *Appendix 10.8.1*). The variables are measured on Likert-scale, therefore, the units of measurement are points on the Likert-scale. The coefficient denote a partial effect of the independent variables on the dependent variables, holding other factors fixed. (Wooldridge, 2009)

Before interpreting the results, we have to note that in factor analysis, functional risk and financial risk were dropped from the list of variables, as well as benevolence. (see Chapter *5.2.4. Discussion of PCA).* Therefore, they were not included in further analysis, H1b and 1e, and H3c were not tested. Privacy and security risk were grouped into one variable after the factor analysis (see Chapter *5.2.3 Discussion of PCA).* Therefore, we did not test H1d and H1g. However, we introduced H1h, the joint effect of privacy and security risk on attitude, and thus, we modified H2 to H2mod. The new hypotheses that we tested are the following:

H1h*: Privacy and security risk together will negatively influence attitude.*

***H2mod**: Among the dimensions of perceived risk that have been included in the model, privacy and security risk together will have the strongest influence, the highest partial effect, on attitude.*

H1a: Time risk

Time risk is found to have the strongest negative influence on attitude, and to be statistically significant at 1% level of significance. A one point increase in perceived time risk in the service gives rise to a .38 points decrease in attitude towards the service. The unique contribution of time risk to the model is 12%.

We conclude that H1a is supported, perceived time risk negatively influences attitude towards the service.

H1c: Psychological risk

Psychological risk is found to have a negative influence on attitude, however, statistically non-significant. A one point increase in perceived psychological risk in the service gives rise to a .11 points decrease in attitude towards the service.

We conclude that H1c is rejected. Perceived psychological risk negatively influences attitude towards the service; however, the relationship is not statistically significant.

H1f: Social risk

Social risk is found to have a negative influence on attitude, however, statistically not significant. A one point increase in perceived social risk in the service gives rise to a .01 points decrease in attitude towards the service.

We conclude that H1c is rejected. Perceived social risk negatively influences attitude towards the service; however, the relationship is not statistically significant.

H1h: Privacy/security risk

Privacy/security risk is found to have a negative influence on attitude, and to be statistically significant at 1% level of significance. A one point increase in perceived privacy/security risk in the service gives rise to a .2 points decrease in attitude towards the service. The unique contribution of privacy/security risk to the model is 2%.

We conclude that H1h is supported, perceived privacy/security risk negatively influences attitude towards the service.

H2mod: Privacy and security risk together have the strongest influence

Time risk was found to have a higher partial effect (-.38) and a higher unique contribution (12%) on attitude than privacy/security risk (-.20 and 2% respectively) at the same significance level. Therefore, H2mod is rejected. Among the dimensions of perceived risk that have been included in the model, privacy/security risk together do not have the strongest influence on attitude.

H3a: Integrity

Integrity is found to have a positive influence on attitude, however, statistically non-significant. A one point increase in perceived integrity of the firm gives rise to a .10 points increase in attitude towards the service.

We conclude that H3a is rejected. Perceived integrity positively influences attitude towards the service; however, the relationship is not statistically significant.

H3b: Ability

Ability is found to have a positive influence on attitude, and to be statistically significant at 5% level of significance. A one point increase in perceived ability of the firm gives rise to a .15 points increase in attitude towards the service.

We conclude that H3b is supported, perceived ability positively influences attitude towards the service.

H4: Internet self-efficacy

Internet sel-efficacy is found to have the strongest positive influence on attitude, and to be statistically significant at 1% level of significance. A one point increase in the self-evaluation of internet usage effectiveness gives rise to a .17 points increase in attitude towards the service.

We conclude that H4 is supported, internet self-efficacy positively influences attitude towards the service.

5.5.3. Sequential multiple regression I.

A sequential multiple regression was applied to see whether adding trust and internet self-efficacy improved the prediction of attitude compared to a model where only risk had been used.

Model1: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR$

Model2: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI$

Model3: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI + \beta_7 SEF$

The analysis was performed using IBM SPSS. The sample size *n* is 214. The results of the multiple regression is presented in Table 7 that displays the correlations between the variables, the unstandardized regression coefficients (B), and the semi partial correlations (sr^2) (Tabachnick & Fidell, 2013); and Table 8 that displays R^2 , Adjusted R^2 , and R^2 change.

	R^2	*Adjusted R^2*	*R^2 Change*
Model1	.506	.496	.506**
Model2	.548	.535	.042**
Model3	.565	.550	.016**

Table 7. Sequential multiple regression, changes in R2
* p < .05, ** p < .01

Interpretation of R^2

Model 1: R^2 is .506, this means that the model explains 51% of the variation in attitude. R^2 is significantly different from zero with F Change (4, 209) = 53.5 at 1% level of significance.

Model 2: R^2 is .548, this means that the model explains 55% of the variation in attitude. R^2 Change is .042 and is significantly different from zero with F Change (2, 207) = 9.7 at 1% level of significance. This means that Model 2 explains 4.2% more of the variance in attitude than does Model 1. Adjusted R^2 is also higher than in Model 1. Therefore, Model 2 explains more of the variance in attitude.

Model 3: R^2 is .565, this means that the model explains 57% of the variation in attitude. R^2 Change is .016 and is significantly different from zero with F Change (1, 206) = 7.8 at 1% level of significance. This means that Model 3 explains 1.6% more of the variance in attitude than does Model 2. Adjusted R^2 is also higher than in Model 1 and 2. Therefore, Model 3 explains more of the variance in attitude than Model 1 and 2.

Thus we conclude, that it is better to use the whole model to explain the variation in attitude. However, to see the partial effects of the explanatory variables, a sequential approach might show us more interesting results.

	Model 1		*Model 2*		*Model 3*	
	B	**sr^2**	**B**	**sr^2**	**B**	**sr^2**
TIR	**-.43****	.15	**-.40****	.13	**-.38****	.12
PYR	-.12		**-.14***	.01	-.11	
SOR	-.05		-.07		-.01	
PSR	**-.25****	.03	**-.18****	.02	**-.20****	.02
INT			**.15****	.00	.10	
ABI			.11		**.15***	.01
SEF					**.17****	.02

Table 8. Sequential multiple regression of risk, trust and self-efficacy on consumer attitude
* p < .05, ** p < .01

Interpretation of semi partial correlations

In Model 1, time risk uniquely explains 15% of the total variance in attitude, and this tells us that if time risk was not included in the model R^2 would drop by the same percent. The same interpretation applies for privacy/security risk with 3%.

In Model 2, the unique contribution of time risk and privacy/security risk is reduced to 13% and 2% of the total variance in attitude, by psychological risk with 1%.

In Model 3, the unique contribution of time risk is further reduced to 12% of the total variance in attitude, by ability and self-efficacy 1% and 2% respectively. Privacy/security risk's unique contribution is 2%.

Comparison of coefficients

The first observation is that as more variables are added, the partial effect of the risk variables decreases. The partial effects of time risk and privacy/security risk are the highest in Model 1. This is not surprizing, since Model 2 and Model 3 have more variables that correlate to some extent with the risk variables, and take away some of the "power" of the risk variables.

Second, in Model 2 the coefficient of psychological risk increases and becomes statistically significant. Previously, we observed a high correlation between privacy/security risk and psychological risk that might be the reason why the effect of psychological risk is lower in Model 1 and not statistically significant.

Third, as we discussed in the assumptions, integrity and ability highly correlates as well. Their effect on attitude is influenced by adding self-efficacy. In Model 2 integrity shows a stronger positive influence on attitude that is statistically highly significant, whereas in Model 3 where self-efficacy is included ability shows a stronger positive influence.

5.5.4. Sequential multiple regression II.

To further analyse the possible effects of multicollinearity between psychological risk and privacy/security risk, and integrity and ability on the regression coefficients, we ran a second sequential regression where the following steps were included:

Model1: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR$

Model2: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR$

Model3: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT$

Model4: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI$

Model5: $ATT = \beta_0 + \beta_1 TIR + \beta_2 PYR + \beta_3 SOR + \beta_4 PSR + \beta_5 INT + \beta_6 ABI + \beta_7 SEF$

	R^2	*Adjusted* R^2	R^2 *Change*
Model1	.474	.466	.474**
Model2	.506	.496	.032**
Model3	.542	.531	.037**
Model4	.548	.535	.006
Model5	.565	.550	.016**

Table 9. Sequential multiple regression, changes in R2
* p < .05, ** p < .01

Interpretation of R^2

Model 1: R^2 is .474, this means that the model explains 47% of the variation in attitude. R^2 is significantly different from zero with F Change (3, 210) = 63 at 1% level of significance.

Model 2: R^2 is .506, this means that the model explains 51% of the variation in attitude. R^2 Change is .032 and is significantly different from zero with F Change (1, 209) = 13.6 at 1% level of significance. This means that Model 2 explains 3.2% more of the variance in attitude than does Model 1. Adjusted R^2 is also higher than in Model 1. Therefore, Model 2 explains more of the variance in attitude.

Model 3: R^2 is .542, this means that the model explains 54% of the variation in attitude. R^2 Change is .037 and is significantly different from zero with F Change (1, 208) = 16.2 at 1% level of significance. This means that Model 3 explains 3.7% more of the variance in attitude than does Model 2.

Model 4: R^2 is .548, this means that the model explains 55% of the variation in attitude. R^2 Change is .006 and is not significantly different from zero with F Change (1, 207) = 2.7. This means that at this point of entry, entering ability does not significantly improves R^2 . This method of hierarchical entry was chosen arbitrarily, only to show how the coefficients change if the variables suspected with multicollinearity problems are entered separately. It does not mean that ability is not a good explanatory variable of attitude.

Model 5: R^2 is .565, this means that the model explains 57% of the variation in attitude. R^2 Change is .016 and is significantly different from zero with F Change (1, 206) = 7.8 at 1% level of significance. This means that Model 5 explains 1.6% more of the variance in attitude than does Model 4. Adjusted R^2 is also higher than in the models before. Therefore, in this regression, we find that Model 5 is a better fit than Model 1-4. Thus we conclude again that it is better to use the whole model to explain the variation in attitude.

	Model 1		*Model 2*		*Model 3*		*Model 4*		*Model 5*	
	B	**sr^2**	**B**	**sr^2**	**B**	**sr^2**	**B**	**sr^2**	**B**	**sr^2**
TIR	**-.47****	.18	**-.43****	.15	**-.41****	.14	**-.40****	.13	**-.38****	.12
PYR	**-.23****	.04	-.12		**-.13***	.01	**-.14***	.01	-.11	
SOR	-.09		-.05		-.06		-.07		-.01	
PSR			**-.25****	.03	**-.19****	.02	**-.18****	.02	**-.20****	.02
INT					**.23****	.04	**.15****	.00	.10	
ABI							.11		**.15***	.01
SEF									**.17****	.02

Table 10. Sequential multiple regression of risk, trust and self-efficacy on consumer attitude
* p < .05, ** p < .01

Interpretation of semi partial correlations

Semi partial correlations decrease as the number of independent variables grow. This is not surprising, the more the independent variables, the less they explain uniquely.

Comparison of coefficients

The first observation is that if privacy/security risk is added only in a second step, it takes away half of the effect of psychological risk and renders it insignificant; whereas time risk and social risk are hardly affected. We think that this is the effect of multicollinearity between the two variables that might give biased and statistically instable results of psychological risk and privacy/security risk.

Second, in Model 3 we add integrity separately to the model and it is significant at 1% level of significance, the estimated coefficient is .23. However, when we add ability in Model 4, it takes away almost half of the effect of integrity. Furthermore, in Model 5 when we add self-efficacy, the effect of ability raises and the effect of integrity decreases. We think that the statistical instability of integrity and ability is a consequence of the multicollinearity between them. Therefore, these coefficients are biased.

5.6. Further analysis

As discussed previously, the relationship between the perceived risk and trustworthiness is complex in nature and cannot be limited to simple direct effects. In *Chapter 2.3*. we introduced the work by Lim (2003) who presents different ways in which the relationship between the two constructs has been modelled by the literature in the past. A recurring view is the proposition that the effect of perceived risk is influenced by the presence of trustworthiness (e.g.: Aldás-Manzano et al., 2009; Grabner-Kräuter & Faullant, 2008). The presence of trustworthiness is said to have a positive effect on intention to buy as well as effective purchasing when faced with risk (Flavián & Guinalíu, 2006; Jarvenpaa et al., 2000). Additionally, the study by Lai & Chen (2006) finds offline brand trust to have significant influence on risk. Given the strong support from the literature, it can be interesting to see whether the perceived trustworthiness of Posten is capable of significantly influencing the negative effect of perceived risk on attitude

towards Digipost. In order to test this alternative relationship we propose a mediation model by using IBM SPSS together with the PROCESS macro developed by Hayes (2013).

5.6.1. Mediation analysis with PROCESS

We conducted a mediation analysis to determine whether the negative effect of perceived risk in an online channel on attitude is mediated by one or more dimensions of a firm's trustworthiness. As PROCESS does not allow us to look at more than one independent variable at a time, this analysis was performed separately for the four risk dimension that had a significant direct influence on attitude, namely time risk, psychological risk, social risk and privacy/security risk (see *Chapter 5.2*). The sample size is N=214, detailed output for the mediation analysis can be found in *Appendix 10.9.*

In line with previous analysis, we find that the direct effect (c'- path) is significantly different from zero for time risk (effect: -.551, $p < .000$; LLCI: -.646 ULCI: -.457), privacy/security risk (effect: -.442, $p < .000$; LLCI: -.551 ULCI: -.332), psychological risk (effect: -.430, $p < .000$; LLCI: -.533 ULCI: -.327) and social risk (effect: -.432, $p < .000$; LLCI: -.560 ULCI: -.304). Furthermore, we find indirect effects for time risk and privacy/security risk through integrity. This means that the effect of time risk is mediated through a firm's integrity (effect: -.0247, LLCI: -.081 ULCI: -.002) and the same is the case for privacy/security risk (effect: -.031, LLCI: -.093 ULCI: -.002). However, the indirect effect is not strong enough for full mediation to occur, the total effect for both dimensions on attitude is therefore still significant (time risk total effect: -.598, privacy/security risk effect: -.503; both at significance level $p < .000$). In the case of psychological risk and social risk no mediation could be detected. Additionally, bootstrapping is a robust analysis that is appropriate for the application to non-normal data samples (Preacher & Hayes, 2008). The bias-corrected bootstrap confidence intervals which is entirely above zero further confirms the significance of the main and indirect effect, although it should be noted that the effect size in both cases is small.

5.6.2. Conclusion from further analysis

From the analysis above we can conclude that the presence of integrity to some extent mediates the postulated effect of time risk on attitude. Similarly, for the postulated effect of privacy/security risk on attitude we also find that integrity is a significant mediator. However, in both cases the magnitude of the indirect effect is rather weak and not strong enough to completely explain the main effect. For Digipost, this indicates that Posten is advised to

counteract concerns regarding time risk and security/privacy risk by communicating their adherence to generally accepted principles rather than their skills. The findings supports our approach as we chose to look at the individual effects of trustworthiness and perceived risk to be able to account for differences in the effect of individual dimensions. We conclude that although this study was mainly focused on observing direct effects between the dependent variable and the independent variables, the relationship between risk and trust can be modelled in different ways and is by no means limited to direct effects only. As it was previously mentioned, this study was faced with constraints in terms of time and funds as well as issues with multicollinearity of the data which made a deeper analysis of the subject matter unfeasible. Further research should be dedicated to examining more complex relationships between the two constructs and the resulting influence on attitude. We therefore offer propositions for further research in the last chapter of this thesis.

6. Summary of hypothesis testing

In Table 11. we present a final summary of results regarding hypothesis testing.

Hypothesis	Rejected/Supported
H1a: TIR -> ATT (-)	Supported
H1b: FUR -> ATT (-)	Not tested
H1c: PYR -> ATT (-)	Rejected
H1d: PRR -> ATT (-)	Not tested
H1e: FIR -> ATT (-)	Not tested
H1f: SOR -> ATT (-)	Rejected
H1g: SER -> ATT (-)	Not tested
H1h: PSR -> ATT (-)	Supported
H2mod: PSR strongest influence ->ATT (-)	Rejected
H3a: INT -> ATT (+)	Rejected
H3b: ABI -> ATT (+)	Supported
H3c: BEN -> ATT (+)	Not tested
H4: SEF -> ATT (+)	Supported

Table 11. Summary of Hypothesis Testing

7. Discussion

Taking the findings from the previous analysis into account, the next section of this paper will discuss theoretical and practical implications. While the relationship between risk and trust is complex in nature, this thesis is aimed at contributing to this particular field of study by offering further theoretical insights. Furthermore, this study offers some useful implications for Posten Norge and other companies that are planning on introducing SST innovation.

7.1. Theoretical implications

The findings from our study are in line with the general consensus among scholars in that consumer attitude is in general negatively affected by perceived risk and positively affected by trust and self-efficacy. Furthermore, we found that the greatest variance in consumer attitude was explained by adding all three constructs into the model, which is also supported by the previous literature. However, the importance of risk dimensions varies greatly within the context in which they are applied. In this study, although we expected security and/or privacy risk to have the biggest influence on attitude towards Digipost, we actually found the presence of time risk to be the biggest deterrent. We therefore believe that valuable insights can be gained from examining all factors that make up multidimensional constructs, such as risk, rather than merging them together. Moreover, the results of the hypotheses tests should be viewed with caution. Time risk and privacy/security showed a high level of correlation that rendered the results unstable as showed in *Chapter 5.5.3* Sequential multiple regression II. Therefore we acknowledge that the results of the tests might be biased.

Additionally, although we specifically controlled for differences in outcome of the three dimensions of trustworthiness according to Mayer et al. (1995), we could not empirically distinguish between the three constructs. This was evident by cross-loadings in the principal component analysis (Chapter 5.2) as well as when conducting multiple regression analysis (Chapter 5.5 onwards). Nevertheless, other scholars (Gefen, 2002b) have verified the validity of Mayer et al.'s three-dimensional trust framework and we believe that our failure to detect significantly different constructs stems from multicollinearity issues within the data set. We do acknowledge Mayer et al. (1995)'s work as a fundamental contribution to the literature on trust and its antecedents and believe that their work should be further replicated in different studies in order to improve validity.

Furthermore, we found that although self-efficacy is mentioned in the literature as an important contributor to attitude formation (Akhter, 2014), relatively few studies have focused on the specific influence of this construct. Previous studies mostly focus on internet self-efficacy as an antecedent to either risk or trust (Akhter, 2014), however, we found a significant direct influence of self-efficacy on attitude even after the effect of risk and trust have been controlled for. Therefore we believe that more research should be dedicated to analysing self-efficacy as an independent construct and its importance for attitude formation and usage intention.

7.2. Managerial implications

Although it is apparent that privacy and security risk still have a strong influence on consumer's attitude towards the service, we found time risk to have the strongest negative influence. This finding is rather counter intuitive given that one of Digipost's greatest advantages is to improve convenience and save time for its customers. We believe that this result is connected to the fact that the use of postal services is rather habitual and consumers are therefore less willing to adapt to new practices. In fact, previous research on internet banking adoption has found that one of the biggest deterrents is that consumers do not perceive a benefit in adopting new, innovative services if they are satisfied with traditional offerings (Gerrard & Cunningham, 2003). As our study is conducted among non-users of Digipost, it is clear that these consumers will need to invest some time into changing their habits (i.e. getting acquainted with the application, navigating the website etc.) before being able to benefit from increased convenience. While the customer might experience some short-term losses due to his unfamiliarity with the new service, it should be clearly communicated how adapting the SST will be beneficial in terms of convenience and security in the long-term. Moreover, it should be made clear that adoption of the SST will result in a new or improved offering to the consumer, meaning that the SST innovation should fit in the existing channel network of the company and generate value for the consumer. Therefore it is necessary that companies distinguish the benefits that can be derived from SST innovation in contrast to traditional offline channels.

To further counteract the negative effect that is caused by the strong presence of time risk we also suggest that Posten and other SST innovators put an emphasis on communicating the ease of use in Digipost, particularly during the registration process. The website through which

Digipost is accessed should be easy to navigate and self-explanatory to enhance the user experience and ease the transition from traditional offerings to new, more innovative services.

8. Limitations

As all other scientific studies, ours is subject to several limitations, which pose a threat to the reliability and validity of its results. These will be discussed in the following chapter.

8.1. Reliability

The reliability of a study refers to the extent that one gets consistent and repeatable findings (Trochim, 2006). Reliability is divided into an internal and an external part. If a study is internally reliable, the survey items measure a single construct. If a study is externally reliable, it uses consistent, stable measures over time (Bryman & Cramer, 2001).

According to Bryman and Cramer (2001), when using scales with multiple items, the internal validity or consistency of the constructs must be checked. We accounted for internal validity with our Cronbach's alpha analysis in *Chapter 5.2.3. Internal consistency of constructs*, after we grouped several answers into a single variable based on our principal component analysis. We judged the internal reliability of our constructs to be satisfactory.

As for external validity, we had to ensure that if other researchers repeated our study they would find consistent findings. We gave a detailed description of the choice of the methods used as, well as, the steps of our analysis. However, when it comes to survey respondents, if a different sample is used, or in a different time period, the results are very possibly going to be different, in terms of which risk and trustworthiness variables are going to be significant predictors of attitude. It is important to note that the most general findings, that risk influences attitude negatively, and trustworthiness and self-efficacy positively are not likely to change, as they were tested through many different samples and in different circumstances.

8.2. Validity

To ensure that our findings are valid, three of the four most common types of validity concerns will be discussed: construct validity, external validity and conclusion validity. The fourth type,

internal validity, is restricted to examining cause-and-effect relationships and is thus not relevant for descriptive studies (Trochim, 2006).

E*xternal validity* describes to what degree valid generalisations can be made from our sample group to the bigger population (Trochim, 2006). As described in *Ch. 4.3. Data Collection & Sampling*, our sample was drawn from a wider population of customers of Posten Norge AS, who are not registered as users of Digipost. The three biggest threats to external validity stem from the possibility that the findings of a study might not be generalizable to other "people", "places" and "times" (Trochim, 2006).

If the threat of "people" is applicable, it means that our results are not generalizable for the whole population (Trochim, 2006). When selecting participants for the survey, a random sampling technique was employed to ensure a certain degree of external validity regarding the general population of Posten Norge AS customers, who were not simultaneously using Digipost at the time of completing the survey. As our sample only consist of customers of one company (Posten Norge AS) in one industry (postal services), reviewing one particular online service (Digipost), we acknowledge that generalisability of our findings is weak when applied to other online self-services, companies or industries. Furthermore, the survey was restricted to Posten Norge customers in Norway, therefore generalizing to a similar population in other countries is not possible. However, given the time and resource constraints involved in carrying out this research project, further research should be dedicated to replicating and improving this study in different settings.

To counteract threats to external validity that stem limitations to a particular geographic location (Trochim, 2006), we assessed the respondent's individual profile in *Chapter 4.3.1.* (see also Appendix 10.2.) and found that the distribution of participants across Norway was at a satisfactory level. However, we still acknowledge that the threat of "place" is a concern for the generalisability of our study in a wider sense, as we can't assume applicability of our findings for other countries outside Norway.

Finally, the threat of "time" entails that our results are due to the circumstance that the study was conducted in a particular time frame (Trochim, 2006). This concern might be particularly relevant for our study as we opted for the use of cross-sectional data, which was collected at a single point in time and is therefore difficult to use as basis for generalisation (De Vaus, 2001).

Moreover, we recognize that potential advertisements of Posten Norge AS or Digipost, would have a disrupting effect on our findings, as repeated advertisement is proven to have a significant impact on attitude formation and behavioural intention (Berger & Mitchell, 1989). Therefore we acknowledge that the effect of advertisement is a potential limitation to our study, however, it should be noted that we were not informed about any particular promotional activities that were carried out around the time that the survey was conducted.

Similar to external validity, *construct validity* is also related to generalisability, in particular it refers to the question if the operationalisations used in this study can relate back to the theoretical concepts they were based on (Trochim, 2006). Cook & Campbell (1979) list a number of different threats to construct validity, such as inadequate explication of constructs prior to operationalisation, confounding constructs and various social threats, e.g. hypothesis guessing or researcher's expectancies. In order to ensure correct operationalisation, Trochim (2006) advises to check for different types of construct validity, which are either translation-related (face and content validity) or criterion-related (convergent and discriminant validity). *Face validity*, i.e. a subjective judgement as to whether the operationalisation was done correctly (Trochim, 2006), is ensured not only through usage of pre-established scales, but also through the fact that the survey was developed by people with considerable research experience, including our thesis supervisor, from the *Department of Strategy and Leadership* at Norges Handelshøyskolen. Similarly, *content validity* can be assumed due to the clear operationalisations provided by other researchers (Jacoby & Kaplan, 1972; Mayer et al., 1995), the validity of which has been extensively tested in previous studies (Rousseau et al., 1998).

Furthermore, *convergent validity* ensures that the constructs we used in the operationalisation are similar to other operationalisations that are said to measure the same construct; dissimilarity to constructs that it is not supposed to measure is referred to as *divergent (or discriminant) validity* respectively (Trochim, 2006). To ensure the presence of both, we conducted a principal component analysis in Chapter *5.2. Factor Reduction and Construct Validation*. Following the results of the principal component analysis, we choose to eliminate performance risk, financial risk and benevolence from further analysis, as these items showed cross-loadings with other constructs (for a more detailed reasoning as to why these factors were excluded from the analysis, see *Ch. 5.2.4*). From the findings of the PCA we further decided to merge privacy and security risk into one construct. All remaining constructs (time loss risk, psychological risk, social risk, privacy/security risk, ability, integrity and attitude) were further assessed through

generating Cronbach's Alpha (*Ch. 5.2.3)* and showed satisfactory high levels of convergent and divergent validity.

Lastly, *(statistical) conclusion validity* is concerned with the degree to which the conclusions we reach are valid (Trochim, 2006). Two major threats to conclusion validity are that we either fail to detect existing relationships between variables or we wrongly assume a conclusion that does not exist (Trochim, 2006), also referred to as Type 1 and Type 2 errors (Pallant, 2010). Trochim (2006) names violations of assumptions of statistical tests as one of the major threat to this type of validity, as such, the issue of non-normality of our sample data was already discussed in earlier in this research paper.When assessing the skewness of the data in *5.1 Descriptive Statistics* we concluded that although our data deviates from normal distribution, the differences are not substantial. Furthermore, following the CLT in *Chapter 5.3 Descriptive statistics*, we consider our sample size to be significantly large to overcome issues associated with non-normal distribution. Therefore, we conclude that the techniques we employed during analysis are sufficiently robust to provide a satisfactory level of statistical conclusion validity. Furthermore assumptions to the statistical techniques we employed are discussed

9. Conclusion

When developing our study we were interested in the direct effects of the dimensions of perceived risk in an online self-service, a firm's trustworthiness and individual consumer characteristics on consumer attitude; and whether all three factors significantly contribute to explain changes in consumer attitude. The direct effect of perceived risk in the online service was negative, whereas the effect of firm trustworthiness and individual consumer characteristics, namely internet self-efficacy was positive. These findings are in line with theory. Moreover, it is statistically proven that if all three factors are used we can explain a larger part of the variation in consumer attitude. The aim of this paper was to derive general theoretical implications that enrich research in online services, as well as, managerial implications that are useful for Posten Norge and other companies that are introducing SST innovations.

Our study adds two main contributions to the existing research. The first is that we examined factors that influence attitude towards SST innovation in different channels. Previous studies

examined how risk and trust perceived in an online channel interact and affect consumer attitude towards the channel. On the contrary, by accounting for differences in the levels on which these variables operate we created a deeper understanding of how risk and trustworthiness influence attitude. Additionally, we showed that self-efficacy as an independent variable has a positive, direct effect on attitude towards SST. This finding undermines the importance of self-efficacy when explaining attitude formation and further research should be conducted to investigate the relative importance of self-efficacy compared to other variables. The second main contribution is that we specifically emphasised the multidimensionality of risk and trustworthiness, which enabled us to account for differences in the effects of the individual dimensions.

Furthermore, we were able to derive practical implications from our analysis. Contrary to our initial hypothesis, the findings suggest that time risk is the strongest deterrent to SST adaption. We therefore suggest that by incorporating the long-term time saving benefits of Digipost in the communication strategy of the company, Posten can achieve a more positive perception and attitude of its new service. Additionally, SST innovators should create an interface that is self-explanatory and easy to navigate.

To conclude, in order to create a positive consumer attitude towards SST innovation, Posten Norge and other SST providers are advised to pay close attention to the factors influencing attitude formation and usage intention. In this study, we focused primarily on explaining how multidimensional variables and constructs on different levels can differ in their effects. Nonetheless, due to the quality of our data, we were not able to address all different aspects that our model proposes. This opens new avenues for further research on the topic which will be outlined in the final paragraphs.

Further research

First, due to the quality of our data sample, we were not able to demonstrate how the dimensions of trustworthiness differ in their influence on attitude towards SST. We believe that a more extensive research can yield more comprehensive results. If the sample size is increased the problems of multicollinearity are likely to disappear and differences between the risk and the trustworthiness variables can be examined more successfully. Further research should investigate the different impact of the dimensions of trustworthiness on attitude while controlling for a sufficiently large sample size to avoid multicollinearity issues.

Next, not only direct effects but different types of interactions exist between the variables. For example, as we have demonstrated in *Ch. 5.6. Further analysis*, there is a mediator effect of trustworthiness on the relationship between perceived risk and attitude. However, some of the many other possibilities can be self-efficacy as a mediator between both risk-attitude and trustworthiness-attitude relationships, as individual characteristics always play an effect in attitude formation.

Moreover, from the antecedents of trust we have chosen perceived trustworthiness in the firm to include in the model. However, further research can inspect the effects of individuals' trust propensity to explain a larger share of the variation in attitude, and also to enlarge the spectrum of individual characteristics that can affect attitude. Following this line of thought, the relative importance of self-efficacy, as an individual characteristic, in contrast to perceived risk and trustworthiness. In particular, we propose that future studies should test whether the relative importance of self-efficacy is dependent on the context in which it is reviewed, i.e. whether it is particularly relevant for adaptation of SST innovations. A deeper understanding of this variable will contribute to the understanding of attitude formation in general as well as SST adaptation in particular.

Finally, it should also be noted that attitude formation is a complex process that is influenced by a broad range of different factors. Including more explanatory variables, such as perceived benefits of the service or website design, will lead to more variation explained in attitude towards SS.

10. Appendix

10.1. Translated questionnaire

Perceived risk

Question 2 Time risk

Time_risk1: I think my use of Digipost is time-consuming

Time_risk2: I think I waste much time when I use Digipost

Time_risk3: I feel that using Digipost is inefficient use of my time

Question 3 Functional risk

Func_risk1: I am sometimes concerned if Digipost work as it is supposed to

Func_risk2: I think there is a significant chance that Digipost will not work as well as it is supposed to

Func_risk3: I am unsure if the technological solutions in Digipost work as it is supposed to

Question 4 Psychological risk

Psych_risk1: I may feel uneasy when I use Digipost

Psych_risk2: Using Digipost may give me a feeling of anxiety

Psych_risk3: I feel a little nervous when using Digipost

Question 5 Privacy risk

Priv_risk1: I think there is a significant chance that my personal information can be lost when I use Digipost

Priv_risk2: I am worried that my use of Digipost increases the chances of receiving mail that I have not requested

Priv_risk3: I am afraid that my use of Digipost increases the chances that my personal information can be used for other purposes

Question 6 Financial risk

Fin_risk1: I think I can lose money by using Digipost

Fin_risk2: I think I can lose control over bank accounts and credit cards by using Digipost

Fin_risk3: I am worried about financial losses due to system failures resulting in that I do not receive certain mail

Question 7 Social risk

Soc_risk1: People who mean a lot to me think it is a bad idea to use Digipost

Soc_risk2: My acquaintances think it is unwise to use Digipost

Soc_risk3: My use of Digipost gives a negative impression on my friends

Question 8 Security risk

Sec_risk1: I do not think that the digital service Digipost is secure

Sec_risk2: I do not think that Digipost is well protected from hacking

Sec_risk3: I sometimes wonder if it is safe to use Digipost

Internet self-efficacy

Question 16 Self-efficacy

Self_eff1: I manage to use Digipost effectively

Self_eff2: I have satisfactory abilities to use Digipost effectively

Self_eff3: I have satisfactory skills to use Digipost

Trust

Question 30 Integrity

Integ1: I think Posten is honest

Integ2: To me, Posten is reliable

Integ3: Posten keeps their promises

Question 31 Ability

Ability1: Posten has high competence

Ability2: Posten has a high degree of expertise

Ability1: Posten has a high degree of knowledge and abilities

Question 32 Benevolence

Benevol1: Posten seems to be concerned with what is best for me as a customer

Benevol2: I think Posten considers my welfare besides making profit

Benevol3: I am sure that if I have a problem, Posten will respond constructively and care about me

Attitude

Question 17-20 Attitude towards using Digipost

I think using Digipost is:

Bad _ _ _ _ _ _ _ Good

Unreasonable_ _ _ _ _ _ _ Reasonable

Unfavorable _ _ _ _ _ _ _ Favorable

Negative _ _ _ _ _ _ _ Positive

Age

Question 41 How old are you?

Gender

Question 42 Gender?

10.2. Descriptive Statistics from Respondent's profile

	Minimum	Maximum	Mean	Std. Deviation	Skewness	Skewness Std. Error	Kurtosis	Kurtosis Std. Error
AGE	0	94	46.47	15.02	.585	.166	.160	.331

GENDER	Frequency	Percent
Female	91	42.5
Male	123	57.5
Total	214	100

EDUCATION	Frequency	Percent
Elementary school	2	.9
High school	27	12.6
Higher education (1 - 4 years)	84	39.3
Higher education (more than 4 years)	101	47.2
Total	214	100

GEOGRAPHIC DISPERSION	Frequency	Percent
Oslo	40	18.7
Akershus	30	14.0
Hordaland	26	12.1
Rest of Norway	118	55.2

Total	214	100

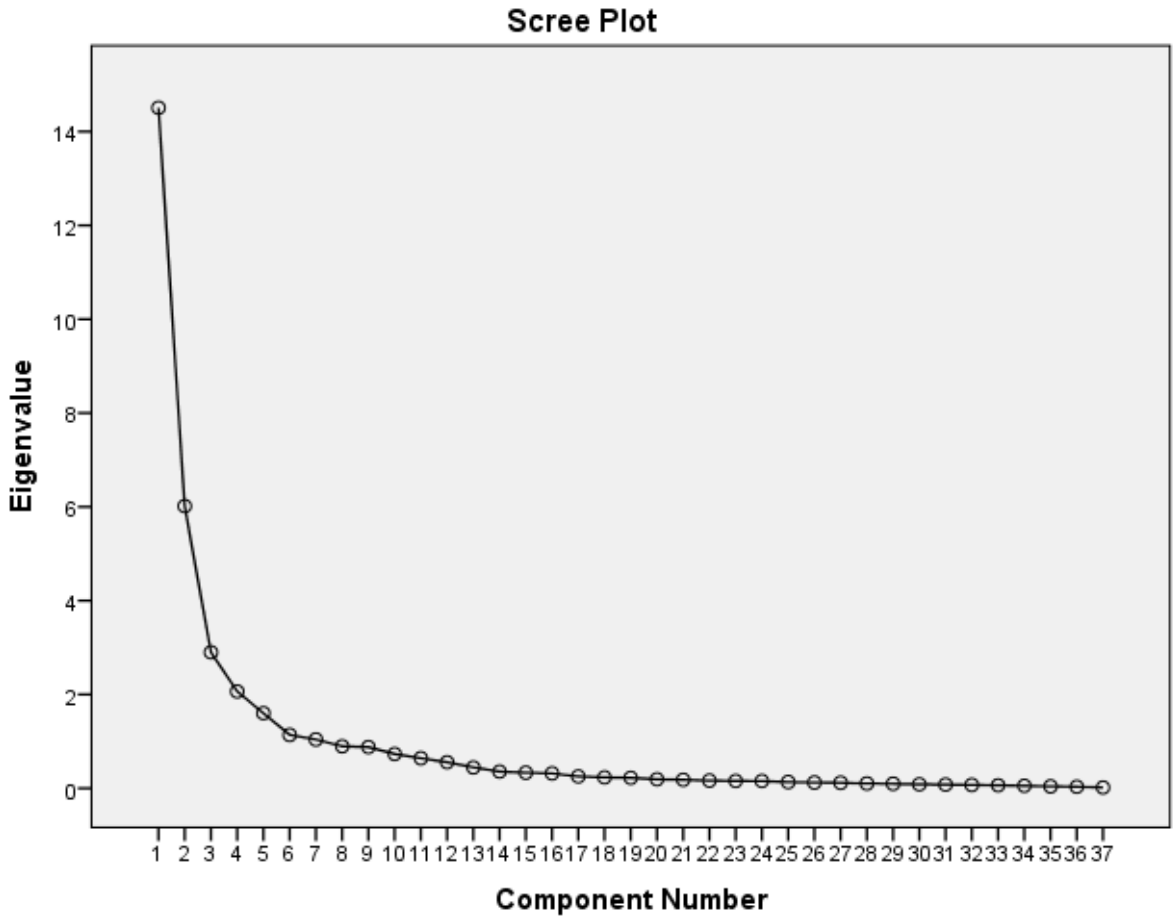
10.3. Factor Analysis

10.3.1 Results KMO and Bartlett's Test

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.911
Bartlett's Test of Sphericity	Approx. Chi-Square	9349.363
	df	666
	Sig.	.000

10.3.2. Results Scree plot



10.3.3. Eigenvalues greater than 1 in PCA

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.508	39.210	39.210	14.508	39.210	39.210
2	6.017	16.261	55.472	6.017	16.261	55.472
3	2.898	7.832	63.304	2.898	7.832	63.304
4	2.064	5.579	68.883	2.064	5.579	68.883

5	1.601	4.328	73.210	1.601	4.328	73.210
6	1.139	3.077	76.288	1.139	3.077	76.288
7	1.041	2.813	79.101	1.041	2.813	79.101

10.3.4. Factor analysis only for trustworthiness

Correlation Matrix

		Integ1	Integ2	Integ3	Abili1	Abili2	Abili3	Benevol1	Benevol2	Benevol3
Correlation	Integ1	1.000	.746	.745	.574	.557	.547	.545	.522	.542
	Integ2	.746	1.000	.903	.633	.667	.666	.598	.570	.571
	Integ3	.745	.903	1.000	.666	.691	.677	.631	.616	.621
	Abili1	.574	.633	.666	1.000	.946	.937	.759	.702	.714
	Abili2	.557	.667	.691	.946	1.000	.952	.757	.700	.701
	Abili3	.547	.666	.677	.937	.952	1.000	.750	.687	.710
	Benevol1	.545	.598	.631	.759	.757	.750	1.000	.855	.803
	Benevol2	.522	.570	.616	.702	.700	.687	.855	1.000	.800
	Benevol3	.542	.571	.621	.714	.701	.710	.803	.800	1.000

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.903
Bartlett's Test of Sphericity	Approx. Chi-Square	2442.094
	df	36
	Sig.	.000

Communalities

	Initial
Integ1	1.000
Integ2	1.000
Integ3	1.000
Abili1	1.000
Abili2	1.000
Abili3	1.000
Benevol1	1.000
Benevol2	1.000
Benevol3	1.000

Extraction Method: Principal Component Analysis.

Pattern Matrix[a]

	Component	
	1	2
Integ1		.941
Integ2		.933
Integ3		.872
Abili1	.902	
Abili2	.880	
Abili3	.885	
Benevol1	.937	
Benevol2	.909	
Benevol3	.880	

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.[a]

a. Rotation converged in 4 iterations.

Structure Matrix

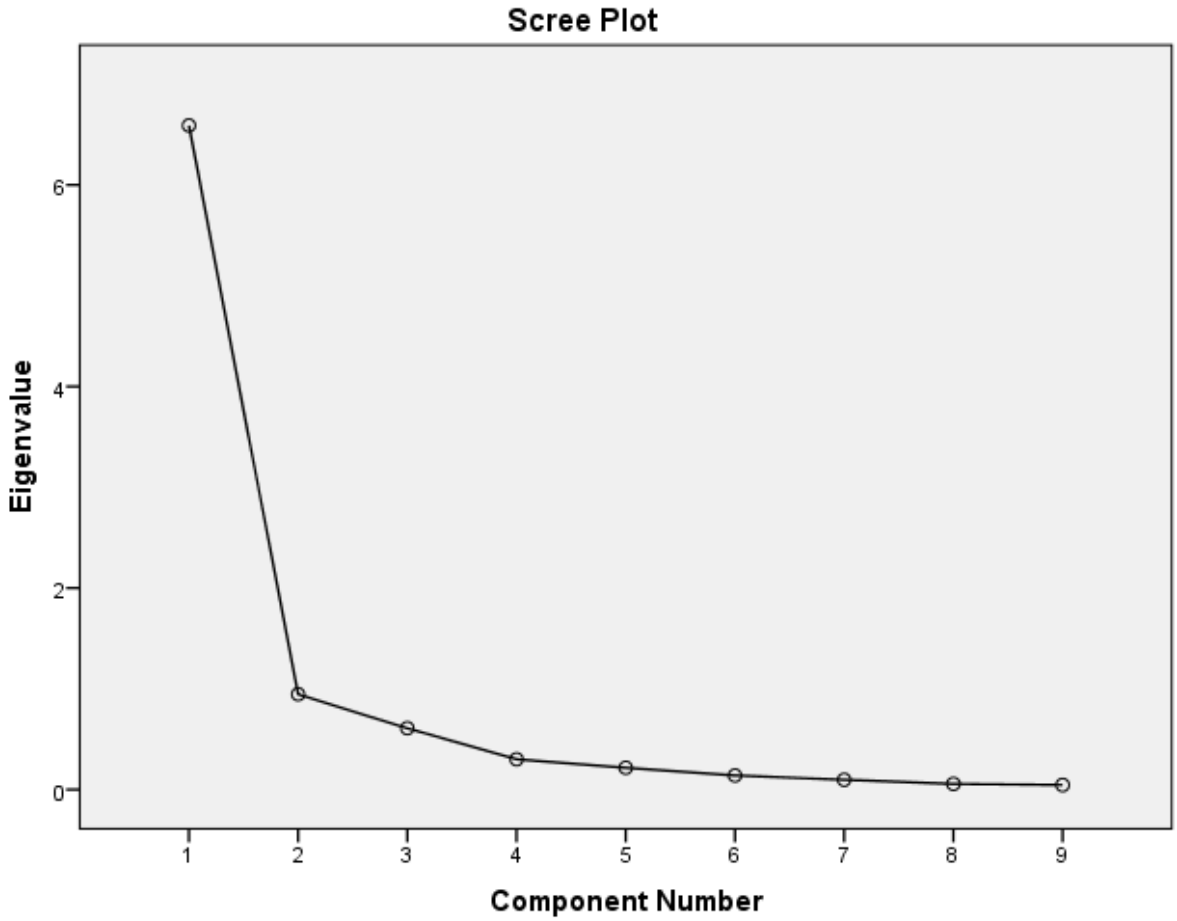
	Component	
	1	2
Integ1	.595	.894
Integ2	.679	.949
Integ3	.717	.945
Abili1	.929	.672
Abili2	.929	.688
Abili3	.925	.679
Benevol1	.908	.616
Benevol2	.875	.589
Benevol3	.869	.603

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total
1	6.590	73.226	73.226	6.255
2	.946	10.507	83.733	5.070
3	.609	6.762	90.495	
4	.301	3.344	93.839	
5	.216	2.404	96.242	
6	.140	1.553	97.795	
7	.097	1.078	98.873	
8	.056	.627	99.500	
9	.045	.500	100.000	

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.



10.4. Descriptive statistics for demographics

	Male		Female		Overall	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Time risk	3.94	1.774	3.70	1.669	3.84	1.730

Social Risk	2.45	1.542	1.98	1.305	2.25	1.462
Psychological risk	2.91	1.737	3.05	1.757	2.97	1.743
Privacy risk	3.96	1.648	3.71	1.594	3.86	1.627
Security risk	4.07	1.774	3.50	1.739	3.83	1.778

Means and SD for male and female respondents.

	Group Age 1		**Group Age 2**		**Overall**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Time risk	3.90	1.943	3.79	1.568	3.84	1.730
Social Risk	2.27	1.597	2.24	1.364	2.25	1.462
Psychological risk	3.01	1.907	2.93	1.623	2.97	1.743
Privacy risk	3.89	1.636	3.84	1.626	3.86	1.627
Security risk	3.87	1.803	3.79	1.767	3.83	1.778

Means and SD for Age Group 1 and Age Group 2 respondents.

10.5. Results of independent sample t-test

Gender:

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sum_TIR	Equal variances assumed	.411	.522	-.980	212	.328	-.234	.239	-.706	.237
	Equal variances not assumed			-.989	200.171	.324	-.234	.237	-.702	.233
Sum_PYR	Equal variances assumed	.001	.981	.590	212	.556	.142	.241	-.333	.618
	Equal variances not assumed			.589	192.791	.556	.142	.242	-.334	.619
Sum_PSR	Equal variances assumed	.167	.683	-1.960	212	.051	-.456	.233	-.915	.003
	Equal variances not assumed			-1.959	193.676	.052	-.456	.233	-.915	.003
Sum_SOR	Equal variances assumed	1.691	.195	-2.373	212	.019	-.475	.200	-.869	-.080
	Equal variances not assumed			-2.433	208.147	.016	-.475	.195	-.859	-.090

Age:

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sum_TIR	Equal variances assumed	8.701	.004	.433	212	.665	.104	.240	-.370	.578
	Equal variances not assumed			.418	163.634	.676	.104	.249	-.388	.596
Sum_PYR	Equal variances assumed	2.484	.117	.322	212	.748	.078	.242	-.400	.555
	Equal variances not assumed			.313	170.021	.755	.078	.249	-.413	.569
Sum_PSR	Equal variances assumed	.036	.849	.401	212	.688	.095	.235	-.370	.559
	Equal variances not assumed			.398	183.832	.691	.095	.237	-.374	.563
Sum_SOR	Equal variances assumed	2.585	.109	.128	212	.899	.026	.203	-.375	.427
	Equal variances not assumed			.124	170.523	.901	.026	.209	-.386	.438

10.6. Results Kolmogorov-Smirnov test

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TIR	.111	214	.000	.950	214	.000
PYR	.168	214	.000	.894	214	.000
SOR	.204	214	.000	.818	214	.000
PSR	.094	214	.000	.966	214	.000
ATT	.120	214	.000	.957	214	.000
INT	.168	214	.000	.911	214	.000
ABI	.157	214	.000	.936	214	.000
SEF	.143	214	.000	.902	214	.000
a. Lilliefors Significance Correction						

10.7. Assumptions

10.7.1. RESET test I.

.quietly reg att tir pyr sor psr int abi sef

. predict yhat

(option xb assumed; fitted values)

. gen yhat2=yhat*yhat

. gen yhat3=yhat2*yhat

. quietly reg att tir pyr sor psr integ abil selfe yhat2 yhat3

. test yhat2 yhat3

(1) yhat2 = 0

(2) yhat3 = 0

F(2, 204) = 0.93

Prob > F = 0.3972

10.7.2. RESET test II.

. qui reg logatt logtir logpyr logsor logpsr logint logabi logsef

. predict yhat

(option xb assumed; fitted values)

```
. gen yhat2=yhat*yhat
. gen yhat3=yhat2*yhat
. qui reg logatt logtir logpyr logsor logpsr logint logabi logsef yhat2 yhat3
. test yhat2 yhat3
 ( 1)  yhat2 = 0
 ( 2)  yhat3 = 0
       F(  2,   204) =    3.80
            Prob > F =    0.0240
```

10.7.3. Breusch-Pagan/Cook-Weisberg test I.

```
. quiet reg att tir pyr sor psr abi int sef
. estat hettest
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of att

         chi2(1)      =     0.12
         Prob > chi2  =   0.7317
```

10.7.4. Breusch-Pagan/Cook-Weisberg test II.

```
. qui reg logatt logtir logpyr logsor logpsr logint logabi logsef
. estat hettest
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of logatt

         chi2(1)      =    17.99
         Prob > chi2  =   0.0000
```

10.8. Standard multiple regression

10.8.1. Coefficients table

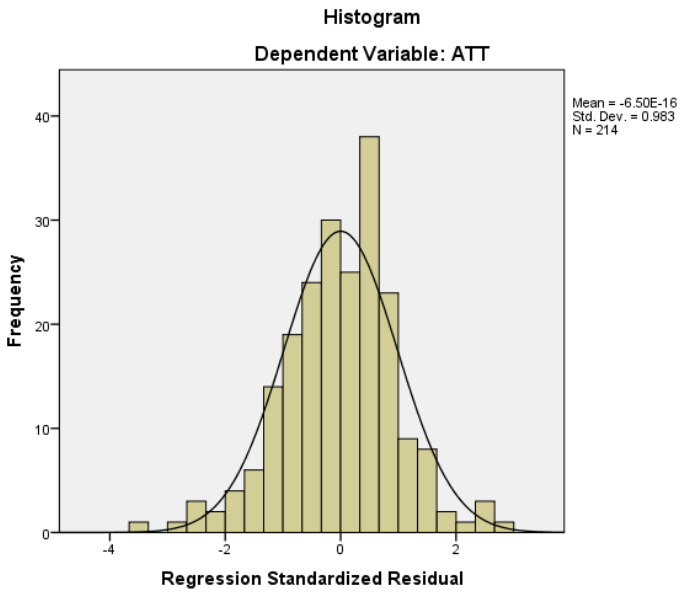
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.503	.550		8.184	.000	3.418	5.587
	TIR	-.379	.052	-.405	-7.321	.000	-.482	-.277
	PYR	-.106	.059	-.114	-1.788	.075	-.222	.011
	SOR	-.012	.064	-.011	-.189	.850	-.139	.115
	PSR	-.200	.065	-.198	-3.078	.002	-.328	-.072
	INT	.096	.078	.082	1.243	.215	-.056	.249
	ABI	.149	.068	.145	2.188	.030	.015	.284
	SEF	.167	.060	.153	2.790	.006	.049	.286

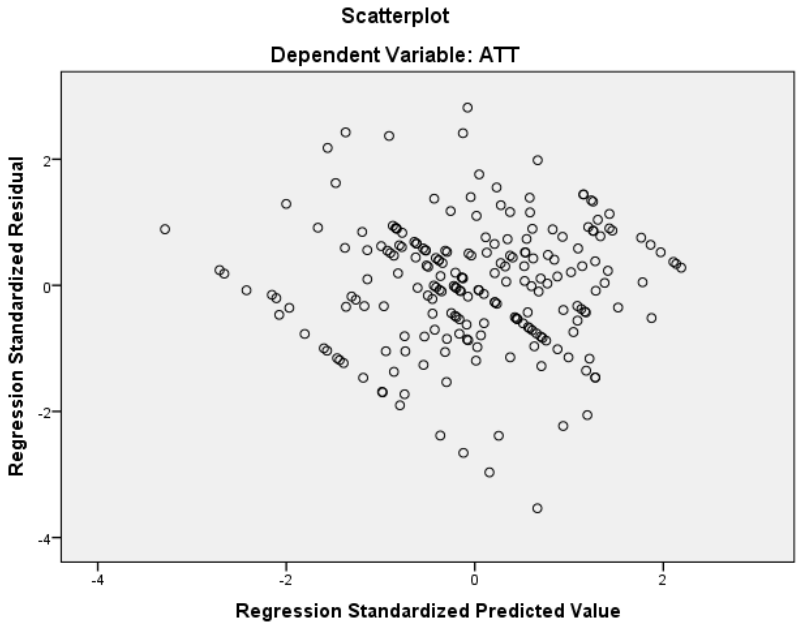
a. Dependent Variable: ATT

Correlations			Collinearity Statistics	
Zero-order	Partial	Part	Tolerance	VIF
-.639	-.454	-.337	.689	1.452
-.496	-.124	-.082	.522	1.916
-.415	-.013	-.009	.623	1.605
-.545	-.210	-.142	.512	1.952
.337	.086	.057	.485	2.062
.342	.151	.101	.480	2.085
.389	.191	.128	.703	1.423

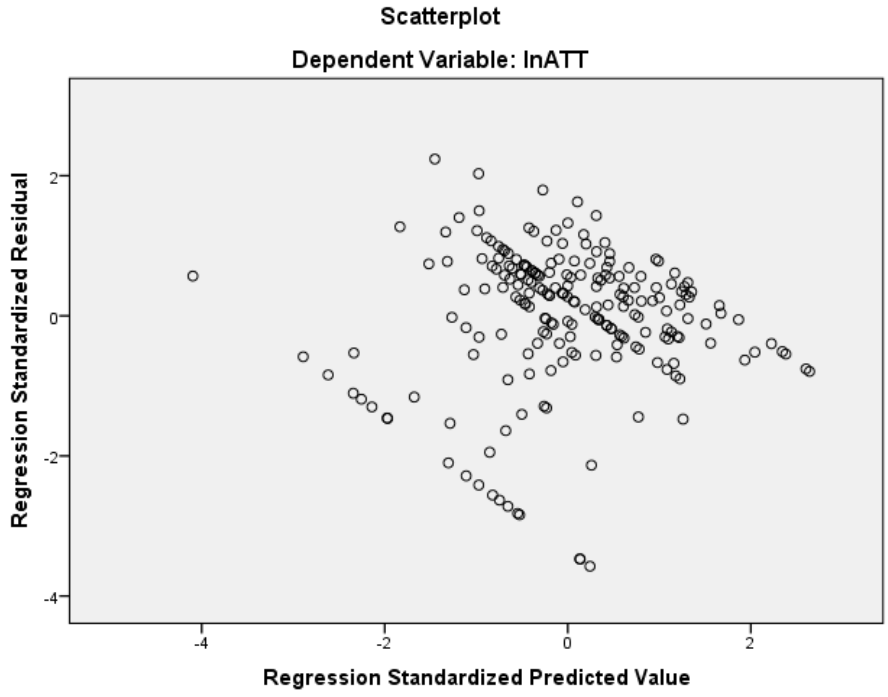
10.8.2. Histogram of standardized residuals



10.8.3. Scatter plot of residuals against the fitted values



10.8.4. Scatter plot of residuals against the fitted values log-log model



10.9. Results from PROCESS mediation analysis

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Release 2.13.2 **************

        Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3
```

```
**************************************************************************
Model = 4
    Y = Sum_ATT
    X = Sum_TIR
   M1 = Sum_INT
   M2 = Sum_ABI

Sample size
        214

**************************************************************************
Outcome: Sum_INT

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,1705      ,0291     1,8529     6,3478     1,0000   212,0000      ,0125

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,7954      ,2268    25,5478      ,0000     5,3482     6,2425
Sum_TIR      -,1358      ,0539    -2,5195      ,0125     -,2421     -,0296

**************************************************************************
Outcome: Sum_ABI

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,1997      ,0399     2,3913     8,8021     1,0000   212,0000      ,0034

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,3873      ,2577    20,9054      ,0000     4,8793     5,8953
Sum_TIR      -,1817      ,0612    -2,9668      ,0034     -,3024     -,0610

**************************************************************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,6848      ,4689     1,4116    61,8002     3,0000   210,0000      ,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     4,6233      ,4050    11,4147      ,0000     3,8248     5,4217
Sum_INT       ,1820      ,0820     2,2179      ,0276      ,0202      ,3437
Sum_ABI       ,1206      ,0722     1,6697      ,0965     -,0218      ,2630
Sum_TIR      -,5513      ,0481   -11,4694      ,0000     -,6460     -,4565

************************** TOTAL EFFECT MODEL ****************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      ,6391      ,4084     1,5575   146,3686     1,0000   212,0000      ,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     6,3274      ,2080    30,4241      ,0000     5,9174     6,7374
Sum_TIR      -,5979      ,0494   -12,0983      ,0000     -,6953     -,5005

***************** TOTAL, DIRECT, AND INDIRECT EFFECTS ********************
```

```
Total effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,5979      ,0494   -12,0983      ,0000     -,6953     -,5005

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,5513      ,0481   -11,4694      ,0000     -,6460     -,4565

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0466      ,0216     -,0990     -,0141
Sum_INT     -,0247      ,0174     -,0810     -,0023
Sum_ABI     -,0219      ,0192     -,0704      ,0071
(C1)        -,0028      ,0295     -,0714      ,0539

Partially standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0288      ,0132     -,0600     -,0086
Sum_INT     -,0153      ,0106     -,0464     -,0009
Sum_ABI     -,0135      ,0118     -,0440      ,0039

Completely standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0498      ,0230     -,1064     -,0149
Sum_INT     -,0264      ,0184     -,0823     -,0026
Sum_ABI     -,0234      ,0205     -,0757      ,0068

Ratio of indirect to total effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0780      ,0368      ,0231      ,1754
Sum_INT      ,0413      ,0285      ,0045      ,1226
Sum_ABI      ,0366      ,0322     -,0124      ,1199

Ratio of indirect to direct effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0846      ,0439      ,0236      ,2126
Sum_INT      ,0448      ,0323      ,0046      ,1373
Sum_ABI      ,0397      ,0367     -,0133      ,1428

Specific indirect effect contrast definitions
(C1)   Sum_INT    minus      Sum_ABI

******************** ANALYSIS NOTES AND WARNINGS *************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     1000

Level of confidence for all confidence intervals in output:
    95,00

------ END MATRIX -----

Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Release 2.13.2 **************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 4
```

```
    Y = Sum_ATT
    X = Sum_PSR
   M1 = Sum_INT
   M2 = Sum_ABI

Sample size
        214

**************************************************************************
Outcome: Sum_INT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,2246      ,0505     1,8121    11,2677     1,0000   212,0000
,0009

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,9839      ,2306    25,9489      ,0000     5,5293     6,4385
Sum_PSR      -,1827      ,0544    -3,3567      ,0009     -,2900     -,0754

**************************************************************************
Outcome: Sum_ABI

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,2525      ,0638     2,3317    14,4409     1,0000   212,0000
,0002

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,6015      ,2616    21,4138      ,0000     5,0859     6,1172
Sum_PSR      -,2347      ,0618    -3,8001      ,0002     -,3564     -,1129

**************************************************************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,5791      ,3353     1,7666    35,3142     3,0000   210,0000
,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     4,2410      ,4726     8,9742      ,0000     3,3094     5,1726
Sum_INT       ,1729      ,0919     1,8808      ,0614     -,0083      ,3541
Sum_ABI       ,1270      ,0810     1,5674      ,1185     -,0327      ,2868
Sum_PSR      -,4417      ,0557    -7,9316      ,0000     -,5515     -,3319

************************ TOTAL EFFECT MODEL ****************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,5266      ,2773     1,9027    81,3512     1,0000   212,0000
,0000

Model
```

```
              coeff         se          t          p       LLCI       ULCI
constant     5,9869      ,2363    25,3367      ,0000     5,5211     6,4527
Sum_PSR      -,5031      ,0558    -9,0195      ,0000     -,6131     -,3932

***************** TOTAL, DIRECT, AND INDIRECT EFFECTS ********************

Total effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,5031      ,0558    -9,0195      ,0000     -,6131     -,3932

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,4417      ,0557    -7,9316      ,0000     -,5515     -,3319

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0614      ,0282     -,1324     -,0186
Sum_INT     -,0316      ,0214     -,0934     -,0018
Sum_ABI     -,0298      ,0248     -,0910      ,0066
(C1)        -,0018      ,0367     -,0776      ,0753

Partially standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0379      ,0171     -,0821     -,0119
Sum_INT     -,0195      ,0131     -,0563     -,0014
Sum_ABI     -,0184      ,0152     -,0568      ,0039

Completely standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0643      ,0290     -,1401     -,0207
Sum_INT     -,0331      ,0223     -,0965     -,0016
Sum_ABI     -,0312      ,0256     -,0940      ,0065

Ratio of indirect to total effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,1220      ,0559      ,0371      ,2571
Sum_INT      ,0628      ,0419      ,0025      ,1775
Sum_ABI      ,0592      ,0493     -,0138      ,1802

Ratio of indirect to direct effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,1390      ,0768      ,0385      ,3462
Sum_INT      ,0715      ,0526      ,0031      ,2346
Sum_ABI      ,0675      ,0622     -,0155      ,2342

Specific indirect effect contrast definitions
(C1)   Sum_INT    minus      Sum_ABI

******************** ANALYSIS NOTES AND WARNINGS *************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     1000

Level of confidence for all confidence intervals in output:
    95,00

------ END MATRIX -----
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Release 2.13.2 **************
```

```
          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 4
    Y = Sum_ATT
    X = Sum_PYR
   M1 = Sum_INT
   M2 = Sum_ABI

Sample size
        214

**************************************************************************
Outcome: Sum_INT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,1047      ,0110     1,8875     2,3482     1,0000   212,0000
,1269

Model
             coeff         se          t          p       LLCI       ULCI
constant     5,5196      ,1857    29,7231      ,0000     5,1536     5,8857
Sum_PYR      -,0828      ,0540    -1,5324      ,1269     -,1893      ,0237

**************************************************************************
Outcome: Sum_ABI

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,0877      ,0077     2,4714     1,6445     1,0000   212,0000
,2011

Model
             coeff         se          t          p       LLCI       ULCI
constant     4,9251      ,2125    23,1780      ,0000     4,5062     5,3440
Sum_PYR      -,0793      ,0618    -1,2824      ,2011     -,2011      ,0426

**************************************************************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,5899      ,3480     1,7330    37,3557     3,0000   210,0000
,0000

Model
             coeff         se          t          p       LLCI       ULCI
constant     3,4186      ,4070     8,4001      ,0000     2,6163     4,2208
Sum_INT       ,1788      ,0910     1,9656      ,0507     -,0005      ,3582
Sum_ABI       ,2017      ,0795     2,5367      ,0119      ,0450      ,3584
Sum_PYR      -,4299      ,0521    -8,2584      ,0000     -,5325     -,3273

************************ TOTAL EFFECT MODEL ****************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
```

```
p
      ,4960      ,2460     1,9852    69,1605     1,0000   212,0000
,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,3990      ,1904    28,3496      ,0000     5,0236     5,7744
Sum_PYR      -,4607      ,0554    -8,3163      ,0000     -,5699     -,3515

****************** TOTAL, DIRECT, AND INDIRECT EFFECTS ********************

Total effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,4607      ,0554    -8,3163      ,0000     -,5699     -,3515

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,4299      ,0521    -8,2584      ,0000     -,5325     -,3273

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0308      ,0276     -,1001      ,0138
Sum_INT     -,0148      ,0153     -,0643      ,0028
Sum_ABI     -,0160      ,0187     -,0685      ,0084
(C1)         ,0012      ,0203     -,0357      ,0526

Partially standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0190      ,0169     -,0579      ,0093
Sum_INT     -,0091      ,0094     -,0400      ,0016
Sum_ABI     -,0099      ,0115     -,0427      ,0053

Completely standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0331      ,0294     -,1036      ,0162
Sum_INT     -,0159      ,0164     -,0706      ,0027
Sum_ABI     -,0172      ,0199     -,0744      ,0093

Ratio of indirect to total effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0668      ,0596     -,0313      ,2059
Sum_INT      ,0321      ,0328     -,0058      ,1355
Sum_ABI      ,0347      ,0405     -,0222      ,1411

Ratio of indirect to direct effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0716      ,0702     -,0304      ,2593
Sum_INT      ,0344      ,0384     -,0059      ,1724
Sum_ABI      ,0372      ,0467     -,0208      ,1801

Specific indirect effect contrast definitions
(C1)   Sum_INT    minus      Sum_ABI

******************* ANALYSIS NOTES AND WARNINGS ************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     1000

Level of confidence for all confidence intervals in output:
    95,00
```

```
------ END MATRIX -----

Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Release 2.13.2 **************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 4
    Y = Sum_ATT
    X = Sum_SOR
   M1 = Sum_INT
   M2 = Sum_ABI

Sample size
        214

**************************************************************************
Outcome: Sum_INT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,0915      ,0084     1,8924     1,7895     1,0000   212,0000
,1824

Model
             coeff         se          t          p       LLCI       ULCI
constant     5,4683      ,1729    31,6243      ,0000     5,1274     5,8091
Sum_SOR      -,0862      ,0645    -1,3377      ,1824     -,2133      ,0408

**************************************************************************
Outcome: Sum_ABI

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,0533      ,0028     2,4835      ,6044     1,0000   212,0000
,4378

Model
             coeff         se          t          p       LLCI       ULCI
constant     4,8193      ,1981    24,3296      ,0000     4,4288     5,2097
Sum_SOR      -,0574      ,0739     -,7774      ,4378     -,2030      ,0882

**************************************************************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,5358      ,2871     1,8949    28,1851     3,0000   210,0000
,0000

Model
             coeff         se          t          p       LLCI       ULCI
constant     3,0255      ,4157     7,2787      ,0000     2,2061     3,8449
Sum_INT       ,1766      ,0952     1,8547      ,0650     -,0111      ,3644
Sum_ABI       ,2234      ,0831     2,6873      ,0078      ,0595      ,3873
```

```
Sum_SOR      -,4319      ,0648    -6,6661      ,0000     -,5596     -,3042

************************* TOTAL EFFECT MODEL ****************************
Outcome: Sum_ATT

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      ,4154      ,1726     2,1784    44,2170     1,0000   212,0000
,0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     5,0679      ,1855    27,3178      ,0000     4,7022     5,4336
Sum_SOR      -,4599      ,0692    -6,6496      ,0000     -,5963     -,3236

***************** TOTAL, DIRECT, AND INDIRECT EFFECTS ********************

Total effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,4599      ,0692    -6,6496      ,0000     -,5963     -,3236

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
     -,4319      ,0648    -6,6661      ,0000     -,5596     -,3042

Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0281      ,0354     -,1018      ,0381
Sum_INT     -,0152      ,0190     -,0708      ,0081
Sum_ABI     -,0128      ,0232     -,0707      ,0261
(C1)        -,0024      ,0234     -,0432      ,0519

Partially standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0173      ,0217     -,0625      ,0237
Sum_INT     -,0094      ,0116     -,0428      ,0054
Sum_ABI     -,0079      ,0143     -,0426      ,0163

Completely standardized indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL       -,0253      ,0318     -,0946      ,0334
Sum_INT     -,0138      ,0172     -,0671      ,0073
Sum_ABI     -,0116      ,0208     -,0618      ,0232

Ratio of indirect to total effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0610      ,0771     -,0951      ,2216
Sum_INT      ,0331      ,0405     -,0167      ,1489
Sum_ABI      ,0279      ,0506     -,0645      ,1529

Ratio of indirect to direct effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        ,0650      ,0893     -,0869      ,2847
Sum_INT      ,0353      ,0470     -,0180      ,1860
Sum_ABI      ,0297      ,0582     -,0598      ,1900

Specific indirect effect contrast definitions
(C1)   Sum_INT    minus      Sum_ABI

******************** ANALYSIS NOTES AND WARNINGS ************************
```

```
Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     1000

Level of confidence for all confidence intervals in output:
    95,00

------ END MATRIX -
```

Summary of tables and figures

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