Blockchain adoption among webshops:
"an explanatory analysis on characteristics leading to firm- and individual-level adoption"

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Chapter I: Introduction

Mankind is on the verge of a digital revolution due to the rise of a new disruptive technology. A disruptive technology has the ability to radically reshape competition and strategy (Porter & Heppelmann, 2014) and is defined as "a technology that changes the bases of competition by changing the performance metrics along which firms compete" (Danneels, 2004, p. 249). As a result of the advent of disruptive technologies, the business environment has changed radically twice in the last 50 to 60 years (Porter & Heppelmann, 2014). Firstly with the invention of computers and information technology (IT) during the 1960s and 1970s, and secondly with the development of the internet during the 1980s and 1990s (Porter & Heppelmann, 2014).

Currently, a third wave of disruptive technology is appearing that has the potential to impact every industry in today's digital economy (Crosby, Pattanayak, Verma, & Kalyanaraman, 2016). This technology, one of the most discussed disruptors in this IT-era, is called 'Blockchain technology' (hereinafter 'Blockchain'). Blockchain is predicted to impact the value chains in all industries (e.g. retail, telecommunication, healthcare, government services, education, defense, and financial services) (Friedlmaier, Tumasjan, & Welpe, 2018; Siebel, 2017). Such a widespread effect can be expected as Blockchain bears implications for both financial (e.g. institutions, and banks) and non-financial areas (e.g. marriage licenses, legal documents, loyalty payments in the music industry, health records, private securities, and notary) (Crosby et al., 2016). According to Diar (2018), the venture capital invested in Blockchain and cryptocurrency companies rose to $3.8 billion in 2018; an increase of 280% compared to 2017. This illustrates Blockchain's potential to add economic value to the business environment. Though, some remain skeptical and question the security, sustainability, scalability (Piscini, Dalton, & Kehoe, n.d.), integrity, anonymity, and adaptability (Conoscenti, Vetro, & De Martin, 2016) of the technology.

Blockchain was introduced to the world by Satoshi Nakamoto with the launch of Bitcoin in 2008 (Nakamoto, 2008). It is the technological innovation on which Bitcoin operates (Eyal, Gencer, Sirer, & Van Renesse, 2016). Essentially, Blockchain is a public ledger, or distributed database of records, that registers all transactions and digital events that have been carried out by its participants. Within Blockchain, a transaction is only verified by a majority of the participants in the network. As a result, double-spending is prevented and no third party is in control of the transactions (Crosby et al., 2016). Hence, Blockchain provides security, anonymity, and data integrity for its users and their data (Yli-Huumo, Ko, Choi, Park, & Smolander, 2016).

Bitcoin is a peer-to-peer electronic money system that allows its users to send online payments directly from one party to another without the interference of a financial institution (Nakamoto, 2008). Though, Bitcoin was not the first digital cash system that was conceptualized with a central server in order to prevent double-spending (Chaum, 1983). Despite Chaum's advancements in cryptography with the 'blind signature' - a cryptographic signature that prevents linking of the central server's signature which enables the central server to prevent double-spending - the viability of his new digital cash system was put into question due to its inability to ensure compatibility between centralization, double-spending, and anonymity (Back et al., 2014). Nakamoto (2008) eliminated the failing server's signature by introducing Blockchain as the operating system for Bitcoin; a consensus mechanism based on proof of work (Back, 2002).

An established method to assess the maturity of a technology is to analyze its lifecycle process. To make a statement about the lifecycle of Blockchain, one can look at the exchange rate of Bitcoin (BTC) to Euro (EUR). The exchange rate reached its first peak in the latter half of 2017 where 1 BTC was worth 16,000 EUR (Finanzen, n.d.). The value of Bitcoin increased with 1,700% as a result of the mass media attention it received in 2017 (Vos, 2018). Shortly afterwards, the price of 1 BTC had a downfall to below 6,000 EUR (Finanzen, n.d.). Following Gartner's Hype Cycle Curve (see chapter III), this first peak can be seen as the first hype. In June 2019, Bitcoin experienced its second peak as the price of 1 BTC rose to 11,000 EUR in the period from May to June 2019 (Finanzen, n.d.). The value of Bitcoin increased with 155% as a result of the establishment of the Libra Association. Libra Association is a collaboration between multiple organizations from different industries that introduced a new cryptocurrency called: Libra. Libra is backed by organizations such as investment banks (e.g. Andreessen Horowitz), Blockchain companies (e.g. Coinbase), social media companies (e.g. Facebook), E-commerce companies (e.g. eBay), and payment facilitators (e.g. MasterCard, and VISA) (Bitcoin Magazine, 2019). Following Gartner's Hype Cycle Curve, this second peak may be seen as the second hype. The second hype is believed to indicate the beginning of the actual adoption growth. Comparing the second hype to Rogers Adoption Curve (see chapter III) feeds the assumption that the current adopters of Blockchain are the early adopters.

The increasing popularity of Blockchain in the business world is overflowing to the academic world. The amount of academic literature regarding Blockchain is increasing, but many aspects remain underexposed. As of yet, no consensus has been reached about the potential applications Blockchain has to offer. Blockchain's added value for the financial world, due to the application 'Bitcoin', is widely known (Crosby et al., 2016; Pilkington, 2016; Swan, 2015), but potential Blockchain applications for webshops remain insufficiently mapped. Therefore, Zheng, Xie, Dai, Chen and Wang (2017) call for further research on potential Blockchain applications in other industries than the financial domain. Furthermore, research into the adoption process of this disruptive technology is scantily available: Crosby et al. (2016) and Swan (2015) examined the risks and challenges associated with Blockchain adoption, Iansiti and Lakhani (2017) developed a framework in which they compare Blockchain adoption to the adoption of other foundational technologies, and Wang et al. (2016) created a maturity model to assess the appropriate maturity level of Blockchain for the process of adoption. However, research into understanding the adoption process of Blockchain among webshops is lacking. In sum, there is a need for research outlining the possibilities of Blockchain for industries other than the financial sector, and research that provides knowledge on the determinants affecting the adoption process of Blockchain among webshops and their employees.

The present study aims to fill the hiatus in academic literature with respect to the adoption process of Blockchain by webshops and their employees. In attempting to understand the adoption process of new technologies, one can look at the adoption processes of already integrated technologies. In this case, the adoption process of e-commerce technology by businesses is inspected. Though, Blockchain and e-commerce are fundamentally different, Blockchain relying on anonymity in an untrustworthy environment (Zheng et al., 2017) and e-commerce depending on a trustworthy relationship between customer and business (Palvia, 2009), both technologies offer value exchange functionalities for businesses (Swan, 2015; Zhu & ss, 2002). In an effort to gain understanding of the adoption process of new technologies, the following section examines research on e-commerce adoption among businesses.

To and Ngai (2006) found empirical support for three determinants (relative advantage, competitive pressure, and technical resources competence) to positively influence companies' decision to adopt e-commerce. Differently, Wymer and Regan (2005) examined the incentives and barriers for the adoption decision by small and medium enterprises (SME's). They found statistical significance for three incentives (innovativeness, need, and competitive pressure) and four barriers (capital, priority, cost, and partners/vendors) that influence the decision to adopt a website by SME's. Furthermore, Grandon and Pearson (2004) studied e-commerce adoption among SME's in the Midwest region of the United States (US). Their research model was based on the Technology Acceptance Model (TAM) and other relevant research regarding the subject. They classified four significant determinants (perceived ease of use, perceived usefulness, external pressure, and compatibility) of e-commerce adoption among US SME's. Alternatively, Limthongchai and Speece (2003) analyzed e-commerce adoption among SME's in Thailand based on Rogers' Diffusion of Innovations (DI) theory. They concluded that four characteristics of innovation (compatibility, relative advantage, observability, and security/confidentiality) were positively related to the adoption of e-commerce among Thai SME's. Overall, there are various ways in which the adoption decision on e-commerce is measured and captured in literature. Therefore, when comparing the decision to adopt e-commerce with the decision to adopt Blockchain, there is a need for a framework displaying the determinants of Blockchain adoption.

The purpose of this study is to examine Blockchain adoption among webshops on a firm- and individual-level using technology adoption characteristics. "Adoption of innovations in an organization implies that adoption also occurs within the organization" (Frambach & Schillewaert, 2002, p. 164). In other words, the adoption of an innovation at an organizational level implies that adoption also takes place at the individual level. Therefore, this paper examines the effect of both firm-level characteristics (organizational characteristics, and perceived characteristics of Blockchain) as well as individual-level characteristics (individual characteristics). The results will be used to create a framework that represents a selection of determinants that lead to adopt of Blockchain. Managers of webshops can use this framework to analyze their business and examine the webshops' and customer support employees' readiness to adopt Blockchain. The main research question is formulated as follows:

What is the effect of technology adoption characteristics on webshops' and customer support employees' adoption decision regarding Blockchain?

The following sub-questions are accompanied to the research question:

What is the effect of organizational characteristics on webshops' adoption decision regarding Blockchain?

What is the effect of perceived characteristics of Blockchain on webshops' adoption decision regarding Blockchain?

What is the effect of individual characteristics of webshops' customer support employees on their adoption decision regarding Blockchain?

This paper aims to extend the existing literature on the subject of Blockchain by applying technology adoption characteristics to the context of Blockchain adoption among webshops and its customer support employees. In addition to the academic contribution, the present paper will contribute to managers' understanding of the characteristics influencing the adoption decision at the firm- and individual-level. The results can assist webshop managers in deciding whether or not to adopt Blockchain.

This research attempts to contribute to the existing literature by answering the research question and the related sub-questions. These questions are answered by reviewing existing literature, designing the research, conducting quantitative research, and analyzing the results. The analysis of the results is followed by a conclusion, which serves as the fpundation for theoretical and managerial implications. Finally, the limitations are discussed and suggestions for future research are offered.

Chapter II: Background

Before analyzing the theory on technology adoption characteristics that might lead to the adoption of Blockchain, it is important to understand how Blockchain works. The following section describes Blockchain's architecture, and the key characteristics. Next, the best-known application of the technology is presented. Lastly, the possible applications of Blockchain for webshops are discussed as well as the associated challenges.

Blockchain's architecture

Blockchain is a string (or chain) of interrelated blocks. Appendix I.a represents an example of a Blockchain. Each block in the chain represents several transactions which are considered to have occurred at one point in time (Crosby et al., 2016). A block consists of a 'block header' and a 'block body'. Appendix I.b represents the block structure. The blocks are chained in chronological order via a timestamp server. A timestamp server operates by timestamping a hash of a block of items and widely publishing the hash; in a public ledger for instance (Nakamoto, 2008). "Each timestamp includes the previous timestamp in its hash, forming a chain, with each additional timestamp reinforcing the ones before it" (Nakamoto, 2008, p.2). Hereby, the chain represents the entire history of transactions (Yuan & Wang, 2016). There are three types of Blockchain, namely: public Blockchain, private Blockchain, and consortium Blockchain. The types of Blockchain differ in terms of read permission, centralization and the consensus process. This study focuses on public Blockchain as it is the technology behind Bitcoin (Crosby et al., 2016). Public Blockchain provides public read permission for all transactions, is not centralized, and the consensus process is 'permissionless' (Zheng et al., 2017). Blockchain uses a 'public key cryptosystem' to protect each transaction with digital signature protocols (Yli-Huumo et al., 2016). Appendix I.c provides further information on the public key cryptosystem. Lastly, Blockchain uses consensus mechanisms to verify transactions and protect the system from double-spending (Pilkington, 2016). Appendix I.d provides more detailed information on the consensus mechanisms

Key characteristics

According to Zheng et al. (2017), Blockchain's potential to add value is due to a few key characteristics. The key characteristics that these researchers refer to are decentralization, persistency, anonymity, and auditability. Decentralization refers to the validation process. Each transaction is validated through consensus mechanisms, hereby eliminating the trusted third party (Zheng et al., 2017). Persistency relates to the impossibility to commit fraud. Invalid transactions are discovered almost immediately and it is nearly impossible to reverse or delete transactions once they are broadcasted (Zheng et al., 2017). Anonymity refers to the concept that users are not traceable.

Each user's generated address is not being linked to his true identity (Zheng et al., 2017). Auditability relates to the possibility to verify transactions. Transactions can easily be verified and tracked since any transaction has to refer to previous unspent transactions. When the current transaction is communicated into Blockchain, the status of those referred unspent transactions shifts from unspent to spent (Zheng et al., 2017).

Bitcoin

Bitcoin is the best-known application of Blockchain. Bitcoin is a peer-to-peer version of digital cash which allows online payments to be sent directly from one entity to another without the mediation of a financial institution (Nakamoto, 2008). Nakamoto (2008) argued that internet commerce is almost exclusively linked to financial institutions operating as the trusted third party to process electronic payments. This mediation leads to transaction costs and a certain percentage of fraud is accepted as unavoidable which, according to Nakamoto (2008), is unacceptable. Bitcoin uses cryptographic proof to process an electronic transaction between two willing entities (Crosby et al., 2016). Hereby, eliminating the need for the trusted third party to validate transactions via the internet (Yli-Huumo et al., 2016). Cryptography is the science of secret writing. The objective of cryptography is to protect the privacy and authenticity of data transmitted over high-speed lines or stored in computer systems (Robling Denning, 1982). Privacy and authenticity are protected to prevent publication and modification of data by unauthorized entities (Robling Denning, 1982). Therefore, cryptography protects the data transmitted via Blockchain.

Webshops and Blockchain

Before examining information system (IS) literature to see which factors influence the adoption of technologies, it is important to consider the possible use cases and challenges associated with Blockchain in the context of webshops.

First, the use cases. Next to Bitcoin, there are other applications Blockchain-based platforms have to offer such as smart contracts, digital identification, voting systems, justice applications, efficiency and coordination applications, and advanced concepts (Pilkington, 2016; Swan, 2015). Additionally, Deloitte (n.d.) identified business- and consumer-centric use cases of Blockchain. The following business-centric use cases were stated: traceability and visibility, product authenticity and origin, product delivery, fraudulent financial transactions, automated record keeping, the authenticity of digital advertising, product recall, product development, product safety, and supply chain trade and finance (Deloitte, n.d.). In short, these business-centric use cases display that webshops can use Blockchain to create a connected supply chain in which efficiency is improved as well as information about the origins of and modifications to the products. Furthermore, Blockchain can help improve the recordkeeping of data and detect fraudulent transactions. Next, the consumer-centric use cases were identified: Accessing product information, consumer payment, smart loyalty programs, access to aftercare service, and consumer protection. In a nutshell, Blockchain provides webshops' consumers with the possibility to access information on the product, smart loyalty programs, and contracts and agreements for guaranteed aftercare services and warranties. Additionally, it provides the consumers with privacy protection and the possibility for payments via a secure network.

Lastly, there are a couple of key challenges associated with Blockchain which relate to the scalability, security, privacy, and sustainability (Swan, 2015; Zheng et al., 2017). The challenges of scalability relate to the throughput, latency, and size and bandwidth. Blockchain has a throughput of 7 transactions per second (tps). In comparison, Visa processes, typically, 2,000 tps, and 10,000 tps at its peak. For Twitter these numbers 5,000 tps and 15,000, respectively. Advertising networks process over 100,000 tps (Swan, 2015; Zheng et al., 2017). The challenge of latency is due to the time the network needs to process each block; ten minutes (Swan, 2015). Size and bandwidth refer to the number of bytes each user needs to download. In May 2019, the size of Blockchain is 216 GB (Blockchain, 2019). When standardized to VISA-norms, based on the previous mentioned tps, Blockchain's size would be 1.42 PB/year (Swan, 2015). The challenges of security relate to the possibility of a 51% attack - in which one mining entity can seize control over the network – double-spending, and the current cryptography standard which is hackable (Swan, 2015). The challenges of privacy refer to the traceability of users. Despite anonymized users, the transactions and balances can be used to trace peers (Zheng et al., 2017). The challenges of sustainability relate to the energy consumption associated with mining; at least $15 million energy costs per day (Swan, 2015). Overall, the challenges of Blockchain have multiple consequences for companies adopting the technology. First and foremost, companies will have to be patient in order to receive transactions. The processing time of Blockchain is low due to the size and bandwidth of blocks which translates to a low amount of tps. As an outcome, the number of debtors on the financial statements will increase. Furthermore, there remain considerable issues with security and sustainability which may negatively impact companies.

Chapter III: Theoretical background

To form a conceptual model, it is important to define innovation, and to examine theory on innovation adoption curves and the adoption process. The reason to outline these concepts is to maintain transparent definitions throughout the study. Additionally, this paper examines multiple theories and models concerning innovation adoption. Afterwards, the chosen model that serves as the basis for the conceptual model is reasoned. Finally, the conceptual model and hypotheses are explained.

Innovation

Innovation is a complex and multidimensional concept, and academics from a diversity of disciplinary backgrounds are fragmented in defining this phenomenon due to the variety of epistemological and ontological positions they maintain to examine, analyze, and report on this matter (Wolfe, 1994). Moreover, the discordance in the innovation literature is reflected in the variety of approaches to measurement and the number of contrasting measures that are proposed (Adams, Bessant, & Phelps, 2006). Additionally, existing reviews and meta-analysis are scarce and narrowly demarcated, either on the type of innovation (product, process, and business model) or the level of analysis (individual, group, firm, industry, consumer group, region, or nation) (Crossan & Apaydin, 2010). Therefore, it is difficult to identify a multidimensional framework on innovation that represents the diversity in the innovation literature (Adams et al., 2006; Crossan & Apaydin, 2010).

Accordingly, the term 'innovation' is ambiguous and cannot be defined by a single definition nor measure. Hence, for reasons of transparency, this research adopts Rogers' definition of innovation. Innovation is the process of introducing new ideas to the organization which result in increased performance (Rogers, 2010). This definition of innovation is chosen due to a couple of reasons however, some adjustments need to be made. First of all, the definition examines innovation as 'a process' rather than a one-time event. Although, the process being referred to as 'the process of introduction' is only one phase in the innovation adoption process (which will be discussed hereinafter). Second, the definition links innovation to 'introducing new ideas' which accommodates the range of innovation types (product, process, and business model). This is in line with Blockchain's potential to support the actual product with information about the product origins, and the augmented product with payment possibilities, loyalty programs, aftercare services, and consumer protection (Deloitte, n.d.; Levitt, 1980). Furthermore, Blockchain has the potential to change webshops' processes and create new business models. Third, 'introducing new ideas to the firm' implies a firm-level focus which is too narrow. Adopting innovations should not only occur on a firm-level, but also on an individual-level among employees. Lastly, this definition is chosen as it suggests that innovation leads to increased performance. This relates not only to financial performance, but also to other measures of performance (e.g. customer satisfaction). Taken all of the aforementioned into consideration, the adapted definition on innovation for purposes of this research is: innovation is the adoption process of new ideas on a firm- and individual-level which aims to increase performance.

Innovation adoption curves

Innovation adoption curves attempt to gauge the evolution of an innovation. In scientific research, there are three widely known innovation adoption curves, namely: the performance S-curve, Rogers' Adoption Curve, and Gartner's Hype Cycle Curve. The S-curve reflects the performance of an innovation in terms of time (Becker & Speltz, 1983, 1986; Lee & Nakicenovic, 1988; Roussel, 1984) or in terms of the actual investment in its development (Foster, 1988). The S-curve counts four phases of technological performance: embryonic, growth, mature, and aging (Roussel, Saad, & Erickson, 1991). The curve starts with the embryonic phase where there is little performance and not much effort/time invested. The performance grows when the invested effort/time increases. As a result, the technology will tap into other phases of the innovation life cycle. Each phase tends to have its own recommendation for strategically managing the innovation (Nieto, Lopéz, & Cruz, 1998).

Rogers' Adoption Curve shows the market adoption of an innovation over time. Rogers (2010) divided the adopters into five categories based on their most dominant characteristic: innovators (venturesome), early adopters (respect), early majority (deliberate), late majority (skeptical), and laggards (traditional). The relatively earlier adopters differ from later adopters in their socioeconomic status (e.g. more years of formal education, higher social status, and more likely to be literate), personality traits (e.g. more favorable attitude towards change, greater rationality, and greater intelligence), and communication behavior (e.g. have greater knowledge of innovations, engage in more active information seeking, and greater exposure to interpersonal communication channels) (Rogers, 2010).

Gartner's Hype Cycle Curve displays the technology maturity and reflects human attitudes towards the innovation (Linden & Fenn, 2003). The Hype Cycle Curve is divided into seven phases based on market events: technology trigger (technological breakthrough that triggers publicity and interest), on the rise (media attention), at the peak of inflated expectations (an increase in the number of vendors), sliding into the trough of disillusionment (innovation does not live up to high expectations and is promptly discredited), climbing the slope of enlightenment (vendors pursue new investments to climb up the slope), entering the plateau of productivity (mainstream adoption), and post-plateau (full maturity of technology) (Linden & Fenn, 2003). The Hype Cycle Curve shows two phases of increasing hype. The first hype is unstable and caused by media attention, and, the second hype is related to the beginning of the actual adoption growth (Linden & Fenn, 2003).

Innovation adoption process

The maintained definition of innovation suggests that innovation is a process of adoption. The adoption process is "a sequence of stages a potential adopter of an innovation passes through before acceptance of a new product, service or idea" (Frambach & Schillewaert, 2002, p. 164). In scientific literature, the innovation adoption process by organizations has been divided into a variety of phases (Damanpour & Schneider, 2006). The variety of phases is reflected in the innovation literature by the number of phases and the denominators, for instance; awareness, selection, adoption, implementation, and routinization (Klein & Sorra, 1996); knowledge, persuasion, decision, implementation, and confirmation (Rogers, 2010); initiation, development, implementation, and termination (Van de Ven & Angle, 1989); evaluation, initiation, implementation, and routinization (Hage & Aiken, 1970); and knowledge awareness, attitudes formation, decision, initial implementation, and sustained implementation (Zaltman, Duncan, & Holbek, 1973). Although the phases vary in number and denominators, they can be grouped into three more general phases of initiation, adoption, and implementation (Damanpour & Schneider, 2006). In the initiation phase, a potential adopter recognizes a need, identifies suitable innovations, and evaluates alternatives (Damanpour & Schneider, 2006; Frambach & Schillewaert, 2002). In the adoption phase, a potential adopter chooses to adopt or to reject an innovation (Rogers, 2010). In the implementation phase, the adopter modifies the innovation, prepares the organization and employees for its use, and makes use of the innovation (Damanpour & Schneider, 2006; Frambach & Schillewaert, 2002). However, research shows that organizational adoption is only one level in the innovation adoption process (Frambach & Schillewaert, 2002).

The innovation adoption process often occurs on two levels: organizational adoption (firm-level) and individual adoption by users (individual-level) (Gallivan, 2001; Zaltman et al., 1973). Innovations adopted by the organization need to be adopted within the organization; by its employees. Rogers (2010) suggests that the innovation adoption process of an individual is similar to the innovation adoption process of an organization's decision-making unit. Therefore, the phases of the innovation adoption process are considered to be the same on firm-level as on individual-level.

Innovation adoption models and theories

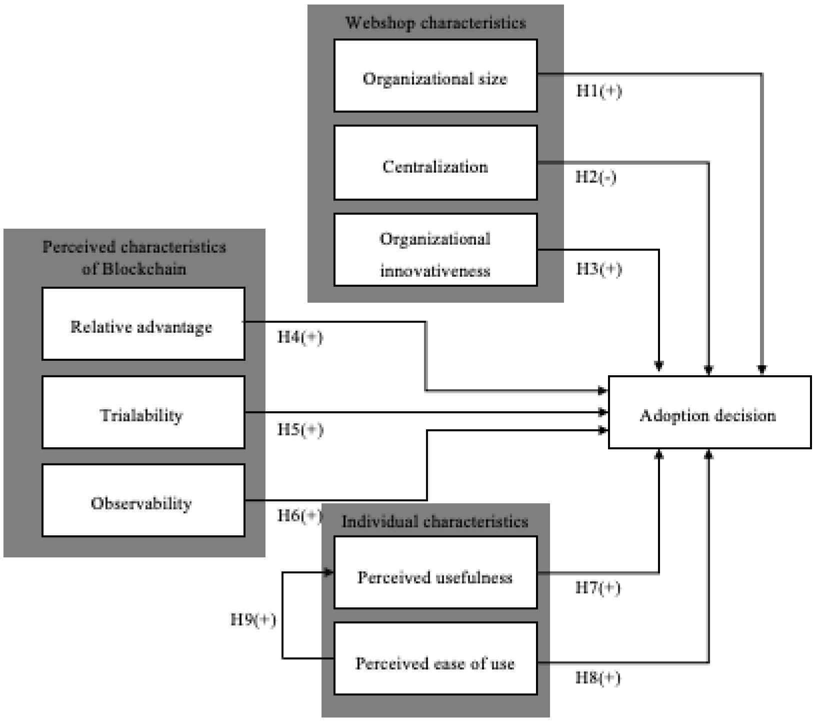
The innovation adoption process has been examined in several studies (Gallivan, 2001), for instance: Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1977; Fishbein & Ajzen, 1980); Theory of Planned Behavior (TPB) (Ajzen, 1985); (the extended) Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989; Davis, 1989; Venkatesh & Davis, 2000); and Diffusion of Innovation theory (DI) (Rogers, 2010). Appendix II describes the different theories and models of innovation adoption. Appendix III states the limitations of each theory and model.

Conceptual model

This research adopts the multi-level framework by Frambach and Schillewaert (2002) to analyze the determinants influencing the adoption process. The choice to use this framework as a basis for the conceptual model is threefold. On the one hand, this framework is chosen as it examines the internal and external determinants (or characteristics) influencing innovation adoption. It is widely known that both internal and external factors influence organizations (Child, 1972). Frambach and Schillewaert (2002) suggest that both these factors may influence the decision to adopt innovations. Though, both factors may influence the adoption decision; this study focuses solely on the internal factors. On the other hand, it is important to study the characteristics of innovation adoption on firm- and individual-level. Organizations may intend to adopt an innovation; this does not mean that its employees accept the introduction of the innovation, nor that they intend to adopt the innovation. By studying the characteristic influencing both firm- and individual-level adoption, this study might be more precise in predicting Blockchain adoption among webshops. Furthermore, this framework is chosen as it incorporates literature on TAM which is widely known and accepted as a model to measure technology acceptance among individual users.

The multi-level framework proposed consists of two conceptual frameworks for innovation adoption: organizational innovation adoption, and individual innovation adoption (Frambach & Schillewaert, 2002). The two frameworks are adapted and merged into one conceptual model. Figure 1 illustrates this conceptual model. The reason to combine these two frameworks to one conceptual model is twofold. On the one hand, the dependent variables, decision to adopt and individual user acceptance are similar. More specifically, the adoption process of an organization is similar to the process of individual user acceptance (Rogers, 2010). Therefore, this study refers to these two concepts as the same, namely: adoption decision. On the other hand, Frambach and Schillewaert (2002) state that each model of individual adoption is somewhat unique in terms of both the innovation and the environment under study. Therefore, the simplified and generic nomological framework needs adaptation to the features of the innovation and organizational contexts (Frambach & Schillewaert, 2002). Next to the adoption decision, the proposed model by Frambach and Schillewaert (2002) also incorporates continued usage as part of the adoption process. Continued usage is disregarded in this research for reasons of delimitation. The sections hereinafter further explain the selected characteristics in the conceptual model as well as the hypothesized effects. Table I provides an overview of the selected characteristics, the hypothesized relationships, and the literature on which the characteristics and hypotheses were based upon.

Figure 1: A conceptual model of webshops' adoption decision with regard to Blockchain



Characteristics of organizational innovation adoption

Frambach and Schillewaert (2002) suggest that the following characteristics influence organizational innovation adoption: adopter characteristics, perceived innovation characteristics, supplier marketing activities, social network, and environmental influences. These characteristics will be further elaborated upon in the section to come, except for supplier marketing activities, social influences, and environmental influences. This study focuses on the influences of internal factors on the adoption decision due to reasons of feasibility. The supplier marketing activities, social network, and environmental influences are external influences. Although excluded from this analysis, these external characteristics may influence the adoption decision.

Adopter characteristics

Adopter characteristics influence the adoption of innovations by organizations (Damanpour, 1991). Frambach and Schillewaert (2002) identified three types of organizational characteristics influencing the adoption decision: organizational size, organizational structure, and organizational innovativeness.

Organizational size is defined as the relative size of an organization which is usually measured in terms of the number of employees or revenue. The influence of organizational size on adoption has often been studied (Becker & Stafford, 1967; Corwin, 1972; Hage & Aiken, 1970; Mohr, 1969;

Mytinger, 1968; Rosner, 1968) and the relationship is argued to be paradoxical (Frambach & Schillewaert, 2002; Kennedy, 1983). On the one hand, organizational size is argued to be positively related to the adoption of innovations as larger organizations feel a greater need to adopt to support and increase their performance (Frambach & Schillewaert, 2002). On the other hand, the relationship is argued to be negative as smaller organizations have higher receptiveness towards innovations as a result of higher flexibility (Frambach & Schillewaert, 2002). Empirical evidence indicates a positive relationship between size and adoption decision (Kennedy, 1983; Thong & Yap, 1995). Accordingly, this research maintains a positive direct relationship between organizational size and the adoption decision.

In their framework, Frambach and Schillewaert (2002), link organizational structure to the adoption decision based on a theory by Zaltman et al. (1973). Zaltman et al. (1973) argue that larger organizations, who often are more formalized and centralized, are less likely to adopt innovations, but are more able to implement an innovation. Centralization is defined as the degree to which decision-making is concentrated in an organization (Pfeffer, 1981). Formalization is defined as "the extent to which standard practices, policies, and position responsibilities have been explicitly formalized by the organization" (Campbell, Fowles, & Weber, 2004, p. 565). Empirical results indicate statistical significance for a negative relationship between centralization and innovation adoption, however, no statistical significance was found for the relationship between formalization and the adoption of innovations (Damanpour, 1991). Nonetheless, this research maintains a negative direct relationship between centralization and the adoption decision.

Organizational innovativeness is defined as the degree to which an organization deviates from existing practices or knowledge in generating new products or process innovations (Srinivasan, Lilien, & Rangaswamy, 1999). The influence of organizational innovativeness on adoption depends on an organization's receptiveness towards innovations (Frambach & Schillewaert, 2002). Firms with higher degrees of innovativeness in their culture are found to have a greater capacity for the adoption of innovations (Hurley & Hult, 1998). Thus, this research maintains a positive direct relationship between organizational innovativeness and the adoption decision.

Overall, adapting the relationships between the adopter characteristics and the adoption decision to the context of Blockchain adoption among webshops leads to the following hypotheses:

Hypothesis 1: Organizational size has a positive direct effect on webshops' adoption decision regarding Blockchain.

Hypothesis 2: Centralization has a negative direct effect on webshops' adoption decision regarding Blockchain.

Hypothesis 3: Organizational innovativeness has a positive direct effect on webshops' adoption decision regarding Blockchain.

Perceived characteristics of the innovation

The perceived characteristics (or attributes) of the innovation are key predictors in explaining innovation adoption (Gallivan, 2001). The perceptions by members of an organization's decision-making unit (DMU) towards an innovation affects their assessment of and tendency to adopt this innovation (Frambach & Schillewaert, 2002). Frambach and Schillewaert (2002) identified six perceived innovation characteristics, (1) relative advantage, (2) complexity, (3) compatibility, (4) trialability, (5) observability, and (6) uncertainty. The first five characteristics in the framework are based upon a frequently cited study about the influence of perceived characteristics on the adoption of technological innovations written by Rogers (2010). Rogers (2010) examined several thousand innovation studies on the diffusion of new information technologies and identified these five characteristics which affect the adoption of an innovation (Moore & Benbasat, 1991). The sixth characteristic in the framework is based upon a paper about the influence of risk on the adoption of innovations written by Nooteboom (1989). Nooteboom (1989) interviewed 1,000 independent retailers in the Netherlands and found that uncertainty affects the adoption of an innovation.

In a separate analysis, Tornatzky, & Klein (1982) examined the most frequently addressed characteristics in the 105 articles they reviewed (Moore & Benbasat, 1991). They identified five additional characteristics next to the five characteristics of Rogers (2010), namely: cost, profitability, divisibility, social approval, and communicability (Tornatzky & Klein, 1982). However, they only found the following characteristics to be significantly related to and have a distinct relationship with adoption: compatibility, relative advantage, complexity, trialability, and observability. These five characteristics proposed by Tornatzky and Klein (1982) are the same as the five characteristics proposed by Rogers (2010).

In another analysis, Moore and Benbasat (1991) developed an instrument to measure the perceptions towards the adoption of an information technology innovation. Moore and Benbasat (1991) asked judges to sort items into construct categories and provide definitions, tested the various scales in pilot tests, and, eventually, surveyed 800 individuals to further refine the scales. The result was a 34-item instrument to measure seven scales, namely: (1) voluntariness, (2) relative advantage, (3) compatibility, (4) image, (5) ease of use, (6) visibility, and (7) trialability. This instrument can be 'shortened' to a 25-items instrument to measure the seven scales by deleting items, which if deleted, would not have a significant negative effect on the reliability and validity (Moore & Benbasat, 1991).

Comparing the five characteristics of Tornatzky and Klein (1982), and Rogers (2010) to the various scales of Moore and Benbasat (1991) leads to the following insights. Although conceptually different, compatibility and relative advantage are correlated as the items of compatibility load with those of relative advantage (Moore & Benbasat, 1991). Therefore, this study adopted only relative advantage as a determinant of the adoption decision. Complexity was not supported in the overall classification to measure the adoption of information technology innovation (Moore & Benbasat, 1991), and, thus, excluded in this study. Trialability was found to be supported in the instrument (Moore & Benbasat, 1991), and, hence, included in this study. Lastly, observability was found to be supported although, the items indicated that the construct was quite complex (Moore & Benbasat, 1991). Therefore, Moore and Benbasat (1991) chose to split this construct into two dimensions: result demonstrability and visibility. Accordingly, observability was included in this study. Overall, this study adopted relative advantage, trialability, and observability as antecedents of the adoption decision. The following paragraphs further explain these characteristics and their relationship with the adoption decision.

Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers & Shoemaker, 1971, p. 138) and has been found statistically significant in eleven of the twenty-nine studies on relative advantage. "Five reported correlations or chi-squares that could be used in a binomial test of significance" (Tornatzky & Klein, 1982, p. 35). All five studies found a positive relationship between relative advantage and innovation adoption. Therefore, this research maintains a positive direct relationship between relative advantage and the adoption decision.

Trialability is defined as "the degree to which an innovation may be experimented with on a limited basis" (Rogers & Shoemaker, 1971, p. 155) and has been found statistically significant in five of the eight studies on trialability.

> "These five cannot be easily summarized in any way, however, as only one study reported the first-order correlation, two performed discriminant analyses alone, one provided only mean characteristic rating scores, and the last reported chi-square results but no actual numbers from which to infer directionality of the relationship" (Tornatzky & Klein, 1982, p. 38).

Rogers (2010) reports a positive relationship between trialability and innovation adoption. Therefore, this research maintains a positive direct relationship between trialability and the adoption decision.

Observability is defined as "the degree to which the results of an innovation are visible to others" (Rogers & Shoemaker, 1971, p. 155) and has been found statistically significant in four of the seven studies on observability. "Of these four, only two provided any direct correlational measure of the observability-adoption relationship" (Tornatzky & Klein, 1982, p. 39). Tornatzky and Klein (1982) remain unclear about the direction of the relationship. Rogers (2010) reports a positive relationship between observability and innovation adoption. Thus, this research maintains a positive direct relationship between observability and the adoption decision.

Overall, adapting the relationships between the perceived characteristics of the innovation and the adoption decision to the context of Blockchain adoption among webshops leads to the following hypotheses:

Hypothesis 4: Relative advantage has a positive direct effect on webshops' adoption decision regarding Blockchain.

Hypothesis 5: Trialability has a positive direct effect on webshops' adoption decision regarding Blockchain.

Hypothesis 6: Observability has a positive direct effect on webshops' adoption decision regarding Blockchain.

Characteristics of individual innovation adoption

Frambach and Schillewaert (2002) suggest that the following characteristics influence individual innovation adoption: attitude towards the innovation, organizational facilitators, personal innovativeness, social influences, and personal characteristics. The section to come elaborates only on one characteristic, namely: attitude towards the innovation (hereinafter referred to as individual characteristics). The individual characteristics were selected as these characteristics incorporate TAM. As earlier explained, TAM is one of the most influential models of technology acceptance (i.e. adoption) (Frambach & Schillewaert, 2002). Furthermore, the attitude towards the innovation is a central independent variable in the framework by Frambach and Schillewaert (2002) as all other variables are suggested to have an indirect effect (next to a direct effect for some variables) on individual adoption through attitude towards the innovation.

The other characteristics are disregarded in the context of this paper. Not because they are not relevant, but for purposes of feasibility. The feasibility of this paper would be endangered if all characteristics of individual innovation adoption would be incorporated.

Individual characteristics

Perceived beliefs and affects held towards an innovation is a recurrent theme in models explaining individual's acceptance of innovation (Davis, 1989; Frambach & Schillewaert, 2002). The individual's attitude towards a given innovation reflects these cognitive beliefs and affects (Frambach & Schillewaert, 2002; Le Bon & Merunka, 1998; Rosenberg, 1960; Triandis, 1971). TRA is a useful model to predict beliefs and attitudes towards individual acceptance behavior (Fishbein et al., 1980). The theory was successfully used to develop TAM (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003), and, ultimately, the extended TAM (Venkatesh & Davis, 2000). The model found empirical support for two beliefs to predict user acceptance of computers, namely: (1) perceived usefulness, and (2) perceived ease of use (Davis et al., 1989; Davis, 1989). Additionally, extended TAM found one extra belief to predict user acceptance; subjective norm (Venkatesh & Davis, 2000). However, in order to research the influence of subjective norm on the adoption decision, one should incorporate the influence of voluntariness; which is beyond the scope of this study.

Affects relate to an individual's attitudes which can be changed and influenced (Frambach & Schillewaert, 2002). Furthermore, an individual's attitudes is found to mediate the influence of external variables and stimuli (Frambach & Schillewaert, 2002). Therefore, Frambach, & Schillewaert (2002) choose to incorporate the effect of external influences (i.e. organizational facilitators, social usage, personal innovativeness, and personal characteristics) on individual acceptance of adoption through attitudinal components. However, as stated earlier, this research disregards the external influences for reasons of feasibility.

In conclusion, this study adopts perceived usefulness and perceived ease of use as antecedents of the adoption decision on individual-level. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" " (Davis, 1989, p. 320). Following TRA, it is expected that positive beliefs about focal innovation lead to positive behavior. Therefore, this research maintains a positive relationship between beliefs (i.e. perceived usefulness and perceived ease of use) and the adoption decision.

Overall, adapting the relationships between the individual characteristics and the adoption decision to the context of Blockchain adoption among customer support employees leads to the following hypotheses:

Hypothesis 7: Perceived usefulness has a positive direct effect on customer support employees' adoption decision regarding Blockchain.

Hypothesis 8: Perceived ease of use has a positive direct effect on customer support employees' adoption decision regarding Blockchain.

Furthermore, Davis (1989) and Davis et al. (1989) found empirical support for perceived ease of use to be a causal antecedent to perceived usefulness. Following TRA, it is expected that this mediation effect is positively related to behavior. Therefore, this research maintains a positive relationship of perceived ease of use on the adoption decision through its effect on perceived usefulness. Adapting this indirect relationship to the context of Blockchain adoption among customer support employees leads to the following hypothesis

Hypothesis 9: Perceived ease of use has a positive indirect effect on customer support employees' adoption decision regarding Blockchain through perceived usefulness.

Table 1: Relationships between the independent variables and the dependent variable ‘adoption decision’

Independent variables	Relationship	Selected related research
Webshop characteristics		
Organizational size	Positive	Kennedy, 1983; Thong, & Yap, 1995
Centralization	Negative	Damanpour, 1991
Organizational innovativeness	Positive	Hurley, & Hult, 1998
Perceived characteristics of Blockchain		
Relative advantage	Positive	Tornatzky, Klein, 1982;
Trialability	Positive	Rogers, 2010
Observability	Positive	Rogers, 2010
Individual characteristics		
Perceived usefulness	Positive	Davis, 1989; Davis et al., 1989; Ajzen, & Fishbein, 1980
Perceived ease of use	Positive	Davis, 1989; Davis et al., 1989; Ajzen, & Fishbein, 1980

Chapter IV: Methodology

Before testing the hypotheses, it is important to design the method of data collection. The following sections describe the research design, the collection of data, and the sample size. Next, the development of measurements is expressed in which the dependent, independent, and control variables are operationalized. Lastly, the validity and reliability are examined as well as the research ethics.

Research design

As stated in the introduction, the main research question was: "*What is the effect of innovation adoption characteristics on webshops' and customer support employees' adoption decision regarding Blockchain?"* The present research tested the degree to which various innovation adoption characteristics influence the adoption decision of among webshops. The degree of influence was tested both on a firm- and individual-level. To test the conceptual model and hypothesized relationships, a quantitative study was conducted. Quantitative studies use numerical information to obtain scientific knowledge (Field, 2013, p. 3). Numerical information was the most appropriate method to measure the degree to which the various innovation adoption characteristics influence the adoption decision of. Furthermore, cross-sectional research was performed as this research aimed to measure the degree to which adoption characteristics influence the adoption decision of at a single point in time. A cross-sectional study is a method where natural events are observed by taking a snapshot of many variables at a single point in time (Field, 2013, p. 13). More specifically, an online survey was conducted to obtain numerical information at a single point in time. Appendix IV provides an overview of the items in the survey. The advantages of online surveys are the speed of data collection, instant access to a wide audience irrespective of their geographical location, and short response time (Ilieva, Baron, & Healey, 2002). Participants will be presented sets of questions regarding the dependent variable, independent variables, and control variables.

Data collection and sample

The online survey is set up with Qualtrics software. In the introduction screen, the participants were informed about the use cases Blockchain offers for webshops and the associated challenges. Additionally, confidentiality and anonymity were emphasized as well as the right to withdraw from the survey at any moment. Furthermore, the duration of the survey was communicated which is approximately ten minutes. After the introduction screen, the participants were asked to answer the items of the survey. In the end, participants were thanked for their input and a comment section was provided for feedback and/or questions. Additionally, the participants were provided with the opportunity to fill in their contact details if they wished to participate in the lottery for 1 of 3 €20 gift cards and/or wish to receive the results of this study.

The participants being surveyed were webshop employees. More specifically, this study focused solely on customer support employees. Within webshops, the customer support employees are most affected by the stated use cases of Blockchain as described in chapter II. Customer support employees were recruited via two techniques of nonprobability sampling. Nonprobability sampling is a method that includes all techniques that are not based on some random-selection method (i.e. probability) (Babbie, 2015). The first technique is called reliance on available subjects. Participants were reached by emailing the webshops that are affiliated to the 'Thuiswinkel Waarborg' and 'WebwinkelKeur' quality marks, by messaging customer support managers via LinkedIn, and by the availability of potential candidates in the network of the researcher. In total, the initial sample size contained approximately 4.000 webshops which related to an unknown number of customer care employees as this number varies per webshop. The second technique is called snowball sampling (Goodman, 1961). The initial sample was asked to forward their invitation to their colleagues, friends and acquaintances.

As a general rule, it is suggested that the ratio of observations to independent variables should not fall below five in order to use multiple regression analysis (Kotrlik & Higgins, 2001). Furthermore, it is suggested that the factor analysis should only be done with at least 100 observations (Kotrlik & Higgins, 2001). In line with these general rules, this study aimed to maintain a minimum number of at least a hundred participants. It is noted that this minimalistic quantity of participants and the use of nonprobability sampling techniques may endanger the generalizability of the results. Eventually, 99 observations were collected.

Measurement development

Dependent variable

The adoption decision of Blockchain was the dependent variable in this study and describes the degree to which webshops tend to adopt Blockchain. The dependent variable was assessed with a 4-items scale adapted from Teo, Wei and Benbasat (2003), and Tan and Teo (2000). Two items were used to measure the adoption decision of on a firm-level, and two items for the measurement on an individual-level. Answers to the items ranged from strongly disagree to strongly agree on a 5-point Likert scale. Appendix IV provides an overview of the items.

Independent variables

The independent variables in this study were predicted to relate to three concepts: webshop characteristics, perceived characteristics of Blockchain, and individual characteristics. The measurement items for the independent variables were adapted from previously validated measures, or, were developed based on literature review. Answers to the items, except for organizational size, ranged from strongly disagree to strongly agree on a 5-point Likert scale. Appendix IV provides an overview of the items.

Webshop characteristics

Webshop characteristics consists of three dimensions: organizational size, centralization, and organizational innovativeness. Organizational size refers to the number of employees as a popular measure to assess business size (Thong & Yap, 1995). The variable was measured with one validated item adapted from Thong and Yap (1995). Answers to this item could be any number of employees.

Centralization was assessed with two indicators: participation in decision making, and hierarchy of authority (Dewar, Whetten, & Boje, 1980). Participation in decision making represents how much the employees of various positions within the organization participate in the allocation of resources and the determination of organization policies (Hage & Aiken, 1967). The hierarchy of authority indicates the distribution of power among social positions (Hage & Aiken, 1967). The dimension was measured with a validated 9-item scale adapted from Dewar, Whetten and Boje (1980). Four items were used to measure participation in decision making, and five for the measurement of hierarchy of authority.

Organizational innovativeness was determined with two indicators: participative decision making, and learning and development (Hurley & Hult, 1998). Participative decision making (Hurley & Hult, 1998) is similar to participation in decision making (Dewar et al., 1980). Therefore, this study refers to them as the same under the name: participation in decision making. Learning and development refers to “the degree to which learning and development are encouraged in the organization” (Hurley & Hult, 1998, p. 47). The dimension was measured with a validated 8-item scale adapted from Dewar, Whetten and Boje (1980), and Hurley and Hult (1998). Four items were used to measure participation in decision making, and four for the measurement of learning and development.

Perceived characteristics of Blockchain

Perceived characteristics of Blockchain consists of three dimensions: relative advantage, trialability, and observability. Relative advantage was measured with 5-items scale adapted from Moore and Benbasat (1991). Moore and Benbasat (1991) validated a 9-items scale to measure relative advantage. They identified four items, that if deleted, would not have a significant negative effect on the reliability and validity of the scale (Moore & Benbasat, 1991). Therefore, this study incorporated the remaining 5-items scale of relative advantage.

Trialability was determined with a validated 2-items scale adapted from Moore and Benbasat (1991). Moore and Benbasat (1991) validated a 2-items scale to measure trialability. They identified none items, that if deleted, would not have a significant negative effect on the reliability and validity of the scale (Moore & Benbasat, 1991). Therefore, this study incorporated both items of trialability.

Observability was assessed by two indicators: result demonstrability and visibility. Result demonstrability indicates that the more amenable to demonstration an innovation is, the more visible its advantages are (Zaltman et al., 1973). Moore and Benbasat (1991) validated a 4-items scale to measure result demonstrability. All items, if deleted, were identified to have a negative effect on the reliability and validity of the scale (Moore & Benbasat, 1991). Therefore, this study incorporated the validated 4-items scale of result demonstrability. Visibility refers to the actual visibility of hardware and software (Moore & Benbasat, 1991). This research excluded the indicator visibility as the validated 2-items scale on the shortened list (i.e. the 25-item instrument) refer only to hardware (which Blockchain is not) and already adopted software. Thus, observability was measured with a validated 4-item scale adapted from Moore and Benbasat (1991).

Individual characteristics

Individual characteristics consists of two dimensions: perceived usefulness and perceived ease of use. Perceived usefulness was measured with a validated 4-items scale adapted from Venkatesh and Davis (2000).

Perceived ease of use was determined with a validated 4-items scale adapted from Venkatesh and Davis (2000).

Control variables

This study included four control variables: industry, gender, age, and knowledge. For industry, it is recommended to incorporate this control variable as it is a frequently used control variable in IS literature (Bresnahan, Brynjolfsson, & Hitt, 2002; Oliveira & Martins, 2010; Soares-Aguiar & Palma-dos-Reis, 2008; Zhu, Dong, Xu, & Kraemer, 2006; Zhu, Kraemer, & Xu, 2003). The different industry categories used were based upon a questionnaire created by TNO; an independent Dutch research organization (TNO, 2003).

For gender, there are contradicting results about the effect of this control variable on the adoption decision. Venkatesh, Morris and Ackerman (2000) used TPB to measure gender differences in the adoption decision on new technologies. They found that men were more strongly influenced by their attitude towards using the new technology (Venkatesh et al., 2000). In turn, women were found to be more strongly influenced by perceived behavioral control and subjective norm (Venkatesh et al., 2000). Opposingly, Venkatesh and Morris (2000) used TAM to measure gender differences in the adoption decision on new technologies. They found that men were more strongly influenced by their perception of usefulness (Venkatesh & Morris, 2000). In turn, women were found to be more strongly influenced by subjective norm and perceptions of ease of use (Venkatesh & Morris, 2000). This study included gender as a control variable as the variable is proven to influence the adoption decision of new technologies.

For age, there is extensive support for the negative effect of this control variable on the adoption decision (Agarwal & Prasad, 1999; Nickell & Pinto, 1986). Morris and Venkatesh (2000) used TPB to measure age differences in the adoption decision on new technologies. They found that, at 2 out of 2 points of measurement, younger workers were more strongly influenced by their attitude towards using a new technology (Morris & Venkatesh, 2000). In turn, older workers were more strongly influenced by perceived behavioral control and subjective norm (Morris & Venkatesh, 2000). This study included age as a control variable as the variable is proven to influence the adoption decision.

For knowledge, it is chosen to incorporate this control variable as Blockchain is a relatively new technology. Employees might not be familiar with the technology nor with its implications on their job tasks. Halfway into the survey, Blockchain, the possible applications, and associated challenges were introduced. Following, the participants were asked to indicate to what extent they think to be able to estimate the possible implications of introducing Blockchain would have on their daily work. Answers to the item ranged from 'I am not able to estimate the possible effects' to 'I am fully able to estimate the possible effects'. Testing the participant's ability to estimate the possible implications improved the validity of the analysis.

Validity and reliability

In scientific research, it is important to measure variables accurately (Field, 2013). More often than not, there will be a discrepancy between the numbers used to represent a measurement and the actual value of the measurement; this is called measurement error (Field, 2013). Field (2013) suggests that the measurement error is supposed to be kept to a minimum. There are two key indicators that express the quality of a measuring instrument, namely: validity, and reliability (Kimberlin & Winterstein, 2008). Validity indicates "whether an instrument measures what it was designed to measure" (Field, 2013, p. 12). Reliability indicates "whether an instrument can be interpreted consistently across different situations" (Field, 2013, p. 12). In this study, the validity and reliability were guaranteed by using measurement items which are validated in adoption literature. Furthermore, three of these items were formulated in a negative manner to further improve validity. Nonetheless, the generalizability of the results may be endangered due to the use of nonprobability sampling techniques and the minimalistic number of participants.

Research ethics

The presented research was subjected to the four ethics of management research. The four principles are: (1) conflicts of interest and affiliation bias, (2) power relations, (3) harm, wrongdoing, and risk and (4) confidentiality and anonymity (Bell & Bryman, 2007). Firstly, this research focuses solely on scientific purposes. Therefore, there was no pressure from managers. Secondly, prior to their participation, participants were informed that participation was not obligated and that they were free to withdraw at any moment. Thirdly, after response to the online survey, there was a section provided for feedback and/or questions. Hereby, offering the participants the opportunity to pronounce their criticism. Fourthly, prior to their participation, participants were informed that their responses would be treated confidential and anonymous. Moreover, their names and the name of the organization they work for were never asked. Questions about other demographics were limited (e.g. only gender, and age). Furthermore, the participants were informed to leave a comment if they have any remaining questions regarding their confidentiality and/or anonymity.

Chapter VI: Results

After collecting the observations, the results were subtracted from Qualtrics. The following sections describe the deletion of incomplete data, factor analyses used to derive at factors, the univariate and bivariate statistics, and regression analyses to test the hypotheses.

Missing data and outliers

The data was collected from a total of 176 respondents. The data set was checked for missing data and outliers. There were 76 observations that contained missing data due to respondents that failed to answer all provided questions. After deleting these observations, there were 100 responses remaining. One outlier was detected as one respondent's age was 1 year. After deleting this outlier, the total data set consisted of 99 responses. As a next step, the three negatively formulated questions were reverse coded to align them with the original direction as proposed in adoption literature. Afterwards, the variable 'Organizational size' and control variable 'Age' were recoded into new variables each with four categories. Furthermore, dummies were created for the control variables 'Knowledge', 'Gender', 'Age', and 'Industry'.

Factor analysis

Before conducting the factor analyses, the normality of the distribution was assessed (appendix V.a). The values for kurtosis and skewness of all items were between the threshold values of -3 and +3 which indicated that the data is normally distributed (Hair, Anderson, Babin, & Black, 2010). Multiple factor analyses were executed to assess the theory-based expectations of which items load on the same constructs. Common factor analysis was chosen as the extraction method as the primary concern was to identify the latent constructs. Orthogonal rotation method (i.e. Varimax) was selected as the rotation method as no correlation between factors were expected, nor, found using the oblique rotation method. A factor analysis consists of the following steps; (1) checking the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and (2) Bartlett's test of sphericity, (3) determining the number of factors to extract based on the latent root criterion, and (4) assessing the communalities of each item as well as (5) the factor loadings.

The KMO measure of sampling adequacy expresses the ratio of squared correlation between items to the squared partial correlations between items (Field, 2013). The values for both the overall test and each individual item must exceed .50 (preferred: >.80); items with lesser values should be omitted one-by-one starting with the smallest value (Hair et al., 2010).

Bartlett's test of sphericity assesses if the correlation matrix differs significantly from an identity matrix (Field, 2013). The test should be significant ($p < .05$) indicating that sufficient correlations exist (Hair et al., 2010).

The latent root criterion tests if an individual construct accounts for at least the variance of a single item (Hair et al., 2010). Following the criterion, only constructs with an eigenvalue greater than 1 are to be considered as significant (Hair et al., 2010).

Communalities indicate the portion of an item's variance that is shared with other items (i.e. common variance) (Field, 2013). The threshold for communalities after extraction is .50; indicating that items with lesser values do not meet acceptable levels of explanation (Hair et al., 2010). Factor loadings express the regression coefficient of an item that describes a construct (Field, 2013). The absolute values for factor loadings should exceed .40 (Field, 2013).

Cross-loading occurs when an item has significant loadings on multiple constructs (Hair et al., 2010). Cross-loadings are exposed when the difference between the highest factor loading and the second-highest factor loading is less than .20. The item with the smallest difference between the highest and second-highest factor loadings are to be deleted.

Webshop characteristics

No factor analysis was performed for the dimension of organizational size as this dimension was measured with one item only.

A factor analysis was conducted for the dimension of centralization (Appendix V.b). The KMO measure had a value of .782 and Bartlett's test was found to be significant ($p < .05$), thus confirming the appropriateness of using factor analysis. Three items were found that did not meet the threshold for communalities. The three items 'Desc_prom', 'Desc_staff', and 'Hier_spvs' were deleted, respectively. The final iteration of the analysis resulted in 2 factors with an eigenvalue greater than 1, explaining 73.2% of the variance. The two factors were formed by six items. One factor, containing two items, referred to the indicator participation in decision making. It is noteworthy to stress out that factors formed by less than three items is undesirable (Raubenheimer, 2004). The second factor, containing four items, referred to the indicator hierarchy of authority.

A factor analysis was performed for the dimension of organizational innovativeness (Appendix V.c). The KMO measure had a value of .804 and Bartlett's test was found to be significant ($p < .05$), therefore confirming the appropriateness of using factor analysis. Four items were found that did not meet the threshold for communalities after extraction, and one item did not surpass the criterions for factor loadings and double-loadings. The items 'LD_gc', 'LD_cmgt', 'LD_fdvl', 'LD_indv', 'Desc_prom', and 'Desc_staff' were deleted, respectively. Rerunning the analysis resulted in one factor with an eigenvalue greater than 1, explaining 81.3% of the variance. The factor consisted of two items, which were the same as with the factor participation in decision making of the dimension centralization. Though the theoretical difference between the dimensions centralization and organizational innovativeness in adoption literature, no empirical difference was found between the two dimensions. Hereby, justifying the deletion of the dimension organizational innovativeness.

Perceived characteristics of Blockchain

A factor analysis was conducted for the dimension of relative advantage (Appendix V.d). The KMO measure had a value of .679 and Bartlett's test was found to be significant (p < .05), thus confirming the appropriateness of using factor analysis. One item was found that did not meet the thresholds for communalities after extraction, and factor loadings. This item, named 'RA_easy_recoded', was deleted. The final iteration resulted in one factor with an eigenvalue greater than 1, explaining 75.2% of the variance. The factor was formed by three items and referred to the dimension relative advantage.

A factor analysis was performed for the dimension of trialability (Appendix V.e). The KMO measure had a value of .500 and Bartlett's test was found to be significant (p < .05), therefore confirming the appropriateness of using factor analysis. The sampling adequacy, indicated by the KMO, is 'miserable' (Field, 2013), but sufficient. None items were found that did not meet the requirements for communalities after extraction, factor loadings, or cross-loadings. The analysis resulted in one factor with an eigenvalue greater than 1, which explained 84.3% of the variance. The factor was build up from two items and referred to the dimension trialability. Again, the use of a 2-item factor is not preferred (Raubenheimer, 2004).

A factor analysis was executed for the dimension of observability (Appendix V.f). The KMO measure had a value of .569 and Bartlett's test was found to be significant (p < .05), thus confirming the appropriateness of using factor analysis. Again, The sampling adequacy is 'miserable' (Field, 2013), but sufficient. Three items were found that did not meet the threshold for communalities after extraction, and one item that had a negative factor loading; indicating that the item does not describe the factor. The items 'Rslt_expl', and 'Rslt_appr' were deleted, respectively. The final iteration showed one factor with an eigenvalue greater than 1, explaining 75.0% of the variance. The factor consisted of two items and referred to the dimension result demonstrability. Anew, the use of a 2-item factor is not preferred (Raubenheimer, 2004).

Individual characteristics

A factor analysis was conducted for the dimension of perceived usefulness (Appendix V.g). The KMO measure had a value of .704 and Bartlett's test was found to be significant (p < .05), therefore confirming the appropriateness of using factor analysis. Two items were found that did not meet the threshold for communalities after extraction, and one item that did not surpass the criterion for factor loadings. The items 'Pusef_jperf_recoded', and 'Pusef_use' were deleted, respectively. The final iteration produced one factor with an eigenvalue greater than 1, explaining 85.5%. The factor contained two items and referred to the dimension perceived usefulness. Anew, using a factor with less than three items is undesirable (Raubenheimer, 2004).

A factor analysis was performed for the dimension of perceived ease of use (Appendix V.h). The KMO measure had a value of .571 and Bartlett's test was found to be significant (p < .05), therefore confirming the appropriateness of using factor analysis. One item was found that did not meet the threshold for communalities after extraction. This item, named 'Pease_cu' was deleted. The final iteration resulted in a factor matrix that could not be extracted as the communality of a variable exceeded 1.0 meaning that the factor has negative variance (SAS, 2009). This is being referred to as an ultra-Heywood case and statisticians are fragmented whether or not factor analysis can be considered legitimate with these cases (Trendafilov, 2003). Some argue that the common factors explain the ultra-Heywood case entirely (Anderson, 2003; Bartholomew, Knott, & Moustaki, 2011), while others argue that a factor analysis containing a ultra-Heywood case is invalid (SAS, 1990). In the case of the factor analysis for the dimension of perceived ease of use it is chosen that the ultra-Heywood case makes it impossible to create a definite factor based on the remaining items.

Adoption decision

A factor analysis was executed for the dimension of the adoption decision (Appendix V.i). The KMO measure had a value of .592 and Bartlett's test was found to be significant (p < .05), therefore confirming the appropriateness of using factor analysis. Again, The sampling adequacy is 'miserable' (Field, 2013), but sufficient. None items were found that did not meet the requirements for communalities after extraction, factor loadings, or cross-loadings. The factor matrix indicated that there were two factors with an eigenvalue greater than 1, explaining 88.7%. One factor, containing two items, referred to the adoption decision on firm-level. The second factor, containing two items, referred to the adoption decision on individual-level. Anew, using a factor with less than three items is undesirable (Raubenheimer, 2004).

Reliability analyses

When using factor analyses for questionnaire validation, it is recommended to check the reliability of each extracted factor (Field, 2013). Reliability describes the degree to which a set of items is consistent in reflecting the factor it is intended to measure (Field, 2013; Hair et al., 2010). The most commonly used measure for determining the consistency of a summated scale is the reliability coefficient (i.e. Cronbach's alpha) (Hair et al., 2010). A minimal value of .70 for Cronbach's alpha is widely agreed upon, but a value of .60 is also allowed (Hair et al., 2010). It is recommended to delete an item if deletion improves the overall reliability of the factor (Field, 2013). Table 2 provides an overview of the reliability coefficients of each factor extracted in the factor analyses. Appendices VI.a – VI.g present detailed insight in the executed reliability analyses. Only the reliability coefficient of the factor result demonstrability was found to be marginally below the threshold of .70. As a result, the reliability of this factor is debatable. Nonetheless, the factor is maintained in the analysis since the difference is only marginal. Nonetheless, it will be treated with caution. Lastly, the factor analysis showed that the dependent variable adoption decision loaded on two factors which both have sufficient internal reliability. Despite the theoretical correspondence, the factors adoption decision on firm-level and adoption decision on individual-level were treated separately in the statistical tests.

Table 2: Overview reliability coefficients of extracted factors

Factor	number of items	items	Cronbach's alpha
Participation in decision making	2	Desc_tech Desc_plcs	.770
Hierarchy of authority	4	Hier_disc Hier_rfr Hier_boss Hier_appr	.836
Relative advantage	3	RA_quick RA_qual RA_effec	.830
Trialability	2	Trial_tryout Trial_trial	.811
Result demonstrability	2	Rslt_rslt Rslt_consq	.665
Perceived usefulness	2	Pusef_prod Pusef_effe	.817
Adoption decision firm-level	2	Fl_ita_cont Fl_ita_adopt	.888
Adoption decision individual-level	2	Il_ita_inter Il_ita_adopt	.849

Partial least squares

In addition to the previous reliability analyses, another statistical test was run to further elaborate on the validity and reliability of the extracted factors. This test, called partial least squares (PLS) path modelling, is a variance-based structural equation modelling (SEM) technique providing the ability to model composites and factors for new technology research (Henseler, Hubona, Ray, & systems, 2016). SEM is a collection of statistical techniques that enables its user to model latent variables, take into account various forms of measurement error, and test entire theories (Henseler et al., 2016). PLS path models are formally determined by two linear equations: the measurement model and the structural model (Henseler et al., 2016). The measurement model indicates the relationships between a construct and its observed indicators, whereas the structural model indicates the relationships between the constructs (Henseler et al., 2016). The aim of using PLS is to further examine the validity and reliability of the extracted constructs. Therefore, only the measurement model was elaborated upon. The relationships between constructs (i.e. structural model) are examined via regression analyses later in this chapter.

Before assessing the measurement model, one should examine the overall goodness of fit of the model. The overall model is considered appropriate when the threshold for standardized root mean square residual (SRMR) is below 95%. SRMR tests if the correlation matrix implied by the estimated model is sufficiently similar to the empirical correlation matrix. The SRMR-value of this study was .07 which is below the threshold value, and thus confirming the appropriateness of the overall model.

Construct reliability indicates whether the amount of random error in construct scores are acceptable (Henseler et al., 2016). The construct reliability was assessed using three reliability measures: Dijkstra-Hensler's rho, Jöreskog's rho, and Cronbach's alpha. Table 3 provides an overview of these measurements. The results show that all constructs exceed the threshold value of .7 for each reliability measure, except for the construct observability. This construct was not deleted as its reliability values for Dijkstra-Hensler's rho and Cronbach's alpha were just below the threshold values. Nonetheless, it needs to be treated with caution. Furthermore, the Dijkstra-Hesneler's rho has two values which are above the maximum value 1 indicating that there is some degree of random error in the constructs participation in decision making and relative advantage. Lastly, the results showed minimal differences in the Cronbach's alpha of each construct as compared to the values of Cronbach's alpha in table 2.

Table 3: Reliability measures

Construct	Dijkstra-Henseler's rho	Jöreskog's rho	Cronbach's alpha
Organizational size	1.00	1.00	
Participation in decision making	1.293	.880	.770
Hierarchy of authority	.970	.872	.839
Relative advantage	1.900	.870	.835
Trialability	.840	.914	.813
Observability	.667	.857	.667
Perceived usefulness	.868	.915	.817
Adoption decision firm-level	.851	.931	.851
Adoption decision individual-level	.888	.947	.888

The measurement of factors should not have any systematic measurement error (Henseler et al., 2016). There are several non-exclusive ways to fulfil this quest for validity. Firstly, convergent validity checks whether a factor is unidimensional (Henseler et al., 2016). The convergent validity was measured using the average variance extracted (AVE). Table 4 provides an overview of the convergent validity. All values were above the threshold value .5, and thus the convergent validity was assumed.

Table 4: Convergent validity

Construct	AVE
Organizational size	1.000
Participation in decision making	.787
Hierarchy of authority	.633
Relative advantage	.694
Trialability	.841
Observability	.750
Perceived usefulness	.843
Adoption decision firm-level	.870
Adoption decision individual-level	.899

Secondly, discriminant validity checks whether each pair of theoretically different factors also differ empirically (Henseler et al., 2016). Discriminant validity was assessed using two criteria: the Fornell-Larcker criterion and the heterotrait-monotrait ratio of correlations (HTMT). According to the Fornell-Larcker criterion, a factor's AVE should be higher than its squared correlations with all other factors in the model (Henseler et al., 2016). The HTMT is an estimate for the correlation between factors (Henseler et al., 2016). The smaller the HTMT of a pair of constructs, the higher the likelihood they are to be discriminant (Henseler, 2017). Tables 5 and 6 provide overviews of the discriminant validity criteria. The values for the Fornell-Larcker criterion showed that each factor's AVE is higher than its squared correlations with all other factors in the model, whereas the values for HTMT were substantially smaller than 1. Therefore, discriminant validity was assumed.

Table 5: Discriminant validity: the Fornell-Larcker criterion

Construct	OS	PDM	HA	RA	TR	OB	PU	ADFL	ADIL
Organizational size (OS)	1.000								
Participation in decision making (PDM)	.085	.787							
Hierarchy of authority (HA)	.001	.076	.633						
Relative advantage (RA)	.003	.006	.001	.694					
Trialability (TR)	.004	.070	.069	.011	.841				
Observability (OB)	.049	.003	.001	.057	.137	.750			
Perceived usefulness (PU)	.004	.000	.017	.222	.037	.008	.843		
Adoption decision firm-level (ADFL)	.022	.004	.008	.139	.145	.081	.076	.870	
Adoption decision individual -level (ADIL)	.001	.025	.033	.017	.160	.232	.001	.184	.899

Table 6: Discriminant validity: the HTMT

Construct	OS	PDM	HA	RA	TR	OB	PU	ADFL	ADIL
Organizational size (OS)									
Participation in decision making (PDM)	.279								
Hierarchy of authority (HA)	.020	.390							
Relative advantage (RA)	.131	.093	.036						
Trialability (TR)	.075	.302	.388	.115					
Observability (OB)	.271	.065	.046	.298	.503				
Perceived usefulness (PU)	.065	.013	.149	.660	.228	.124			
Adoption decision firm-level (ADFL)	.162	.072	.100	.410	.455	.376	.323		
Adoption decision individual -level (ADIL)	.027	.163	.148	.104	.466	.626	.039	.494	

Lastly, loadings should exceed the cross-loadings to ensure that each indicator is correctly assigned to the right factor (Henseler et al., 2016). Table 7 provides an overview of the loadings and cross-loadings. The bold values visualize the loading of the indicator on its respective factor. Each indicator was found to load on its respective factor.

Table 7: Loadings and cross-loadings

Indicator	**OS**	**PDM**	**HA**	**RA**	**TR**	**OB**	**PU**	**ADFL**	**ADIL**
Org_size_recoded	**1.000**	-.291	.038	.053	-.062	.220	.065	.015	.025
Desc_tech	-.329	**.971**	-.284	-.038	.279	.055	-.004	-.061	.175
Desc_plcs	-.113	**.794**	-.176	-.150	.154	.030	.015	-.045	.069
Hier_disc	.068	-.407	**.680**	.093	-.318	-,044	-.129	-.003	-.061
Hier_rfr	-.063	-.268	**.729**	.067	-.337	-.053	-.098	-.122	-.017
Hier_boss	.045	-.164	**.910**	-.016	-.120	-.045	-.129	-.127	-.201
Hier_appr	.011	-.254	**.841**	.053	-.206	.028	-.078	-.026	-.141
RA_quick	.120	-.057	.024	**.797**	.111	.114	.510	.260	.037
RA_qual	-.007	-.085	.049	**.967**	.104	.235	.378	.368	.155
RA_effec	.198	-.009	-.055	**.715**	.050	.224	.523	.270	.039
Trial_tryout	-.012	.243	-.275	.145	**.935**	.342	.166	.364	.402
Trial_trial	-.113	.243	-.120	.040	**.899**	.339	.192	.332	.325
Rslt_rslt	.167	.073	-.045	.111	.312	**.872**	.045	.306	.426
Rslt_consq	.215	.016	.003	.305	.330	**.860**	.109	.186	.409
Pusef_prod	.013	.038	-.092	.451	.113	.100	**.893**	.212	.059
Pusef_effe	.095	-.026	-.141	.422	.226	.067	**.942**	.284	.001
Fl_ita_cont	-.007	.137	-.167	.079	.383	.483	-.006	.358	**.949**
Fl_ita_adopt	.056	.162	-.176	.168	.375	.431	.060	.457	**.947**
Il_ita_inter	.092	-.047	-.141	.328	.302	.188	.255	**.932**	.384
Il_ita_adopt	.187	-.067	-.025	.367	.407	.343	.259	**.934**	.416

Univariate statistics

Table 8 provides an overview of the univariate statistics for the variables used with regard to this study. Before conducting any further analysis it is recommended to check if the data is normally distributed. As stated before, the skewness and kurtosis need to be between the values -3 and +3 (Hair et al., 2010). When looking at the skewness and kurtosis it can be concluded that the values of each factor are between threshold values.

The data indicates that the webshops are rather small in terms of organizational size. On average, there are 2 employees at service. The participation in decision making of those employees is above average and the hierarchy of authority is beneath average. Participants were introduced to Blockchain and its pros and cons related to webshop activities. Nonetheless, they stated not to be able nor to be able to estimate the consequences of adopting Blockchain on their daily work. However, they showed above average scores on the perceived characteristics of Blockchain, namely: relative advantage, trialability, and observability. The same holds up for the perceived usefulness of Blockchain. Overall, in terms of the firm-level adoption decision, participants noted averages between the second and third answer category, $\mu = 2.51$, $n = 99$. This implies that, on average, webshops are not interested in adopting Blockchain or have a neutral position towards it. For the individual-level adoption decision participants noted averages between the third and fourth answer category, $\mu = 3.29$, $n = 99$. As a result, on average, customer support employees have a neutral position towards or are interested in adopting Blockchain.

Table 8: Univariate statistics

Variable type	Concept	N	Mean	Median	St. dev.	Min.-Max.	Skew.	Kurt.
Independent	**Organizational size**	99	2.04	2	1.10	1-4	.520	-1.18
	Participation in decision making	99	3.43	2	1.00	1-5	-.802	.359
	Hierarchy of authority	99	2.07	2	.71	1-3.75	.769	-.077
	Relative advantage	99	3.25	3.33	.75	1-5	-.499	.355
	Trialability	99	3.33	3.5	.89	1-5	-.542	.425
	Observability	99	3.13	3	.78	1-5	-.116	.191
	Perceived usefulness	99	3.31	3	.67	2-5	-.067	-.184
Dependent	**Adoption decision firm-level**	99	2.51	2.5	.89	1-5	-.009	-286
	Adoption decision individual-level	99	3.29	3	.87	1-5	-.546	.601
Control	**Knowledge**	99	3.02	3	1.078	1-5	-.439	-.992
	Age	99	2.22	2	.964	1-4	.274	-.783
	Gender	99	1.31	1	.466	1-2	.818	-1.358
	Industry	99	6.64	3	4.71	1-14	.748	-1.195

Bivariate statistics

Table 9 provides an overview of the bivariate statistics for the relationships of the variables in this study. As could be expected, a significant negative relationship was found between organizational size and participation in decision making, r = -.246, n = 99, p = <.05. Thus, organizations with higher numbers of employees have a more centralized structure for decision making. Furthermore, a significant negative relationship occurred between hierarchy of authority and participation in decision making, r = -.310, n = 99, p = <.01. This makes sense as higher degrees of hierarchy of authority translates to less participation in decision making amongst employees. Nonetheless, there was no significant relationship found between one of the independent variables organizational size, participation in decision making, and hierarchy of authority and the dependent variables adoption decision on firm- and individual-level.

Secondly, two significant positive relationships were detected between the determinants and adoption decision on firm-level. The first relationship was between trialability and adoption decision on firm-level, r = .398, n = 99, p = <.01. This relationship suggests that the perceived characteristic trialability has a positive effect on the adoption decision on firm-level. The second relationship was between observability and adoption decision on firm-level, r = .482, n = 99, p = <.01. This finding suggests that the perceived characteristic observability has a positive influence on the adoption decision on firm-level.

Thirdly, five significant positive relationships were detected between the determinants and adoption decision on individual-level. Three of the correlations relate to the relationship between the perceived characteristics of Blockchain and adoption decision on individual-level. These relationships were not examined in this study as, a priori, the perceived characteristics of Blockchain relate to the adoption decision on firm-level. The fourth relationship was between perceived usefulness and adoption decision on individual-level, r = .269, n = 99, p = <.01. This finding suggests that the perceived usefulness of Blockchain has a positive influence on the adoption decision on individual-level.
The fifth relationship was between adoption decision on firm-level and adoption decision on individual-level, r = .429, n = 99, p = <.01. This finding suggests that the adoption decision on firm-level has a positive influence on the adoption decision on individual-level.

Fourthly, four significant positive relationships were detected with regard to the control variable knowledge. The first relationship was between trialability and knowledge, r = .338, n = 99, p = <.01. This finding suggests that the control variable knowledge has a positive influence on the perceived characteristic trialability. The second relationship was between observability and knowledge, r = .314, n = 99, p = <.01. This finding suggests that the control variable knowledge has a positive influence on the perceived characteristic observability. The third relationship was between adoption decision on firm-level and knowledge, r = .335, n = 99, p = <.01. This finding suggests that knowledge has a positive influence on the adoption decision on firm-level. The fourth relationship was between adoption decision on individual-level and knowledge, $r = .337$, $n = 99$, $p = <.01$. This finding suggests that knowledge has a positive influence on the adoption decision on individual-level.

Fifthly, three significant negative relationships were detected with regard to the control variable gender. The first relationship was between the characteristic trialability and gender, $r = -.213$, $n = 99$, $p = <.05$. This finding suggests that gender has a negative influence on the characteristic trialability. The second relationship was between the adoption decision on individual-level and gender, $r = -.275$, $n = 99$, $p = <.05$. This finding suggests that gender has a negative influence on the adoption decision on individual-level. The third relationship was between the control variables knowledge and gender, $r = -.216$, $n = 99$, $p = <.05$. This finding suggests that gender has a negative influence on the control variable knowledge.

Table 9: Bivariate statistics

Concept		OS	PDM	HA	RA	TR	OB	PU	ADFL	ADIL	KL	AGE	GEN	IND
Organizational size (OS)	r	1												
	N	99												
Participation in decision making (PDM)	r	-.246*	1											
	N	99	99											
Hierarchy of authority (HA)	r	.013	-.310**	1										
	N	99	99	99										
Relative advantage (RA)	r	.111	-.079	.033	1									
	N	99	99	99	99									
Trialability (TR)	r	-.065	.240	-.324**	.100	1								
	N	99	99	99	99									
Observability (OB)	r	.220*	.048	-.038	.219*	.370**	1							
	N	99	99	99	99	99	99							
Perceived usefulness (PU)	r	.059	.011	-.122	.540**	.185	.090	1						
	N	99	99	99	99	99	99	99						
Adoption decision firm-level (ADFL)	r	.026	.135	-.123	.094	.398**	.482**	.033	1					
	N	99	99	99	99	99	99	99	99					

Adoption decision individual -level (ADIL)	r	.147	-.058	-.093	.349**	.377**	.282**	.269**	.429**	1				
	N	99	99	99	99	99	99	99	99	99				
Knowledge (KL)	r	.230*	-.032	-.096	.256*	.338**	.314**	.182	.335**	.337**	1			
	N	99	99	99	99	99	99	99	99	99	99			
Age (AGE)	r	-.190	.032	.103	-.143	.009	.044	-.133	-.027	-.108	.153	1		
	N	99	99	99	99	99	99	99	99	99	99	99		
Gender (GEN)	r	.193	-.127	.224*	-.126	-.213*	.017	-.138	-.192	-.275*	-.216*	.048	1	
	N	99	99	99	99	99	99	99	99	99	99	99	99	
Industry (IND)	r	-.066	.014	.130	-.107	.018	.084	-.036	-.027	-.154	-.111	-.013	.122	1
	N	99	99	99	99	99	99	99	99	99	99	99	99	99

a. * significant at $p < .05$; ** significant at $p < .01$.

Regression analysis

The statistical technique regression analysis is used to assess the hypotheses. A regression analysis predicts the value of a single dependent variable based on the values of several independent variables (Hair et al., 2010). Two regression analyses were performed; one for the dependent variable adoption decision on firm-level, and one for the dependent variable adoption decision on individual-level. First, the regression analysis with regard to the adoption decision on firm-level is elaborated upon. Afterwards, the regression analysis related to the adoption decision on individual-level is examined.

Regression analysis adoption decision on firm-level

Assumptions

In order to use a regression analysis, four assumptions must be met: (1) linearity of the phenomenon measured, (2) constant variance of the error items, (3) independence of the error items, and (4) normality of the error term distribution (Hair et al., 2010, pp. 177-181).

Linearity represents the extent to which change in the dependent variable is related to the independent variable (Hair et al., 2010). This assumption was checked by visually studying the belonging scatterplots of each individual analysis for any curvilinear patterns (Appendix VII.a). No curvilinear patterns were observed, thus linearity was assumed.

Constant variance of the error items requires that there is no presence of unequal variances (i.e. heteroscedasticity) (Hair et al., 2010). The presence of equal variances (i.e. homoscedasticity) was confirmed by plotting the residuals against the predicted dependent values (Appendix VII.b) which resulted in a 'shotgun'-like pattern.

The assumption of independence of the error items demands that the predicted value is not sequenced to any variable (Hair et al., 2010). This assumption was checked using the collinearity statistics (Appendix VII.c). VIF values should remain below 10 and tolerance statistics above .2, which was the case with all variables.

Normality of the error term distribution requires normality of the dependent variables or independent variables or both (Hair et al., 2010). This assumption was checked by using the normal probability plot (Appendix VII.d). No substantial deviation from the normality diagonal could be observed, therefore linearity was assumed.

Summary of model

Before assessing the hypotheses it was necessary to evaluate the overall model. The overall model describes whether the model was successful in predicting the dependent variable adoption decision on firm-level. Table 10 shows the model summary. Model 3 was most successful in predicting the dependent variable as it had the highest amount of significant variance explained, R^2_{adj} = .26, F(23, 75)

= 2.50, *p* = <.01 (see appendix VII.e for ANOVA). This means that the predictors in model 3 account for 26.0% of the variation in the adoption decision. The adjusted R-squared was chosen as the statistical measure as it, as opposed to the R squared, explains the variance in the dependent variable while accounting for the number of predictors. The results showed that the adjusted R-squared decreased between model 1 and model 2 which indicates that the predictors added in model 2 lower the explained variance in the dependent variable. On the contrary, the adjusted R-squared increased between model 2 and model 3 which indicates that the predictors added in model 3 substantially improve the explained variance. Therefore, model 3 was used to assess hypotheses 1-6. The following sections assess each hypothesis individually. Figure 2 provides a visual overview of the results per hypothesis.

Table 10: Model summary

Model	R	Rsq	Radj	std E	Rchg	Fchg	df1	df2	Sig.
1a	.530	.281	.130	.829	.281	1.86	17	81	.034
2b	.542	.294	.113	.838	.013	.474	3	78	.701
3c	.659	.434	.260	.765	.140	6.19	3	75	.001

a. Predictors: control variables.

b. Predictors: control variables, organizational_size_recoded, factor Participation in decision making, and factor Hierarchy of authority.

c. Predictors: control variables, organizational_size_recoded, factor Participation in decision making, factor Hierarchy of authority, factor Relative advantage, factor Trialability, and factor Observability.

Hypothesis 1

Organizational size has a positive direct effect on webshops' adoption decision regarding Blockchain.

The model was used to measure the effect of organizational size on the firm-level adoption decision. The relationship proved to be non-significant, *B* = -.07, *t*(75) = -.758, *p* = .451. Moreover, the unstandardized coefficient indicated a negative relationship between this predictor and the dependent variable, while a positive relationship was hypothesized. As a result, hypothesis 1 was rejected.

Hypothesis 2

Centralization has a negative direct effect on webshops' adoption decision regarding Blockchain.

The model was used to measure the effect of centralization on the firm-level adoption decision. Centralization was measured by the factors participation in decision making, and hierarchy of authority. The relationship between participation in decision making and adoption decision on firm-level proved to be non-significant, *B* = -.01, *t*(75) = -.094, *p* = .925. Additionally, the unstandardized coefficient indicated a positive relationship between this predictor and the dependent variable, while a negative relationship was hypothesized. The relationship between hierarchy of authority and adoption decision on firm-level proved to be non-significant, *B* = .04, *t*(75) = .274, *p* = .785. Furthermore, the unstandardized coefficient indicated a positive relationship between this predictor and the dependent variable, while a negative relationship was hypothesized. Overall, hypothesis 2 was rejected.

Hypothesis 3

Organizational innovativeness has a positive direct effect on webshops' adoption decision regarding Blockchain.

The regression analysis did not include factors to measure the effect of organizational innovativeness on the firm-level adoption decision, as the dimension organizational innovativeness was excluded due to deletion in the factor analysis. Hereby, hypothesis 3 was rejected.

Hypothesis 4

Relative advantage has a positive direct effect on webshops' adoption decision regarding Blockchain.

The model was used to measure the effect of relative advantage on the firm-level adoption decision. The relationship proved to be non-significant, *B* = -.122, *t*(75) = -.938, *p* = .351. Additionally, the unstandardized coefficient suggested a negative relationship between this predictor and the dependent variable, while a positive relationship was hypothesized. In conclusion, hypothesis 4 was rejected.

Hypothesis 5

Trialability has a positive direct effect on webshops' adoption decision regarding Blockchain.

The model was used to measure the effect of trialability on the firm-level adoption decision. The relationship proved to be non-significant, *B* = .16, *t*(75) = 1.418, *p* = .160. According to the unstandardized coefficient, the relationship between the predictor and the dependent variable was, as expected, positive. Overall, hypothesis 5 was rejected.

Hypothesis 6

Observability has a positive direct effect on webshops' adoption decision regarding Blockchain.

The model was used to measure the effect of observability on the firm-level adoption decision. The relationship proved to be significant, *B* = .429, *t*(75) = 3.421, *p* = <.01. According to the unstandardized coefficient, the relationship between the predictor and the dependent variable was, as expected, positive. Therefore, hypothesis 6 was accepted. Additionally, a Sobel test was conducted which showed a partial mediation of the variable observability in the relationship between knowledge and adoption decision on firm-level (*z* = 2.66, *p* = <.01).

Regression analysis adoption decision on individual-level

Assumptions

Just as with the regression analysis for the dependent variable adoption decision on firm-level, the four assumptions needed to be checked in order to perform the regression analysis for the dependent variable adoption decision on individual-level. For linearity, no curvilinear patterns were observed. Thus linearity was assumed (Appendix VIII.a). For constant variance of the error items, homoscedasticity was confirmed by plotting the residuals against the predicted dependent values which resulted in a 'shotgun'-like pattern (Appendix VIII.b). For independence of the error items, the thresholds for VIF values and tolerance statistics were not violated (Appendix VIII.c). Therefore, this assumption was met. For normality of the error term distribution, no substantial deviation from the normality diagonal could be observed (Appendix VIII.d). Thus, linearity was assumed.

Summary of model

Before assessing the hypotheses it is necessary to evaluate the overall model. Table 11 shows the model summary. Model 2 was most successful in predicting the dependent variable adoption decision on individual-level as it had the highest amount of significant variance explained, R^2_{adj} = .18, F(18, 80) = 2.20, p = <.01 (see appendix VIII.e for ANOVA). This means that the predictors in model 2 account for 18.1% of the variation in adoption decision. The results show that the adjusted R-squared increases little between model 1 and model 2 which indicates that the predictors added in model 2 slightly improve the explained variance in the dependent variable. Therefore, model 2 was used to assess hypotheses 7-9. The following sections assess each hypothesis individually. Figure 2 provides a visual overview of the results per hypothesis.

Table 11: Model summary

Model	**R**	**Rsq**	**Radj**	**std E**	**Rchg**	**Fchg**	**df1**	**df2**	**Sig.**
1a	.546	.298	.151	.801	.298	2.023	17	81	.019
2b	.575	.331	.181	.787	.033	3.957	1	80	.050

a. Predictors: control variables.

b. Predictors: control variables, factor Perceived usefulness.

Hypothesis 7

Perceived usefulness has a positive direct effect on customer support employees' adoption decision regarding Blockchain.

The model was used to measure the effect of perceived usefulness on the individual-level adoption decision. The relationship proved to be significant, $B = .289$, $t(75) = 1.989$, $p = .05$. According to the unstandardized coefficient, the relationship between the predictor and the dependent variable was, as expected, positive. In conclusion, hypothesis 7 was accepted.

Hypothesis 8

Perceived ease of use has a positive direct effect on customer support employees' adoption decision regarding Blockchain.

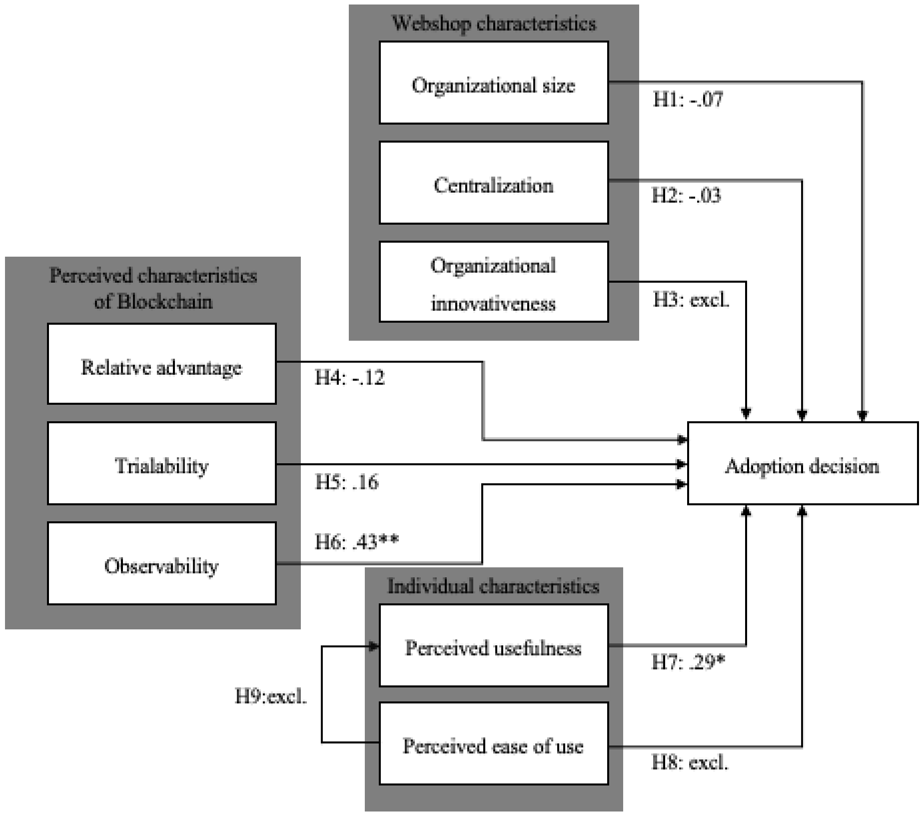
The regression analysis did not include the factor perceived ease of use to measure the effect on the individual-level adoption decision due to its deletion in the factor analysis. Therefore, hypothesis 8 was rejected.

Hypothesis 9

Perceived ease of use has a positive indirect effect on customer support employees' adoption decision regarding Blockchain through perceived usefulness.

The regression analysis did not include the factor perceived ease of use as it was deleted in the factor analysis. Therefore, the regression analysis could not measure its effect on the individual-level adoption decision through the factor of perceived usefulness. Thus, hypothesis 9 was rejected.

Figure 2: Visual representation of results



a. * significant at p < .05; ** significant at p < .01.

b. Centralization consists of a composed score between the factors Participation in decision making and Hierarchy of authority.

c. Adoption decision relates to both adoption decision on firm-level and adoption decision on individual-level.

Chapter VII: Conclusion and discussion

The final chapter of this study aims at interpreting the results of the analysis. The conclusion provides an overview of the study and a concise answer to the main research question. Afterwards, the results are further elaborated on to provide a clear understanding of the empirical findings. Furthermore, a discussion is provided on the limitations that are believed to have impacted the results. Lastly, managerial recommendations are provided as well as suggestions for future research.

Conclusion

Literature study revealed a gap in the scientific knowledge on the determinants affecting the adoption process of Blockchain among webshops and customer support employees. Therefore, this research aimed at answering the following main research question: "*What is the effect of innovation adoption characteristics on webshops' and customer support employees' adoption decision regarding Blockchain?"* In other words, the objective was to examine the influence of technology adoption characteristics on the adoption decision of Blockchain among webshops on a firm- and individual-level.

The study hypothesized nine relationships between technology adoption characteristics and Blockchain adoption. More specifically, the nine relationships relate to the effect of (H1) organizational size, (H2) centralization, (H3) organizational innovativeness, (H4) relative advantage, (H5) trialability, (H6) observability, (H7) perceived usefulness, (H8) perceived ease of use, and (H9) perceived ease of use through perceived usefulness to Blockchain adoption among webshops and its customer support employees. All relationships were hypothesized to be positive, except for H2 which was expected to be negative.

Quantitative research was conducted in order to analyze the hypotheses. An online survey was distributed among Dutch webshops and their customer support employees, which resulted in a definite dataset of 99 responses. Analysis of the data provided support for H6 and H7, and no support for the remaining hypotheses. In answer to the research question, the innovation adoption characteristics observability seems to play a positive direct role in the adoption of Blockchain on a firm-level. Furthermore, knowledge seems to have a positive direct influence on the adoption decision on firm-level as well as an positive indirect influence through observability. In extension to the answer to the research question, the innovation adoption characteristic perceived usefulness was found to have a positive direct influence on the adoption decision on individual-level. Furthermore, knowledge seems to have a positive direct influence on the adoption decision on individual-level whereas gender has a direct negative influence on the dependent variable. Lastly, gender was found to negatively impact knowledge.

Concluding, this research adds knowledge to the determinants of technology adoption in general with the determinants of Blockchain adoption in specific. The study was based on commonly acknowledged determinants of technology adoption of which only some seem to apply to the adoption of Blockchain among webshops and its customer support employees. However, one should interpret these findings with caution as the generalizability is limited due to the minimalistic number of observations. Moreover, the construct observability showed some degree of random error which lowers the construct reliability.

Results interpretation

The first hypothesis posited a positive relationship between organizational size and adoption decision on firm-level. The higher the number of employees within a webshop, the higher its receptiveness towards Blockchain adoption. The results of this analysis showed a non-significant relationship between organizational size and adoption decision. Moreover, it indicated a negative relationship, which suggests that webshops with a smaller number of employees may be more willing to adopt Blockchain. There is one logical argument that may explain why this result if found. As stated before, it is argued that smaller organizations have more receptiveness towards innovations due to higher flexibility (Frambach & Schillewaert, 2002; Hage, 1980). Following this theory, bigger organizations would be too rigid as a result of bureaucracy. However, this hypothesis was rejected by Damanpour (1992). In his study, he found that the average size of innovative firms in the U.K. is increasing, while, simultaneously, their average division size is decreasing. Following, he concluded that the creation of smaller divisions within large innovative firms benefit the large firms' flexibility and autonomy (Damanpour, 1992). Future research should compare small organizations with (specialized) divisions within large organizations to further clarify the effect of organizational size on technology adoption.

The second hypothesis postulated a negative relationship between centralization and adoption decision on firm-level. The more centralized the authority within a webshop, the less likely its decision to adopt Blockchain. The analysis showed a non-significant relationship between centralization and adoption decision. Furthermore, it indicated a positive effect, which suggests that more centralized webshops are more likely to adopt Blockchain. There might be two arguments that support this finding. On the one hand, it is believed to be unlikely that any 'expansion' in the individual's initiative as a result of decentralization would enhance innovation (Zmud, 1982). In fact, more innovation might be observed when it is determined by a centralized hierarchy (Zmud, 1982). On the other hand, formalization is believed to facilitate the adoption of innovations. As opposed to centralization, formalization 'constraints' rather than 'expands' individual behavior (Zmud, 1982). Therefore, formalization hinders individual initiatives, but increases the adoption of innovations (Zmud, 1982).

The third hypothesis proposed a positive relationship between organizational innovativeness and adoption decision on firm-level. The higher the amount of organizational innovativeness, the higher the openness to adopt Blockchain. Though theoretically different, the results of this research showed that organizational innovativeness was not distinctive compared to centralization. This finding suggests that in adoption literature there is need for further research on the differences between these two innovation adoption characteristics.

The fourth hypothesis suggested a positive relationship between relative advantage and adoption decision on firm-level. The higher the relative advantage of using Blockchain, the higher the chance of Blockchain adoption. The results showed a non-significant relationship between relative advantage and the adoption decision. Additionally, it indicated a negative relationship, suggesting that lesser amounts of relative advantage increase the likelihood for webshops to adopt Blockchain. The possible explanation for this result is twofold. On the one hand, relative advantage is believed to be too broad as it lacks conceptual strength, prescriptive power, and reliability (Tornatzky & Klein, 1982). Relative advantage can be expressed in a multitude of ways, such as: hazards removed, time saved, or economic profitability (Rogers & Shoemaker, 1971). As a result, the relative advantage of adopting Blockchain may differ for each webshop. On the other hand, there might be a value barrier that prevents webshops from adopting Blockchain. Literature regarding the resistance to innovations by consumers refers to value barriers as a perceived lack of relative advantage by the innovation over existing alternatives (Hoeffler, 2003; Ram & Sheth, 1989; Talke & Heidenreich, 2014). This might also be the case for Blockchain adoption among webshops. Webshops may be resistant to adopting Blockchain as they do not believe that the relative advantage of Blockchain surpasses the value of already existing technologies. Moreover, webshops may struggle with comprehending the relative advantage as they are not fully aware of Blockchain's advantages and disadvantages.

The fifth hypothesis posited a positive relationship between trialability and adoption decision on firm-level. The easier it is for webshops to try-out Blockchain, the more likely they are to adopt Blockchain. This research resulted in a non-significant relationship between trialability and adoption decision. There is one possible explanation for this result which relates to resistance to change. Resistance to change is a mental model, held by all employees within the firm, that interferes with successful implementing an innovation (Dent, 1999). Opposed to relative advantage, trialability does not question the value of Blockchain, but the long-term uncertainties which may not be experienced during the test period. The webshop may experience positive results during the trial period, but, nevertheless, choose not to adopt Blockchain as it brings substantial uncertainty to the future of the company. As a result of the resistance to change, webshops may choose not to adopt Blockchain.

The sixth hypothesis postulated a positive relationship between observability and adoption decision on firm-level. The more visible the results of using Blockchain, the more plausible Blockchain adoption. The results of this research supported this hypothesis. The observability of Blockchain is of significant influence on the adoption decision. Thus, when the results of Blockchain are demonstrable the likelihood of webshops to adopt Blockchain increases. Moreover, observability was positively impacted by knowledge. As a conclusion, more knowledge on Blockchain positively impacts webshops' perception of the result demonstrability which, ultimately, increases the adoption decision. However, these findings need to be treated with caution as the reliability of the scale result demonstrability was marginally below the threshold value due to some degree of random error.

The seventh hypothesis proposed a positive relationship between perceived usefulness and adoption decision on individual-level. The higher the amount of perceived usefulness, the more receptiveness towards Blockchain adoption. After conducting the analysis, a significant relationship was found. Therefore, higher perceived usefulness of Blockchain leads to higher degrees of adoption among customer support employees. Furthermore, perceived usefulness was positively impacted by knowledge and negatively by gender. As a result, higher degrees of knowledge on Blockchain among customer support employees positively impact their perceived usefulness which, ultimately, increases the adoption decision. Additionally, male customer support employees, as opposed to female customer support employees, tend to be more receptive towards Blockchain which positively impacts their perceived usefulness, and, ultimately, increases the adoption decision.

The eighth hypothesis suggested a positive relationship between perceived ease of use and adoption decision on individual-level. The higher the extent of perceived ease of use, the more likely to adopt Blockchain. This hypothesis could not be tested as the factor perceived ease of use was marked as an ultra-Heywood case. This research excluded the use of the factor perceived ease of use as including it would produce results that would be too distorted.

The ninth hypothesis posited a positive relationship between perceived ease of use and adoption decision on individual-level through perceived usefulness. The higher the amount of perceived ease of use, the higher the extent of perceived usefulness, the higher the likelihood of Blockchain adoption. As stated in the previous paragraphs, perceived ease of use was excluded in the analysis as it was noted as an ultra-Heywood case. Therefore, it was impossible to measure the influence of perceived ease of use on the adoption decision on individual-level through perceived usefulness.

Limitations

There are several limitations associated with this paper. Firstly, the sample size. The minimalistic quantity of 99 observations endangers the generalizability of the results. The explanatory power of the models can be improved by increasing the sample size, which, ultimately, results in more statistical power to base conclusions on. Secondly, the description of Blockchain, and its pros and cons, in the questionnaire were not received as intended. From the respondents, 24.2% could hardly estimate the effects of introducing Blockchain on their daily work. Additionally, 21.2% could not estimate nor estimate the possible consequences. Furthermore, five persons explicitly stated that they were not fully aware of what Blockchain is nor its implications. Not knowing the possible impact of introducing Blockchain has a substantial effect on the validity of the questions related to the characteristics used to predict Blockchain adoption. Therefore, the results of this report have to be interpreted with caution. Thirdly, the results showed that eleven observations were answered by sole traders who do not have any employees. Sole traders do fulfil some tasks as customer support employee since they run the whole business by themselves. Nonetheless, this might give a blurred image of Blockchain adoption among webshops and customer support employees. Lastly, no distinction was made between webshops in business-to-consumer (B2B) context as opposed to webshops in business-to-business (B2B) context. Blockchain adoption among webshops might differ for each context.

Managerial recommendations

For webshop managers, the results of this study do not provide a clear disquisition about the determinants of Blockchain adoption among webshops and its customer support employees. Though observability and perceived usefulness were positively related to Blockchain adoption, all other determinants were proven to be of non-significant influence. Blockchain is believed to be a third-generation disruptive technology and webshop managers who consider adopting Blockchain should take the determinants observability and perceived usefulness into account. This, to mobilize the organization and its customer support employees in order to ensure adoption on firm- and individual-level.

For observability, it is recommended to ensure the demonstrability of the results. Result demonstrability provides users with the opportunity to visualize the consequences of adopting the technology. As a result, they are better informed on the possible outcomes which, in turn, the manager can use to boost adoption.

For perceived usefulness, customer support employees must experience the added value of using Blockchain. Therefore, managers should explain Blockchain and show their customer support employees the benefits of using this technology. Obtaining information on the added value of Blockchain helps customer support employees create a mental image about the usefulness of the technology. When the customer support employees perceive the usefulness to be positive, they are more likely to adopt Blockchain.

Furthermore, knowledge seems to positively influence the characteristic observability. Therefore, when looking to adopt Blockchain, managers should communicate what Blockchain is and what it has to offer for the company. As a result, the company will be better informed about the technology which strengthens the observability, and, ultimately, the adoption decision. Additionally, knowledge is found to have a direct impact on the adoption decision on firm- and individual-level. Thus, the higher the degree of knowledge on Blockchain within the company and between customer support employees the higher the likelihood of adoption.

Lastly, webshop managers should account for gender differences when looking to adopt Blockchain. Men, as opposed to women, seem to be more receptive towards obtaining knowledge on Blockchain, which, ultimately, positively impacts their adoption decision. Therefore, webshop managers should use different persuasive strategies to align the employees with the course of the organization. Webshops with predominantly female customer support employees will experience more difficulty in mobilizing the workforce for the adoption of Blockchain.

Overall, due to its disruptive nature, Blockchain is believed to have a massive impact on businesses in times to come. Therefore, webshop managers must look into its possibilities and mobilize their organization and customer support employees for adoption. This study showed that observability is a significant determinant in Blockchain adoption among webshops and that perceived usefulness a significant determinant in adoption among customer support employees. The determinant observability is positively impacted by the company's and customer support employees' knowledge on the subject. The determinant perceived usefulness is negatively impacted by gender differences among the customer support employees. The other determinants in this study were found to be of non-significant influence, but webshop managers should be wary of the fact that these determinants might influence Blockchain adoption as the generalizability of the results is low due to the minimalistic amount of observations. Furthermore, there may be other determinants influencing the adoption of Blockchain on firm- and individual-level which are not accounted for in this research.

Academic recommendations

For the academic world, there are five recommendations for future research. First of all, this research focuses on the fourth step in the adoption process of innovations, namely: adoption decision. By focusing on the fourth step, the fifth step remains underexposed. The fifth step in the adoption process is that of continued use. A webshop and its customer support employees may choose to adopt Blockchain, but this does not necessarily mean that they will continue to use the technology in the future. This research examined the adoption characteristics influencing the adoption decision of Blockchain, but future research is needed to fully comprehend the adoption process.

Secondly, this research aimed at investigating the internal technology adoption characteristics as described in the adoption model proposed by Frambach and Schillewaert (2002). As a consequence, the external technology adoption characteristics remain underexposed. External characteristics may have a substantial influence in the adoption process of Blockchain as they are found to have a significant influence on the adoption process of innovations by organizations and employees (Frambach & Schillewaert, 2002). Future research should look into the effect of external technology adoption characteristics for a better understanding of the factors influencing Blockchain adoption.

Thirdly, the results showed significant correlations between the perceived characteristics relative advantage, trialability, and observability and the dependent variable adoption decision on individual-level. Furthermore, there was a significant correlation between adoption decision on firm-level and adoption decision on individual-level. These correlations were not further elaborated upon as they were not hypothesized in the conceptual model. Nevertheless, one could think of arguments that explain these correlations. For the perceived characteristics, one could reason that the adoption decision of each customer support employee is affected differently by these perceived characteristics as each experiences them in a unique manner. For adoption decision on firm-level, there is reason to assume that adoption on firm-level may have a positive influence on the adoption decision on individual-level. More specifically, it is negotiable that Blockchain adoption on firm-level may force customer support employees to adopt the technology individually. Therefore, future research should look into the directional causation of these correlations for a more comprehensive understanding of the determinants influencing the adoption decision.

Fourthly, as stated in the limitations, this research makes no distinction between webshops in B2C and B2B contexts. These two contexts are related, but differ in their customer segment as B2C focusses on consumers and B2B on businesses. Therefore, the contexts are subjected to different environments, policies, and influences. Due to these differences, future research should look into similarities and differences in the adoption decision of Blockchain by webshops and customer support employees in B2C and B2B contexts.

Furthermore, it would be interesting to investigate Blockchain's possibilities in other sectors than the financial sector. As stated in the introduction of this study, the possibilities for the financial sector is widely recognized. The time is here to look at the possible applications Blockchain has to offer for other sectors, especially for webshops. Blockchain is a relatively new technology and the business world nor the academic world is quite sure about the future applicability.

Lastly, researchers should look into which Blockchain-based platform is most suitable for webshops. Many platforms (e.g. Ethereum, Hyperledger Sawtooth, and OpenChain) are on the arise each with different possibilities and features. It would be interesting to examine the different platforms and compare them in terms of possibilities and features. Hereby, one could map which platform is best applicable for webshops as well as the different contexts to use it in.

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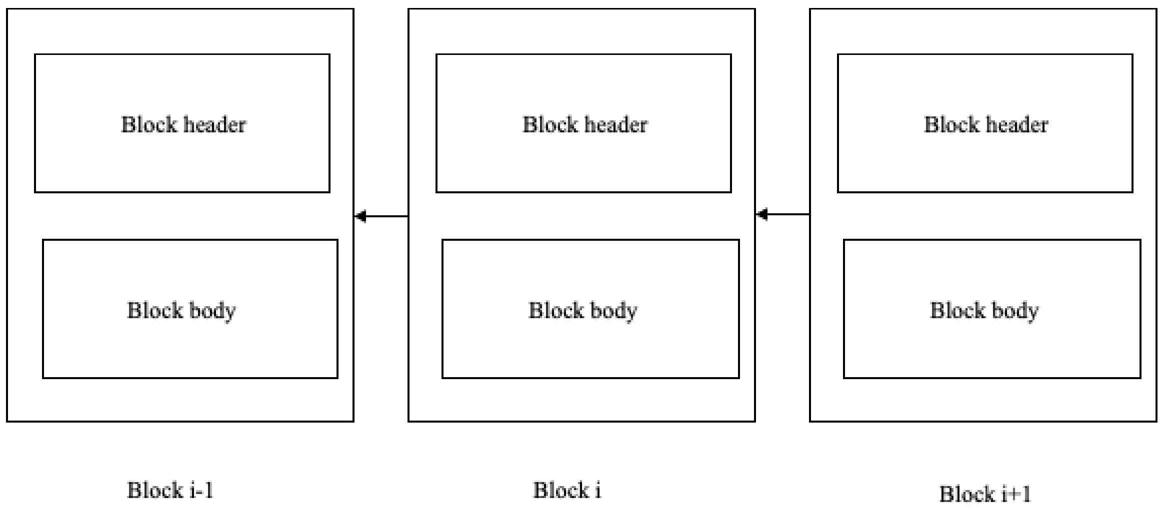
Appendices

Appendix I: Blockchain's architecture

Appendix I.a: Visual representation of Blockchain



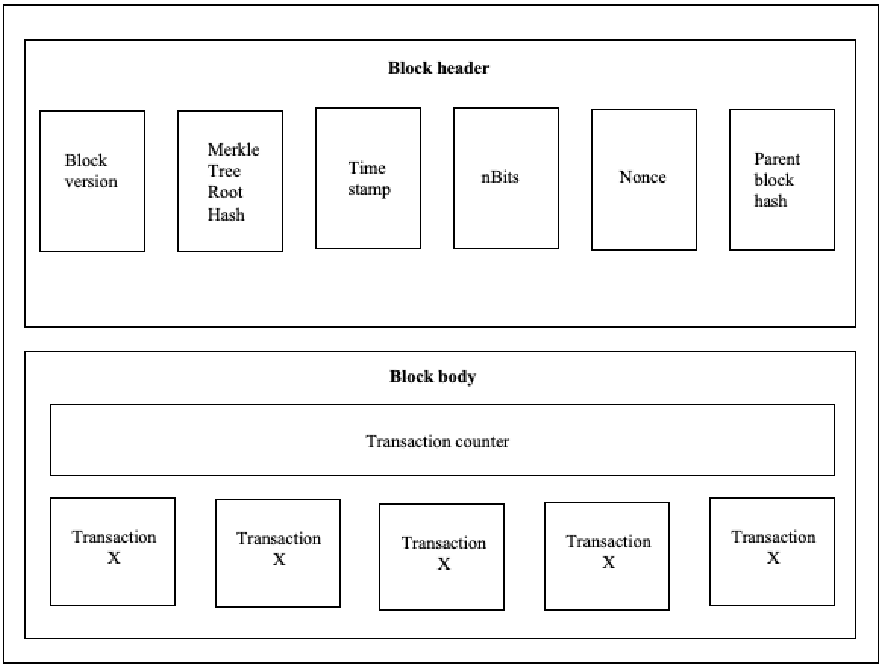
Appendix I.b: The block structure

A block consists of a 'block header' and a 'block body'. A block header contains the following elements:

- Block version (indicates the order of block validation rules to follow).
- Merkle tree root hash (the hash value of all transactions within a block).
- Timestamp (present time since January 1, 1970).
- nBits (target threshold for block hash validity).
- Nonce (an 4-byte field).
- Parent block hash (a 256-bit hash value that refers to the previous block).

A block body consists of the transactions and a transaction counter. The size of each transaction and the block size determine the maximum number of transactions that a block can incorporate (Zheng et al., 2017).

Figure 3: Block structure



Appendix I.c: Public key cryptosystem

Blockchain uses a "public key cryptosystem" to protect each transaction with digital signature protocols (Yli-Huumo et al., 2016). The objective of cryptography is to protect the privacy and authenticity of data transmitted over high-speed lines or stored in computer systems. The privacy and authenticity is protected to prevent publication and modification of data by unauthorized entities (Robling Denning, 1982). The protection of privacy and authenticity occurs via digital signature protocols. A digital signature protocol consists of three parts: a method of signing messages used by communicant A, a method for authenticating a signature used by communicant B, and a method for resolving conflicts, used by the judge (Merkle, 1980). Signing a message and authenticating a signature is done by encrypting messages with one pair of keys. Each user in the network owns a 'public key' and a 'private key' (Yli-Huumo et al., 2016). Public keys may be shared widely, and private keys are confidential only to the owner (Zheng et al., 2017). The following citation explains how the digital signature protocol works:

> *Each transaction is protected through a digital signature, is sent to the 'public key' of the receiver, and is digitally signed using the 'private key' of the sender. In order to spend money, the owner of the cryptocurrency needs to prove his ownership of the 'private key'. The entity receiving the digital currency then verifies the digital signature, which implies ownership of the corresponding 'private key', by using the 'public key' of the sender on the respective transaction* (Crosby et al., 2016, pp. 9-10).

The conflict that needs to be resolved by the judge, is the conflict of double-spending.

The conflict of double-spending relates to the verification process of transactions. Each transaction needs to be verified by every node (i.e. computer) that is connected to the Bitcoin network. This to ensure that (1) the spender owns the cryptocurrency, and (2) the spender has a sufficient amount of cryptocurrency in his account (Crosby et al., 2016). However, there is the problem that the payee cannot verify that the owner of the cryptocurrency did not double-spend his digital cash (Nakamoto, 2008). This is caused by the difference between the sequence in which transactions are generated and the sequence in which transactions are broadcasted. The sequence in which the cryptocurrency transactions are executed is not guaranteed to be equal to the sequence in which transactions are broadcasted from node to node for verification. Hence, there is need for a mechanism that reports the order of transactions to prevent double-spending (Crosby et al., 2016). The solution to double-spending is a distributed ledger (i.e. Blockchain) in which each transaction is validated based on a consensus mechanism (Pilkington, 2016).

Appendix I.d: Consensus mechanism

To obtain consensus in Blockchain, there are multiple mechanisms: PoW (Proof of Work), PoS (Proof of Stake), PBFT (Practical byzantine Fault Tolerance), DPoS (Delegated Proof of Stake), Ripple, and Tendermint (Zheng et al., 2017). In PoW, each node needs to solve a mathematical puzzle, the given value must be equal to or smaller than a certain given hash value, and all other nodes need to jointly confirm the correctnssess of the hash value (Back, 2002; Zheng et al., 2017). PoW is the consensus mechanism on which Bitcoin operates (Back, 2002). In PoS, consensus is reached by proving the ownership of the amount of currency (Zheng et al., 2017). In PBFT, each node has to validate other nodes while Stellar Consensus Protocol (SCP) gives participants the power to choose which set of other participants to accept (Zheng et al., 2017). DPoS is an alternative to PoS, based on representative democracy rather than direct democracy. In other words, participants choose their delegates to validate the ownership of the amount of currency (Zheng et al., 2017).

In Ripple, a collectively-trusted subnetworks is utilized within a larger network. These subnetworks have a Unique Node List (UNL) that need to reach at least 80% agreement in the query of nodes (Zheng et al., 2017). Tendermint is an alternative to PBFT where a validator is chosen. If a validator is found to be fraudulent, it will be penalized (Zheng et al., 2017).

Appendix II: Theories and models of innovation adoption

Theory / model	**Core constructs**	**Definitions**
Theory of Reasoned Action (TRA)		
TRA is developed by Ajzen and Fishbein (1980). The goal is to understand and predict an individual's behavior (Ajzen, & Fishbein, 1980). Behavior is assumed to be influenced by intentions, however, the interaction between behavior and intentions will not always be a perfect correlation (Ajzen, & Fishbein, 1980). An individual's behavioral intention is influenced by attitude towards the behavior (i.e. attitudinal component) and by subjective norm (i.e. normative component). An individual's attitude is influenced by his behavioral beliefs and the subjective norm by normative beliefs (Ajzen, & Fishbein, 1980).	Attitude towards behavior	*"the individual's positive or negative evaluation of performing the behavior"* (Ajzen, & Fishbein, 1980, p. 6)
	Subjective norm	*"the person's perception of the social pressures put on him to perform or not perform the behavior in question"* (Ajzen, & Fishbein, 1980, p. 6).
Theory of Planned Behavior (TPB)		
TPB is an extension of TRA (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1977). Ajzen (1991) argued that the original TRA model has limitations in dealing with behaviors over which people have incomplete volitional control. Logically, an individual's actual behavioral control is important (Ajzen, 1991) as *"the resources and opportunities available to a person must to some extent dictate the likelihood of behavioral achievement"* (Ajzen, 1991, p. 183) More important, however, is the individual's perception of behavioral control and its impact on intentions and behavior (Ajzen, 1991). The beliefs that underlie an individual's perceived behavioral control are called control beliefs (Ajzen, 1991).	Attitude towards behavior	Adapted from TRA
	Subjective norm	Adapted from TRA
	Perceived behavioral control	*"The perceived ease or difficulty of performing the behavior"* (Ajzen, 1991, p. 188)

Technology Acceptance Model (TAM)		
TAM is developed by Davis (1989) and based upon TRA. Davis (1989) argued that there is need for valid measurement scales for predicting user acceptance of computers. It was hypothesized and empirically supported that perceived usefulness and perceived ease of use were fundamental determinants of user acceptance. Furthermore, the results suggest that there is a significant indirect effect of perceived usefulness on usage when controlling for perceived ease of use (Davis, 1989).	Perceived usefulness	*"the degree to which a person believes that using a particular system would enhance his or her job performance"* (Davis, 1989, p. 320).
	Perceived ease of use	*"the degree to which a person believes that using a particular system would be free of effort"* (Davis, 1989, p. 320).
The Extended Technology Acceptance Model (TAM2)		
TAM2 incorporated two additional theoretical constructs: social influence processes (Image, voluntariness, and subjective norm), and cognitive instrumental processes (output quality, job relevance, perceived ease of use, and result demonstrability) (Venkatesh, & Davis, 2000). Both social influence processes and cognitive instrumental processes were found to significantly influence user acceptance. Moreover, Venkatesh and Davis (2000) state that subjective norm, next to perceived usefulness and perceived ease of use, has a significant direct effect on usage intentions for mandatory (but not for voluntary) systems.	Perceived usefulness	Adapted from TAM
	Perceived ease of use	Adapted from TAM
	Subjective norm	*"person's perception that most people who are important to him think he should or should not perform the behavior in question"* (Fishbein, & Ajzen 1977, p. 302).

Diffusion of innovations (DI)		
DI is developed by Rogers (1995). Since the 1960s, IDT has been used to study a variety of innovations, ranging from organizational innovation to agricultural tools (Tornatzky, & Klein, 1982; Venkatesh et al., 2003). The characteristics of innovations presented by Rogers (1995) were adapted and refined by Moore and Benbasat (1991) into a number of validated constructs that could be used to study individual technology acceptance for information systems (Venkatesh et al., 2003).	Relative advantage	*"The degree to which an innovation is perceived as being better than its precursor"* (Moore, & Benbasat, 1991, p.195).
	Ease of use	*"The degree to which an innovation is perceived as being difficult to use"* (Moore, & Benbasat, 1991, p. 195).
	Image	*"The degree to which use of an innovation is perceived to enhance one's image or status in one's social system"* (Moore, & Benbasat, 1991, p. 195).
	Visibility	*"The degree to which one can see others using the system in the organization"* (Venkatesh et al., 2003, p. 431)
	Compatibility	*"The degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters"* (Moore, & Benbasat, 1991, p. 195).
	Result demonstrability	"*The tangibility of the results of using the innovation, including their observability and communicability"* (Moore, & Benbasat, 1991, p. 203).

	Voluntariness of use	“The degree to which use of the innovation is perceived as being voluntary, or free of will” (Moore, & Benbasat, 1991, p. 195).

Appendix III: Limitations of theories and models for innovation adoption.

Technology Acceptance Model	
Limitations presented by author	1. The generalizability of the findings needs to be proven by future research; 2. In contradiction to the results, another study by Davis et al. (1989) found significant results indicating a direct effect of perceived ease of use on usage intention, controlling for perceived usefulness, directly after the training session with a technology; 3. The usage measures were self-reported rather than objectively measured; 4. The possibility of a halo-effect as the same questionnaire was used to measure perceived usefulness and perceived ease of use as well as usage.
Limitations presented by Venkatesh et al. (2003)	1. TAM did not include experience as a moderator. David et al. (1989) and Szanja (1996), have found empirical evidence that ease of use becomes non-significant with increased experience (Venkatesh, et al., 2003); 1. TAM did not include voluntariness as a moderator. No further research available; 2. TAM did not include gender as a moderator. Empirical evidence showed that perceived usefulness was more notable for men (Venkatesh et al., 2003). In turn, perceived ease of use was more notable for women (Venkatesh et al., 2003); 2. TAM did not include age as a moderator. No further research available.

The Extended Technology Acceptance Model (TAM2)	
Limitations presented by author	1. The sample size for each of the four longitudinal samples were less than 50, which could lessen the power of significance tests; 2. The measurement of a multitude of constructs consisted of only two items; 3. The field studies did not include experimental manipulation of theoretical constructs; 4. The usage measures were self-reported rather than objectively measured; 5. The underlying dynamics of the causal mechanisms are underexposed as a result of the variance theory approach rather than a process approach that analyzes the sequences of events and actions over time.
Limitations presented by Venkatesh et al. (2003)	1. TAM 2 did not include experience as a moderator. See TAM; 2. TAM 2 did not include voluntariness as a moderator. Empirical evidence showed that subjective norm was more notable in mandatory settings and even then only in cases of limited experience with the technology (Venkatesh et al., 2003); 3. TAM2 did not include gender as a moderator. Empirical evidence showed that subjective norm was more notable for women in the early stages of experience (Venkatesh et al., 2003); 3. TAM2 did not include age as a moderator. No further research available.

Theory of Reasoned Action (TRA)	
Limitations presented by author	1. TRA references to an individual's attitude towards behavior, it does not include attitudes towards objects, people or institutions; 2. TRA does not incorporate external variables, such as personality characteristics, demographic variables, and other factors (e.g. social role).
Limitations presented by Venkatesh et al. (2003)	1. TRA did not include experience as a moderator. There are conflicting results for the moderating effect of experience (Venkatesh et al., 2003). Davis et al (1989) found no empirical evidence for the moderating effect of experience on the determinants. On the contrary, Karahanna, Straub and Chervany (1999) found that attitude became more important with increasing experience, while subjective norm became less important with increasing experience; 2. TRA did not include voluntariness as a moderator. Hartwick and Barki (1994) suggested that subjective norm is more influential when system use is experienced to be less voluntary; 4. TRA did not include gender as a moderator. No further research available; 5. TRA did not include age as a moderator. No further research available.

The Theory of Planned Behavior (TPB)	
Limitations presented by author	1. The exact relationship between control beliefs and perceived behavioral control remains uncertain. Particularly, there is concern about the correlations of only moderate magnitude that are frequently observed in attempts to associate belief-based measures of TRA's constructs to other, more global measures of these constructs (Ajzen, 1991). At its best, resealing measures can help overcome scaling limitations, but the observed gain in correlations between belief-based and global measures is insufficient to deal with the problem (Ajzen, 1991).
Limitations presented by Venkatesh et al. (2003)	1. TPB did not include experience as a moderator. The effect of experience is similar to the effect as explained in the context of TRA; 2. TPB did not include voluntariness as a moderator. The effect of voluntariness is similar to the effect as explained in the context of TRA; 3. TPB did not include gender as a moderator. Empirical evidence showed that attitude was more notable for men. In turn, subjective norm and perceived behavioral control were more notable for women in early stages of experience (Venkatesh et al., 2000); 4. TPB did not include age as a moderator. Empirical evidence showed that attitude was more notable for younger workers. In turn, perceived behavioral control was more notable for older workers. Lastly, subjective norm was more notable for older women (Morris, & Venkatesh, 2000).

Innovation Diffusion Theory (IDT)	
Limitations presented by author	1. No limitations presented by author.
Limitations presented by Venkatesh et al. (2003)	1. IDT did not include experience as a moderator. To study the impact of innovation characteristics on adoption (no/low experience) and usage behavior (greater experience), a between-subjects comparison was conducted by Karahanna et al. (1991). Empirical support was found for differences in the predictors of adoption (relative advantage, ease of use, trialability, result demonstrability, and visibility) versus usage behavior (relative advantage, and image); 2. IDT did not include voluntariness as a moderator. Instead, it was proven to be a direct predictor of intention to adopt; 3. IDT did not include gender as a moderator. No further research available; 4. IDT did not include age as a moderator. No further research available.

Appendix IV: An overview of the measurement items

Constructs / indicators	Selected research	Items
Webshop characteristics		
Centralization		
Participation in decision making	Dewar, Whetten, & Boje, 1980	Employees participate in the decision to adopt new technologies. Employees participate in the decision to adopt new policies. Employees participate in the decision to hire new staff. Employees participate in the decisions on the promotions of any of the professional staff.
Hierarchy of authority	Dewar, Whetten, & Boje, 1980	There can be no action taken until a supervisor approves a decision. An employee who wants to make his own decisions would be discouraged. Even small decisions have to be referred to someone higher up for a final answer. An employee has to ask his boss before doing anything. Any decision an employee makes has to have his boss' approval.
Organizational innovativeness		
Participation in decision making	Dewar, Whetten, & Boje, 1980 Hurley, & Hult, 1998	See items Participation in decision making
Learning and Development	Hurley, & Hult, 1998	Employees are provided with opportunities for individual development other than formal training (e.g. work assignments and job rotation). Managers are encouraged to attend formal developmental activities (e.g. training professional seminars, and symposia). There are employees who provide guidance and counsel regarding one's career. Career management is a shared responsibility of both employees and managers.
Control variable		
Knowledge	No selected research	To what extent are you able to estimate the possible effects of Blockchain on your daily work?

Perceived characteristics of Blockchain		
Relative advantage	Moore, & Benbasat, 1991	Blockchain would enable our company to accomplish tasks more quickly. Blockchain would improve the quality of work at our company. Blockchain would make it more difficult to do our job.* Blockchain would enhance our company's effectiveness on the job.
Trialability	Moore, & Benbasat, 1991	The company I work for would let me try out Blockchain before deciding whether to use it. The company I work for would permit me to use Blockchain on a trial basis long enough to see what it could do.
Observability		
Result demonstrability	Moore, & Benbasat, 1991	The possible results of using Blockchain are apparent to the company I work for. The company I work for would have difficulty explaining why using Blockchain may or may not be beneficial. The company I work for would have no difficulty telling others about the possible results of using Blockchain. The company I work for believes we could communicate to others the possible consequences of using Blockchain.
Individual characteristics		
Perceived usefulness	Venkatesh, & Davis, 2000	Blockchain would decrease my job performance.* Blockchain would increase my productivity. Blockchain would enhance my effectiveness. I would find Blockchain to be useful in my job.
Perceived ease of use	Venkatesh, & Davis, 2000	My interaction with Blockchain would be clear and understandable. Interacting with Blockchain would not require a lot of my mental effort. I would find Blockchain to be hard to use.* I would find it easy to get Blockchain to do what I want it to do.

Decision to adopt		
Firm-level	Teo, Wei, & Benbasat, 2003	The company I work for is considering to adopt Blockchain. The company I work for will adopt Blockchain.
Individual-level	Tan, & Teo, (2000	I am interested in using Blockchain if it is available to me. I would adopt Blockchain if it is available to me.
Webshop characteristic		
Organizational size	Thong, & Yap, 1995	How many people are employed at the company you work for?
Control variables		
Industry		In what industry is the company you work for active?
Gender		What is your gender?
Age		What is your age?
Extra's		
Comments		Do you have comments and / or feedback?
Gift card		Provide your email address if you wish to have a chance to win one of the three Bol.com gift vouchers worth 20 euros.
Results of research		Provide your email address if you wish to receive the results of the study.

* Reversed question

Appendix V: Factor analyses

Appendix V.a: Normality of distribution

		Org_size _recoded	Desc_tech	Desc_plcs	Desc_prom	Desc_staff	Hier_spvs	Hier_disc	Hier_rfr	Hier_boss	Hier_appr
N	Valid	99	99	99	99	99	99	99	99	99	99
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		2,04	3,46	3,39	2,74	3,30	2,63	2,09	1,97	2,20	2,03
Median		2	4	4	3	3	2	2	2	2	2
Mode		1	4	4	3	4	2	2	2	2	2
Std. Deviation		1,106	1,119	1,105	1,006	1,035	1,016	0,771	1,015	0,869	0,775
Skewness		0,520	-0,780	-0,745	0,183	-0,358	0,572	0,662	1,018	0,546	0,484
Std. Error of Skewness		0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243
Kurtosis		-1,179	-0,132	-0,261	-0,432	-0,428	-0,464	0,524	0,270	-0,200	0,030
Std. Error of Kurtosis		0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481
Percentiles	25	1	3	3	2	3	2	2	1	2	2
	50	2	4	4	3	3	2	2	2	2	2
	75	3	4	4	3	4	3	2	2	3	2

		LD_indv	LD_fdvl	LD-gc	LD_cmgt	Contr_knwldg	RA_quick	RA_qual	RA_easy _recoded	RA_effec	Trial_tryout
N	Valid	99	99	99	99	99	99	99	99	99	99
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		3,48	3,47	3,08	3,46	3,02	3,21	3,17	3,21	3,35	3,32
Median		4	4	3	4	3	3	3	3	3	3
Mode		4	4	3	4	4	3	4	3	3	4
Std. Deviation		0,962	0,885	0,911	0,873	1,078	0,860	0,948	0,773	0,773	1,018
Skewness		-1,043	-0,554	-0,410	-0,877	-0,439	-0,427	-0,500	0,153	-0,305	-0,275
Std. Error of Skewness		0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243
Kurtosis		0,825	0,098	-0,380	0,549	-0,992	-0,097	-0,416	-0,382	0,078	-0,440
Std. Error of Kurtosis		0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481
Percentiles	25	3	3	2	3	2	3	3	3	3	3
	50	4	4	3	4	3	3	3	3	3	3
	75	4	4	4	4	4	4	4	4	4	4

		Trial_trial	Rslt_appr	Rslt_expl	Rslt_rslt	Rslt_cosq	Pusef_jperf _recoded	Pusef_prod	Pusef_effe	Pusef_use	Pease_cu
N	Valid	99	99	99	99	99	99	99	99	99	99
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		3,33	2,71	2,94	3,03	3,22	3,52	3,24	3,38	3,37	3,16
Median		3	3	3	3	3	3	3	3	3	3
Mode		4	3	3	3	3	3	3	4	3	3
Std. Deviation		0,926	0,929	0,913	0,931	0,864	0,734	0,730	0,724	0,737	0,696
Skewness		-0,639	-0,003	0,039	-0,293	-0,062	0,105	-0,090	-0,241	-0,411	-0,229
Std. Error of Skewness		0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243
Kurtosis		0,371	-0,636	-0,516	-0,619	-0,063	-0,251	-0,549	-0,417	0,300	0,210
Std. Error of Kurtosis		0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481
Percentiles	25	3	2	2	2	3	3	3	3	3	3
	50	3	3	3	3	3	3	3	3	3	3
	75	4	3	4	4	4	4	4	4	4	4

		Pease_meff	Pease_ease _recoded	Pease_appl	Fl_ita_cont	Fl_ita_adopt	Il_ita_inter	Il_ita_adopt	Contr_ind	Contr_gend	Contr_age _recoded
N	Valid	99	99	99	99	99	99	99	99	99	99
	Missing	0	0	0	0	0	0	0	0	0	0
Mean		3,08	3,08	2,99	2,43	2,59	3,31	3,26	6,64	1,31	2,22
Median		3	3	3	3	3	3	3	3	1	2
Mode		3	3	3	3	3	4	3	3	1	2
Std. Deviation		0,724	0,650	0,707	0,939	0,937	0,976	0,887	4,713	0,466	0,964
Skewness		-0,124	0,149	-0,163	0,005	0,011	-0,669	-0,456	0,748	0,818	0,374
Std. Error of Skewness		0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243	0,243
Kurtosis		-0,114	0,020	1,627	-0,535	-0,207	0,089	0,260	-1,195	-1,358	-0,783
Std. Error of Kurtosis		0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481	0,481
Percentiles	25	3	3	3	2	2	3	3	3	1	1
	50	3	3	3	3	3	3	3	3	1	2
	75	4	3	3	3	3	4	4	14	2	3

Appendix V.b: Factor analysis centralization

Correlation Matrix[a]

		Desc_tech	Desc_plcs	Desc_prom	Desc_staff	Hier_spvs	Hier_disc	Hier_rfr	Hier_boss	Hier_appr
Correlation	Desc_tech	1,000	0,626	0,454	0,397	-0,088	-0,393	-0,266	-0,161	-0,287
	Desc_plcs	0,626	1,000	0,415	0,537	-0,131	-0,330	-0,199	-0,126	-0,097
	Desc_prom	0,454	0,415	1,000	0,499	-0,067	-0,298	-0,048	-0,161	-0,016
	Desc_staff	0,397	0,537	0,499	1,000	-0,134	-0,393	-0,263	-0,216	-0,088
	Hier_spvs	-0,088	-0,131	-0,067	-0,134	1,000	0,383	0,434	0,584	0,572
	Hier_disc	-0,393	-0,330	-0,298	-0,393	0,383	1,000	0,591	0,506	0,491
	Hier_rfr	-0,266	-0,199	-0,048	-0,263	0,434	0,591	1,000	0,563	0,663
	Hier_boss	-0,161	-0,126	-0,161	-0,216	0,584	0,506	0,563	1,000	0,582
	Hier_appr	-0,287	-0,097	-0,016	-0,088	0,572	0,491	0,663	0,582	1,000
Sig. (1-tailed)	Desc_tech		0,000	0,000	0,000	0,193	0,000	0,004	0,056	0,002
	Desc_plcs	0,000		0,000	0,000	0,098	0,000	0,024	0,106	0,169
	Desc_prom	0,000	0,000		0,000	0,255	0,001	0,319	0,056	0,438
	Desc_staff	0,000	0,000	0,000		0,093	0,000	0,004	0,016	0,194
	Hier_spvs	0,193	0,098	0,255	0,093		0,000	0,000	0,000	0,000
	Hier_disc	0,000	0,000	0,001	0,000	0,000		0,000	0,000	0,000
	Hier_rfr	0,004	0,024	0,319	0,004	0,000	0,000		0,000	0,000
	Hier_boss	0,056	0,106	0,056	0,016	0,000	0,000	0,000		0,000
	Hier_appr	0,002	0,169	0,438	0,194	0,000	0,000	0,000	0,000	

a. Determinant = ,021

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,782
Bartlett's Test of Sphericity	Approx. Chi-Square	363,124
	df	36
	Sig.	0,000

Communalities

	Initial	Extraction
Desc_tech	0,526	0,511
Desc_plcs	0,511	0,591
Desc_prom	0,379	0,404
Desc_staff	0,433	0,477
Hier_spvs	0,446	0,440
Hier_disc	0,491	0,542
Hier_rfr	0,572	0,603
Hier_boss	0,510	0,572
Hier_appr	0,610	0,684

Extraction Method: Principal Axis Factoring.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,739	41,541	41,541	3,292	36,583	36,583	2,681	29,787	29,787
2	2,001	22,239	63,780	1,531	17,009	53,592	2,142	23,805	53,592
3	0,756	8,401	72,181						
4	0,627	6,969	79,150						
5	0,568	6,314	85,464						
6	0,403	4,474	89,938						
7	0,374	4,157	94,095						
8	0,297	3,303	97,398						
9	0,234	2,602	100,000						

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor	
	1	2
Desc_tech	-0,555	0,451
Desc_plcs	-0,518	0,569
Desc_prom	-0,393	0,499
Desc_staff	-0,516	0,459
Hier_spvs	0,558	0,358
Hier_disc	0,736	0,020
Hier_rfr	0,714	0,305
Hier_boss	0,673	0,344
Hier_appr	0,693	0,453

Extraction Method: Principal Axis Factoring.
a. 2 factors extracted. 7 iterations required.

Appendix V.c: Factor analysis organizational innovativeness

Correlation Matrix[a]

		Desc_tech	Desc_plcs	Desc_prom	Desc_staff	LD_indv	LD_fdvl	LD_gc	LD_cmgt
Correlation	Desc_tech	1,000	0,626	0,454	0,397	0,452	0,352	0,073	0,383
	Desc_plcs	0,626	1,000	0,415	0,537	0,423	0,308	0,151	0,284
	Desc_prom	0,454	0,415	1,000	0,499	0,365	0,336	0,235	0,303
	Desc_staff	0,397	0,537	0,499	1,000	0,322	0,231	0,136	0,238
	LD_indv	0,452	0,423	0,365	0,322	1,000	0,578	0,292	0,482
	LD_fdvl	0,352	0,308	0,336	0,231	0,578	1,000	0,357	0,412
	LD_gc	0,073	0,151	0,235	0,136	0,292	0,357	1,000	0,376
	LD_cmgt	0,383	0,284	0,303	0,238	0,482	0,412	0,376	1,000
Sig. (1-tailed)	Desc_tech		0,000	0,000	0,000	0,000	0,000	0,237	0,000
	Desc_plcs	0,000		0,000	0,000	0,000	0,001	0,069	0,002
	Desc_prom	0,000	0,000		0,000	0,000	0,000	0,010	0,001
	Desc_staff	0,000	0,000	0,000		0,001	0,011	0,090	0,009
	LD_indv	0,000	0,000	0,000	0,001		0,000	0,002	0,000
	LD_fdvl	0,000	0,001	0,000	0,011	0,000		0,000	0,000
	LD_gc	0,237	0,069	0,010	0,090	0,002	0,000		0,000
	LD_cmgt	0,000	0,002	0,001	0,009	0,000	0,000	0,000	

a. Determinant = ,075

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,804
Bartlett's Test of Sphericity	Approx. Chi-Square	245,000
	df	28
	Sig.	0,000

Communalities

	Initial	Extraction
Desc_tech	0,501	0,543
Desc_plcs	0,505	0,642
Desc_prom	0,365	0,390
Desc_staff	0,383	0,429
LD_indv	0,465	0,561
LD_fdvl	0,397	0,515
LD_gc	0,230	0,266
LD_cmgt	0,343	0,421

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,557	44,468	44,468	3,056	38,195	38,195	2,078	25,980	25,980
2	1,257	15,718	60,187	0,711	8,884	47,079	1,688	21,099	47,079
3	0,799	9,992	70,179						
4	0,620	7,752	77,931						
5	0,565	7,059	84,989						
6	0,511	6,387	91,377						
7	0,390	4,877	96,254						
8	0,300	3,746	100,000						

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor	
	1	2
Desc_tech	0,693	-0,250
Desc_plcs	0,709	-0,373
Desc_prom	0,611	-0,128
Desc_staff	0,580	-0,305
LD_indv	0,710	0,239
LD_fdvl	0,623	0,357
LD_gc	0,368	0,361
LD_cmgt	0,580	0,291

Extraction Method: Principal Axis Factoring.
a. 2 factors extracted. 9 iterations required.

Appendix V.d: Factor analysis relative advantage

Correlation Matrix[a]

		RA_quick	RA_qual	RA_easy_recoded	RA_effec
Correlation	RA_quick	1,000	0,655	0,193	0,684
	RA_qual	0,655	1,000	0,047	0,543
	RA_easy_recoded	0,193	0,047	1,000	0,061
	RA_effec	0,684	0,543	0,061	1,000
Sig. (1-tailed)	RA_quick		0,000	0,028	0,000
	RA_qual	0,000		0,321	0,000
	RA_easy_recoded	0,028	0,321		0,274
	RA_effec	0,000	0,000	0,274	

a. Determinant = ,279

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,679
Bartlett's Test of Sphericity	Approx. Chi-Square	122,359
	df	6
	Sig.	0,000

Communalities

	Initial	Extraction
RA_quick	0,603	0,863
RA_qual	0,451	0,505
RA_easy_recoded	0,054	0,018
RA_effec	0,486	0,551

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,281	57,021	57,021	1,938	48,443	48,443
2	0,992	24,796	81,817			
3	0,458	11,456	93,273			
4	0,269	6,727	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor
	1
RA_quick	0,929
RA_qual	0,711
RA_easy_recoded	0,134
RA_effec	0,742

Extraction Method: Principal Axis Factoring.
a. 1 factors extracted. 15 iterations required.

Appendix V.e: Factor analysis trialability

Correlation Matrix[a]

		Trial_tryout	Trial_trial
Correlation	Trial_tryout	1,000	0,685
	Trial_trial	0,685	1,000
Sig. (1-tailed)	Trial_tryout		0,000
	Trial_trial	0,000	

a. Determinant = ,530

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,500
Bartlett's Test of Sphericity	Approx. Chi-Square	61,217
	df	1
	Sig.	0,000

Communalities

	Initial	Extraction
Trial_tryout	0,470	0,685
Trial_trial	0,470	0,685

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,685	84,268	84,268	1,369	68,453	68,453
2	0,315	15,732	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor
	1
Trial_tryout	0,827
Trial_trial	0,827

Extraction Method: Principal Axis Factoring.
a. 1 factors extracted. 8 iterations required.

Appendix V.f: Factor analysis observability

Correlation Matrix[a]

		Rslt_appr	Rslt_expl	Rslt_rslt	Rslt_consq
Correlation	Rslt_appr	1,000	-0,310	0,353	0,273
	Rslt_expl	-0,310	1,000	-0,454	-0,073
	Rslt_rslt	0,353	-0,454	1,000	0,499
	Rslt_consq	0,273	-0,073	0,499	1,000
Sig. (1-tailed)	Rslt_appr		0,001	0,000	0,003
	Rslt_expl	0,001		0,000	0,235
	Rslt_rslt	0,000	0,000		0,000
	Rslt_consq	0,003	0,235	0,000	

a. Determinant = ,472

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,569
Bartlett's Test of Sphericity	Approx. Chi-Square	71,872
	df	6
	Sig.	0,000

Communalities

	Initial	Extraction
Rslt_appr	0,175	0,211
Rslt_expl	0,271	0,209
Rslt_rslt	0,435	0,871
Rslt_consq	0,298	0,234

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,004	50,109	50,109	1,525	38,122	38,122
2	0,933	23,322	73,431			
3	0,704	17,595	91,026			
4	0,359	8,974	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor
	1
Rslt_appr	0,459
Rslt_expl	-0,457
Rslt_rslt	0,933
Rslt_consq	0,484

Extraction Method: Principal Axis Factoring.
a. 1 factors extracted. 24 iterations required.

Appendix V.g: Factor analysis perceived usefulness

Correlation Matrix[a]

		Pusef_jperf_recoded	Pusef_prod	Pusef_effe	Pusef_use
Correlation	Pusef_jperf_recoded	1,000	0,203	0,354	0,339
	Pusef_prod	0,203	1,000	0,691	0,551
	Pusef_effe	0,354	0,691	1,000	0,551
	Pusef_use	0,339	0,551	0,551	1,000
Sig. (1-tailed)	Pusef_jperf_recoded		0,022	0,000	0,000
	Pusef_prod	0,022		0,000	0,000
	Pusef_effe	0,000	0,000		0,000
	Pusef_use	0,000	0,000	0,000	

a. Determinant = ,279

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,704
Bartlett's Test of Sphericity	Approx. Chi-Square	122,353
	df	6
	Sig.	0,000

Communalities

	Initial	Extraction
Pusef_jperf_recoded	0,167	0,147
Pusef_prod	0,526	0,595
Pusef_effe	0,547	0,735
Pusef_use	0,388	0,484

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,390	59,738	59,738	1,961	49,024	49,024
2	0,840	21,006	80,744			
3	0,482	12,050	92,794			
4	0,288	7,206	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor
	1
Pusef_jperf_recoded	0,383
Pusef_prod	0,772
Pusef_effe	0,857
Pusef_use	0,696

Extraction Method: Principal Axis Factoring.
a. 1 factors extracted. 10 iterations required.

Appendix V.h: Factor analysis perceived ease of use

Correlation Matrix[a]

		Pease_cu	Pease_meff	Pease_ease_recoded	Pease_appl
Correlation	Pease_cu	1,000	0,217	0,242	0,356
	Pease_meff	0,217	1,000	0,420	0,420
	Pease_ease_recoded	0,242	0,420	1,000	0,135
	Pease_appl	0,356	0,420	0,135	1,000
Sig. (1-tailed)	Pease_cu		0,015	0,008	0,000
	Pease_meff	0,015		0,000	0,000
	Pease_ease_recoded	0,008	0,000		0,091
	Pease_appl	0,000	0,000	0,091	

a. Determinant = ,565

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,571
Bartlett's Test of Sphericity	Approx. Chi-Square	54,750
	df	6
	Sig.	0,000

Communalities

	Initial	Extraction
Pease_cu	0,165	0,198
Pease_meff	0,311	0,522
Pease_ease_recoded	0,209	0,222
Pease_appl	0,259	0,312

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,904	47,596	47,596	1,254	31,341	31,341
2	0,907	22,682	70,278			
3	0,757	18,922	89,200			
4	0,432	10,800	100,000			

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor 1
Pease_cu	0,445
Pease_meff	0,722
Pease_ease_recoded	0,472
Pease_appl	0,558

Extraction Method: Principal Axis Factoring.
a. 1 factors extracted. 13 iterations required.

Appendix V.i: Factor analysis intention adoption decision

Correlation Matrix[a]

		Fl_ita_cont	Fl_ita_adopt	Il_ita_inter	Il_ita_adopt
Correlation	Fl_ita_cont	1,000	0,799	0,340	0,327
	Fl_ita_adopt	0,799	1,000	0,389	0,464
	Il_ita_inter	0,340	0,389	1,000	0,741
	Il_ita_adopt	0,327	0,464	0,741	1,000
Sig. (1-tailed)	Fl_ita_cont		0,000	0,000	0,000
	Fl_ita_adopt	0,000		0,000	0,000
	Il_ita_inter	0,000	0,000		0,000
	Il_ita_adopt	0,000	0,000	0,000	

a. Determinant = ,124

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,592
Bartlett's Test of Sphericity	Approx. Chi-Square	200,098
	df	6
	Sig.	0,000

Communalities

	Initial	Extraction
Fl_ita_cont	0,648	0,778
Fl_ita_adopt	0,685	0,832
Il_ita_inter	0,562	0,658
Il_ita_adopt	0,596	0,832

Extraction Method: Principal Axis Factoring.

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,532	63,304	63,304	2,313	57,818	57,818	1,590	39,745	39,745
2	1,015	25,375	88,680	0,788	19,697	77,516	1,511	37,771	77,516
3	0,282	7,038	95,718						
4	0,171	4,282	100,000						

Extraction Method: Principal Axis Factoring.

Factor Matrix[a]

	Factor	
	1	2
Fl_ita_cont	0,747	-0,469
Fl_ita_adopt	0,826	-0,387
Il_ita_inter	0,693	0,422
Il_ita_adopt	0,769	0,491

Extraction Method: Principal Axis Factoring.
a. Attempted to extract 2 factors. More than 25 iterations required. (Convergence=,003). Extraction was terminated.

Rotated Factor Matrix[a]

	Factor	
	1	2

Fl_ita_cont	0,865	0,175
Fl_ita_adopt	0,865	0,288
Il_ita_inter	0,212	0,783
Il_ita_adopt	0,220	0,885

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Factor Transformation Matrix

Factor	1	2
1	0,725	0,689
2	-0,689	0,725

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

Appendix VI: Reliability analyses

Appendix VI.a: Reliability analysis participation in decision making

Reliability Statistics

Cronbach's Alpha	N of Items
0,770	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Desc_tech	3,39	1,221	0,626	
Desc_plcs	3,46	1,251	0,626	

Appendix VI.b: Reliability analysis centralization

Reliability Statistics

Cronbach's Alpha	N of Items
0,836	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Hier_disc	6,20	5,204	0,622	0,812
Hier_rfr	6,32	3,996	0,729	0,768
Hier_boss	6,09	4,777	0,646	0,802
Hier_appr	6,26	4,971	0,698	0,782

Appendix VI.c: Reliability analysis relative advantage

Reliability Statistics

Cronbach's Alpha	N of Items
0,830	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
RA_quick	6,53	2,293	0,760	0,694
RA_qual	6,57	2,248	0,656	0,809
RA_effec	6,38	2,708	0,670	0,790

Appendix VI.d: Reliability analysis trialability

Reliability Statistics

Cronbach's Alpha	N of Items
0,811	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Trial_tryout	3,33	0,857	0,685	
Trial_trial	3,32	1,037	0,685	

Appendix VI.e: Reliability analysis result demonstrability

Reliability Statistics

Cronbach's Alpha	N of Items
0,665	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Rslt_rslt	3,22	0,746	0,499	
Rslt_consq	3,03	0,866	0,499	

Appendix VI.f: Reliability analysis perceived usefulness

Reliability Statistics

Cronbach's Alpha	N of Items
0,817	2

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Pusef_prod	3,38	0,525	0,691	
Pusef_effe	3,24	0,532	0,691	

Appendix VI.g: Reliability analysis adoption decision

Reliability Statistics

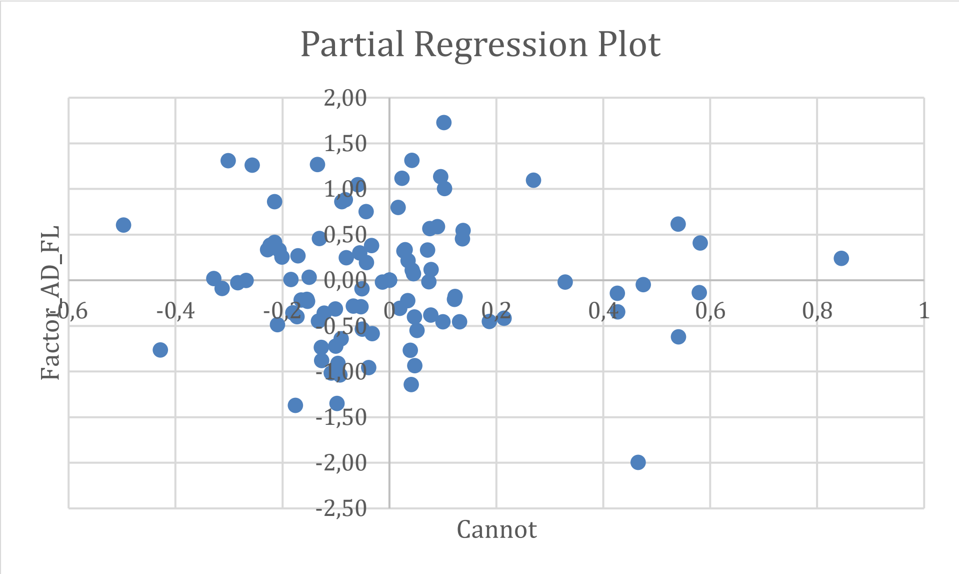
Cronbach's Alpha	N of Items
0,805	4

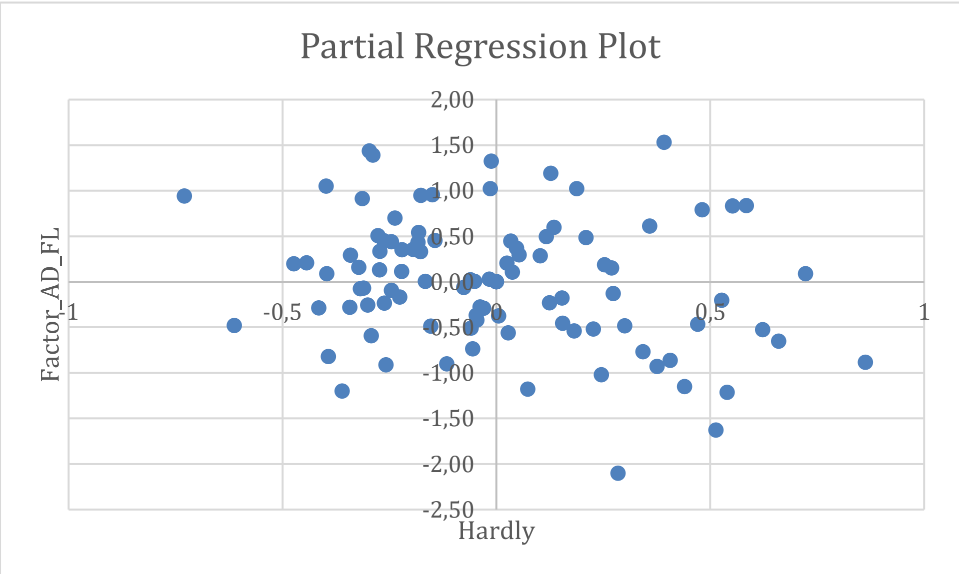
Item-Total Statistics

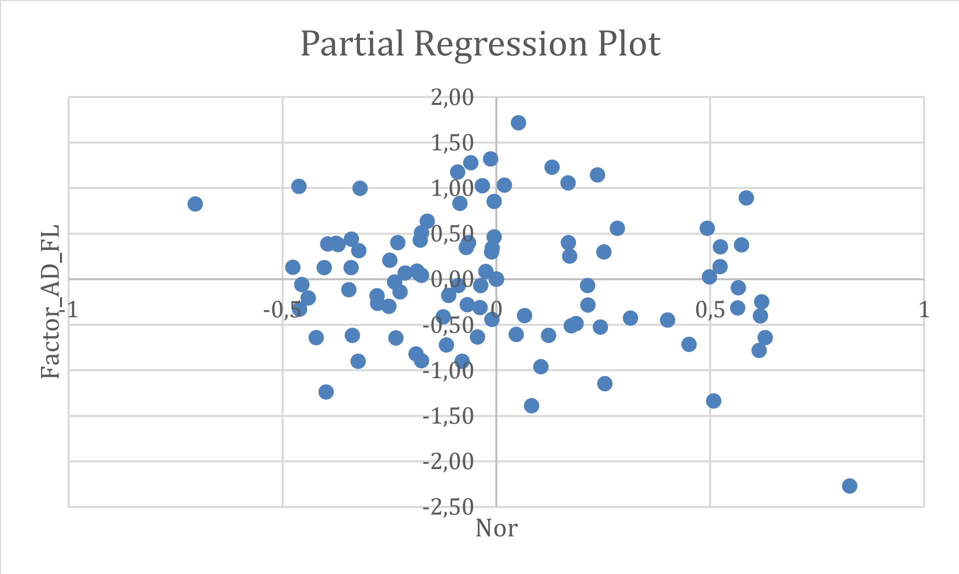
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Fl_ita_cont	9,16	5,382	0,591	0,771
Fl_ita_adopt	9,01	5,071	0,684	0,725
Il_ita_inter	8,28	5,266	0,584	0,775
Il_ita_adopt	8,33	5,449	0,627	0,754

Appendix VII: Regression analysis Adoption decision on firm-level

Appendix VII.a: Assumption linearity






Partial Regression Plot
Factor_AD_FL
Nor
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1,00
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0,00
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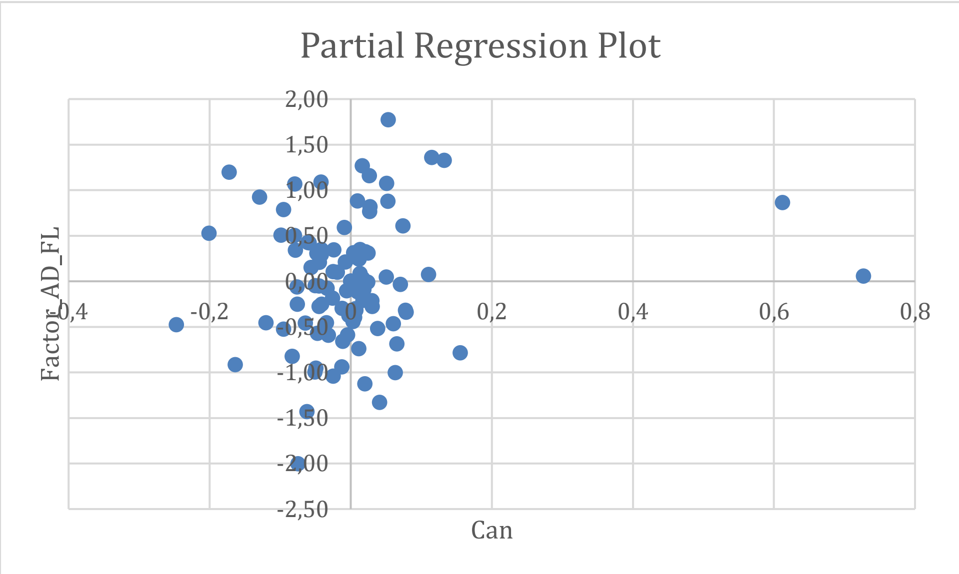
-1,00
-1,50
-2,00
-2,50
-1
-0,5
0
0,5
1


Partial Regression Plot
Factor_AD_FL
Can
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1,00
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0,00
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-0,2
0
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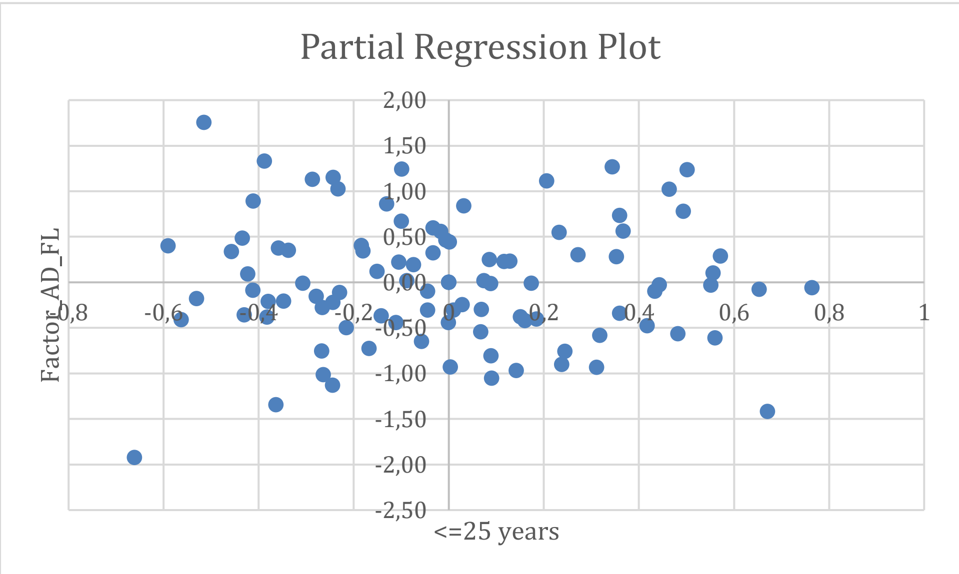
0,4
0,6
0,8


Partial Regression Plot
Factor_AD_FL
<=25 years
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
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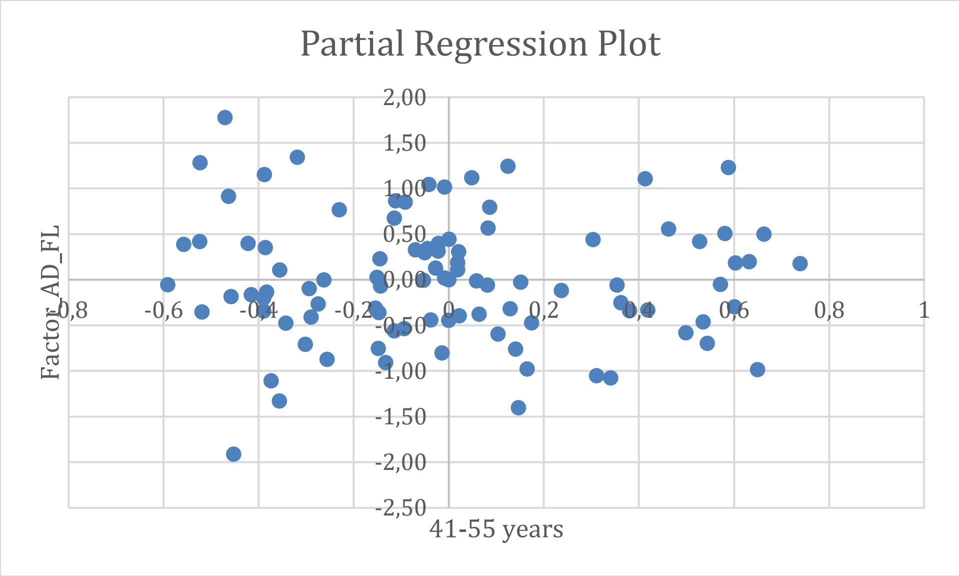
0,6
0,8
1


Partial Regression Plot
Factor_AD_FL
41-55 years
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1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
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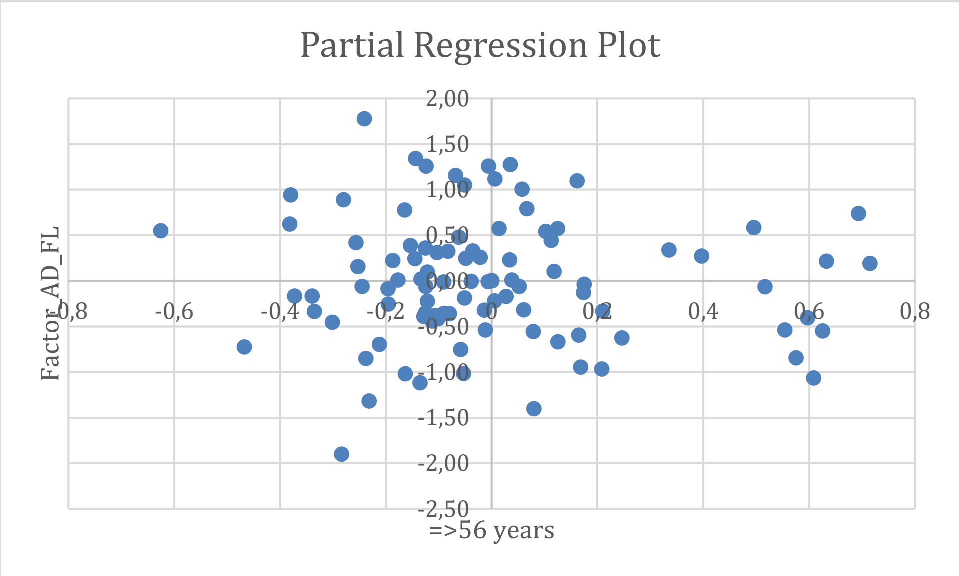
-0,6
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1


Partial Regression Plot
Factor_AD_FL
=>56 years
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0,00
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-1,50
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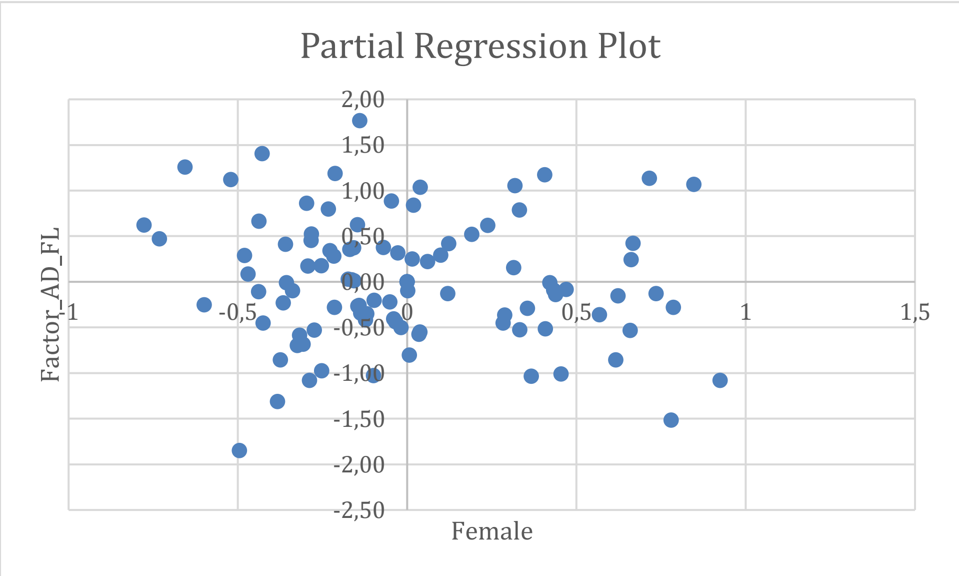
0,4
0,6
0,8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Factor_AD_FL
Female
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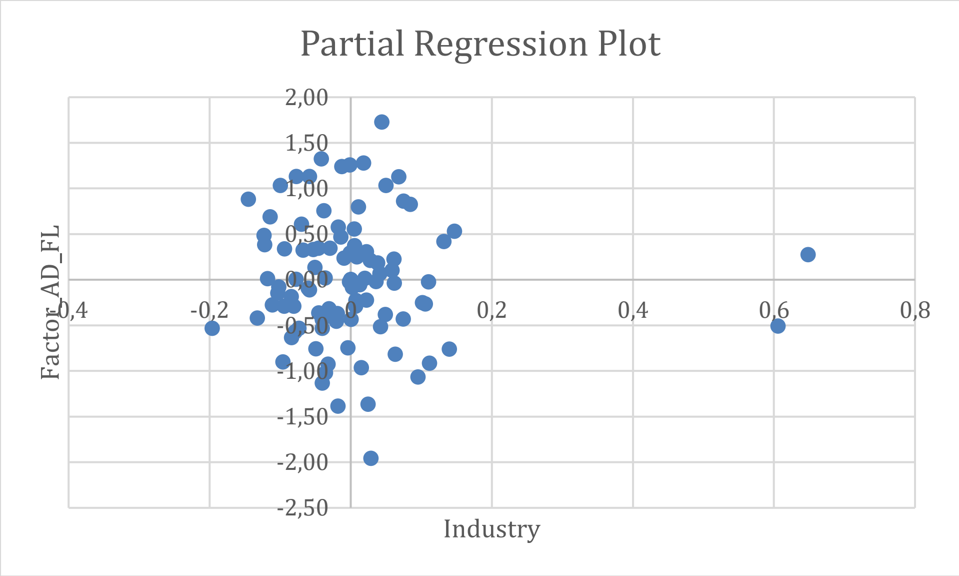
-0,5
0
0,5
1
1,5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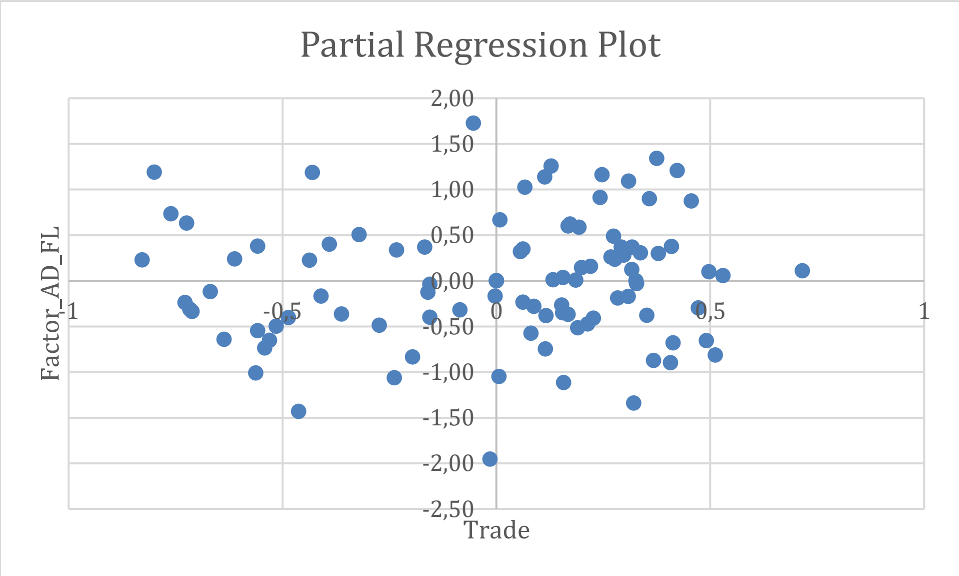
Factor_AD_FL
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,4
-0,2
0
0,2
0,4
0,6
0,8
Industry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Factor_AD_FL
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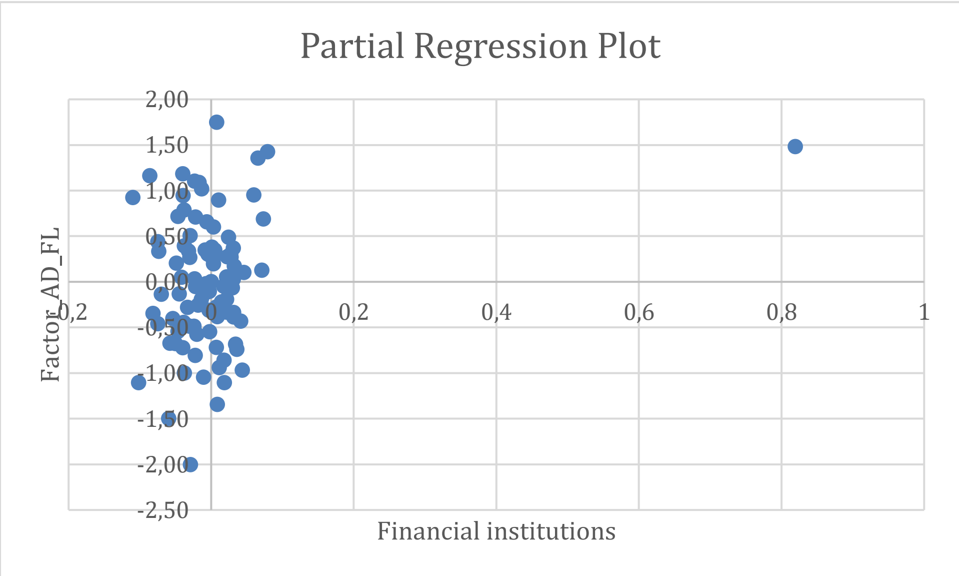
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-1
-0,5
0
0,5
1
Trade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Factor_AD_FL
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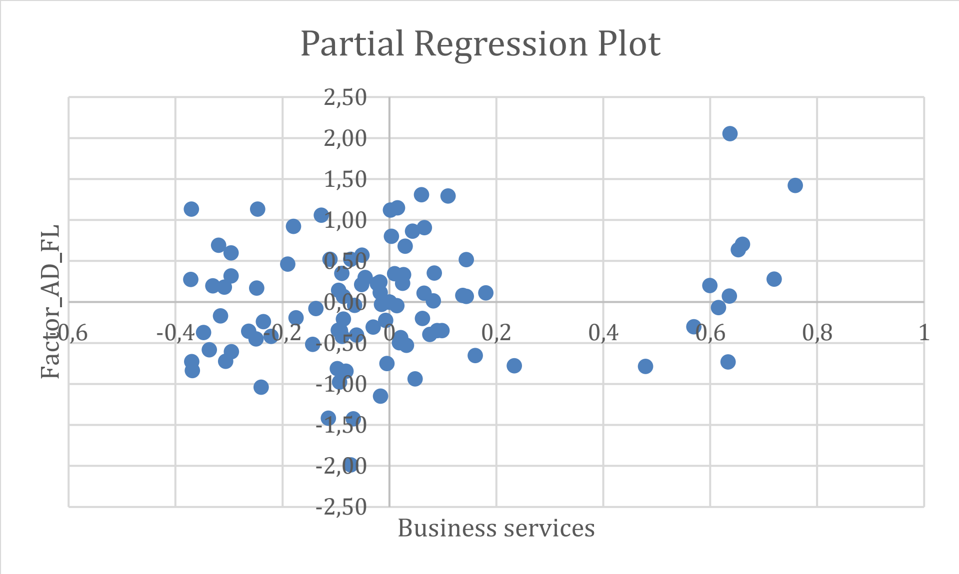
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,2
0
0,2
0,4
0,6
0,8
1
Financial institutions


Partial Regression Plot
Factor_AD_FL
Business services
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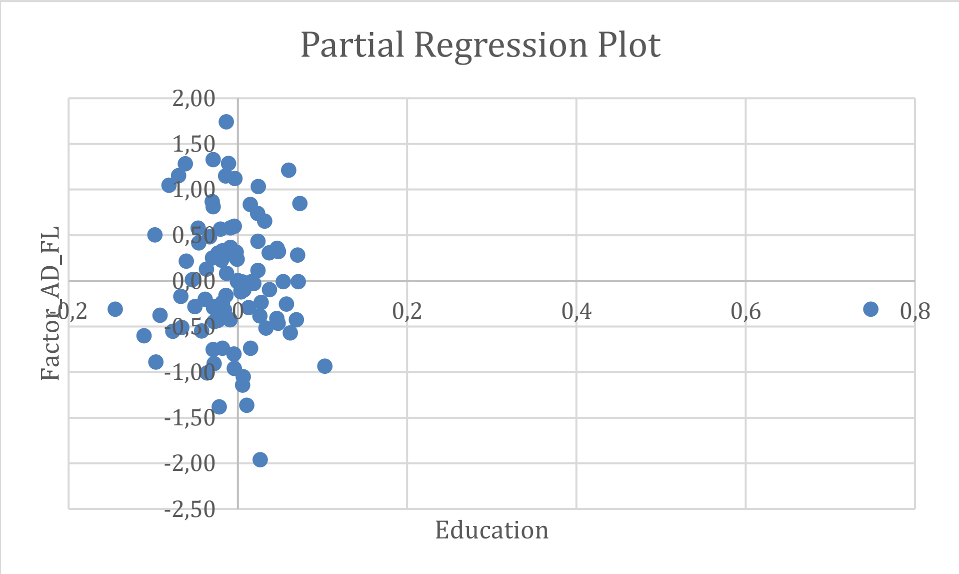
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,6
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1


Partial Regression Plot
Factor_AD_FL
Education
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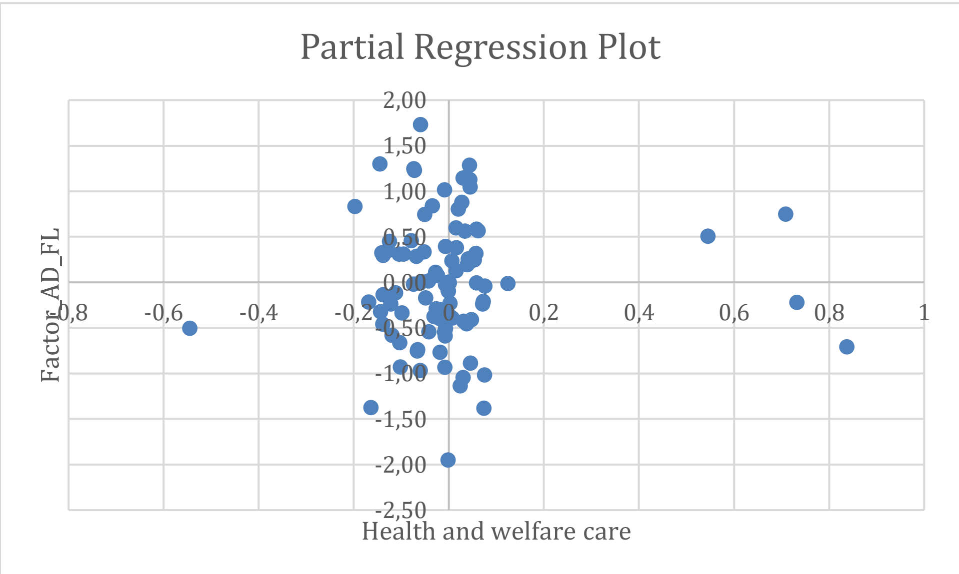
0,6
0,8


Partial Regression Plot
Factor_AD_FL
Health and welfare care
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1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
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-0,6
-0,4
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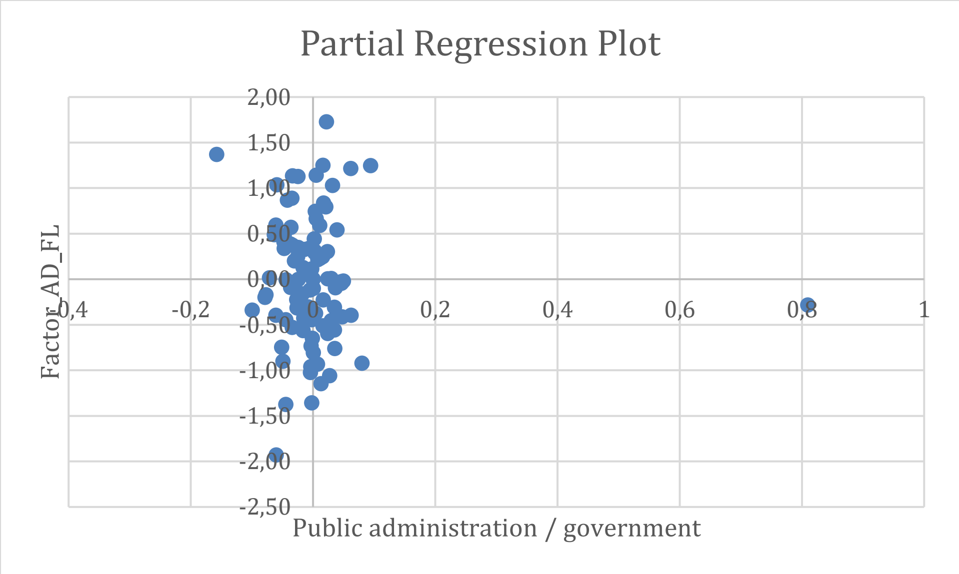
0,6
0,8
1


Partial Regression Plot
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0,00
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-1,00
-1,50
-2,00
-2,50
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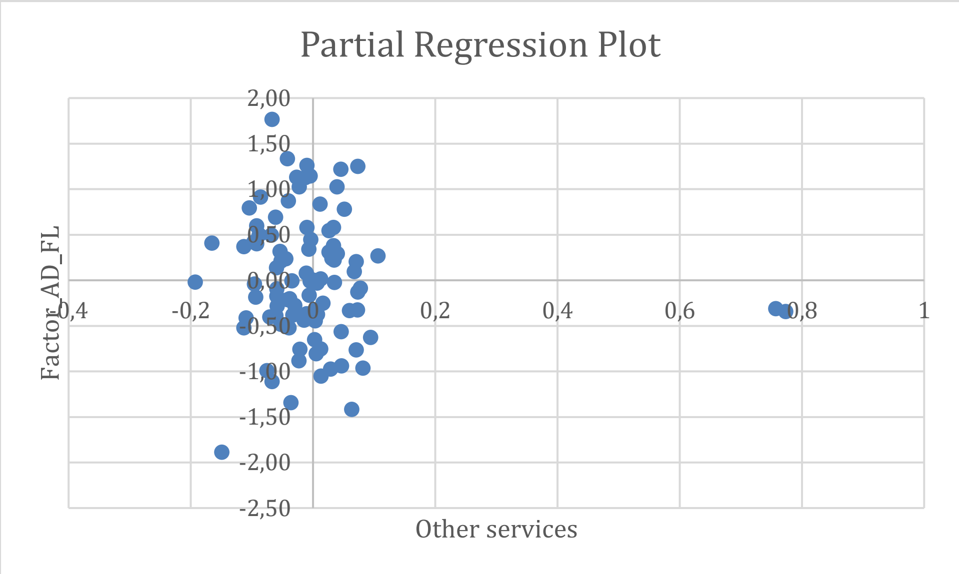
1
Factor_AD_FL
Public administration / government


Partial Regression Plot
2,00
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-1,00
-1,50
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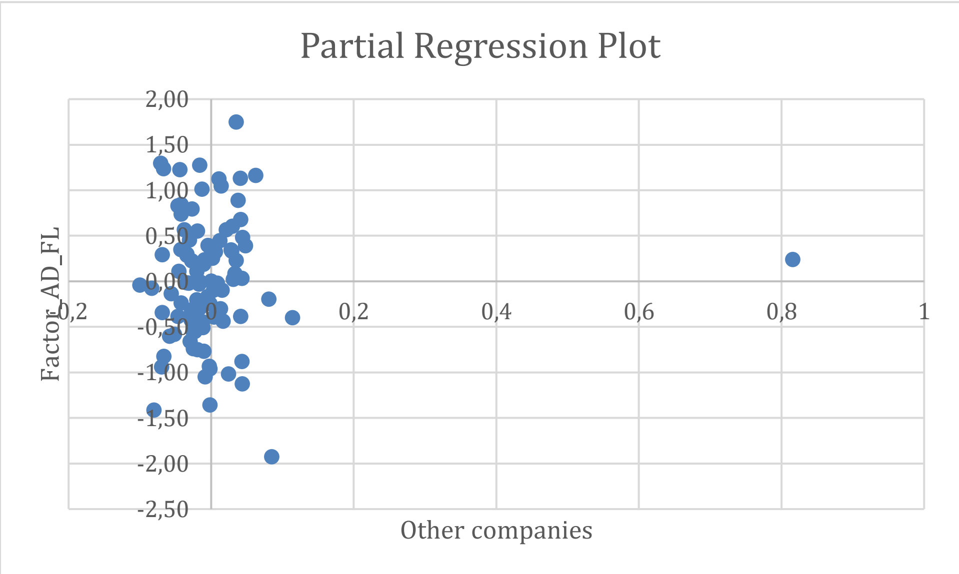
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1
Factor_AD_FL
Other services


Partial Regression Plot
2,00
1,50
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-0,50
-1,00
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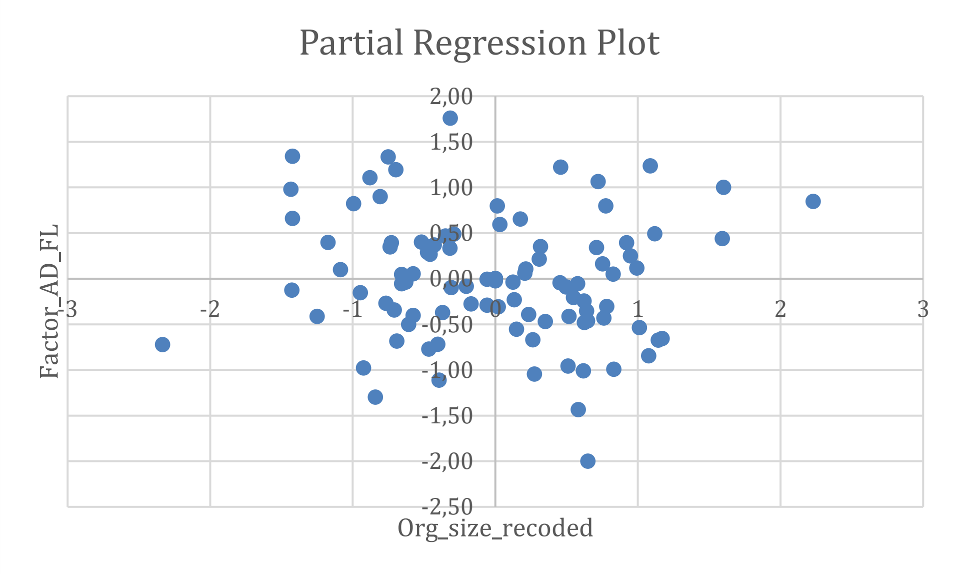
-2,00
-2,50
-0,2
0
0,2
0,4
0,6
0,8
1
Factor_AD_FL
Other companies


Partial Regression Plot
Factor_AD_FL
Org_size_recoded
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1,00
0,50
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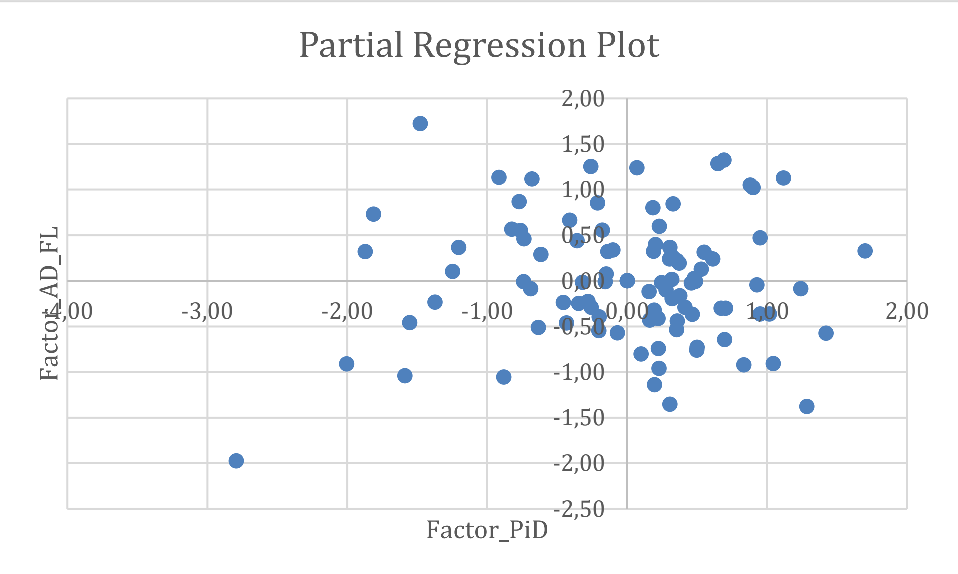
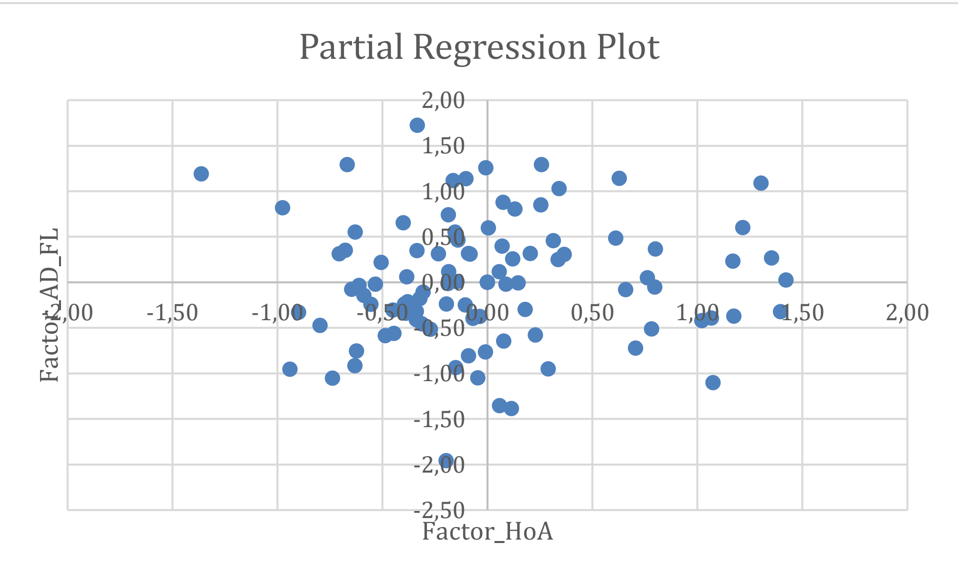
-1,50
-2,00
-2,50
-3
-2
-1
0
1
2
3


Partial Regression Plot
Factor_AD_FL
Factor_PiD
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-4,00
-3,00
-2,00
-1,00
0,00
1,00
2,00


Partial Regression Plot
Factor_AD_FL
Factor_HoA
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
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-1,50
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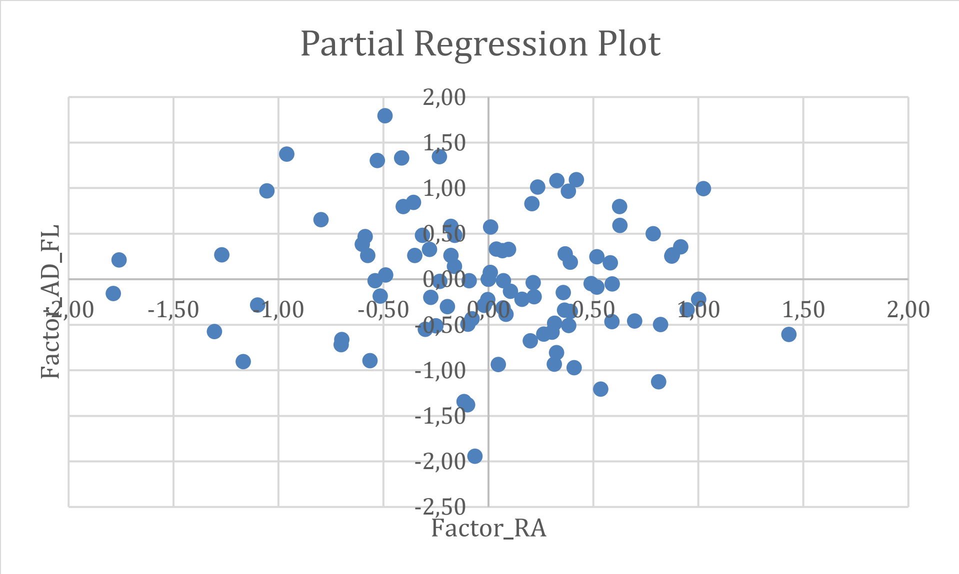
1,00
1,50
2,00


Partial Regression Plot
Factor_AD_FL
Factor_RA
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1,00
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0,00
-0,50
-1,00
-1,50
-2,00
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-2,00
-1,50
-1,00
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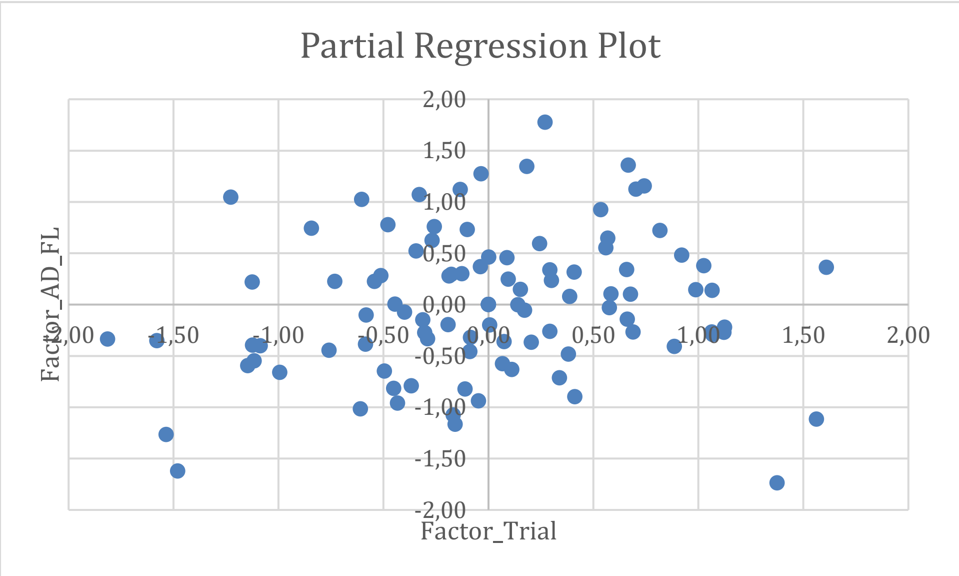
0,00
0,50
1,00
1,50
2,00


Partial Regression Plot
Factor_AD_FL
Factor_Trial
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1,00
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-1,00
-1,50
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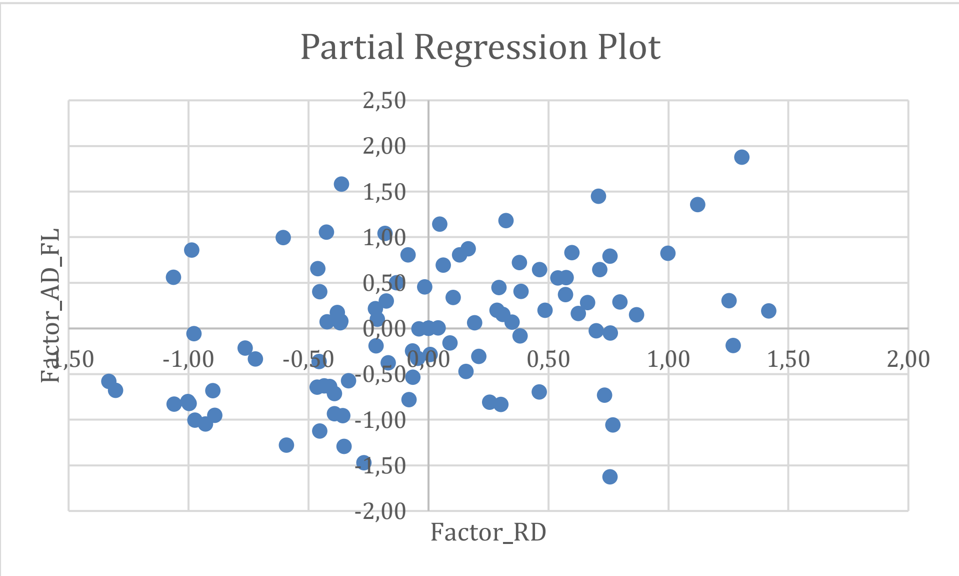
-0,50
0,00
0,50
1,00
1,50
2,00


Partial Regression Plot
Factor_AD_FL
Factor_RD
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1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
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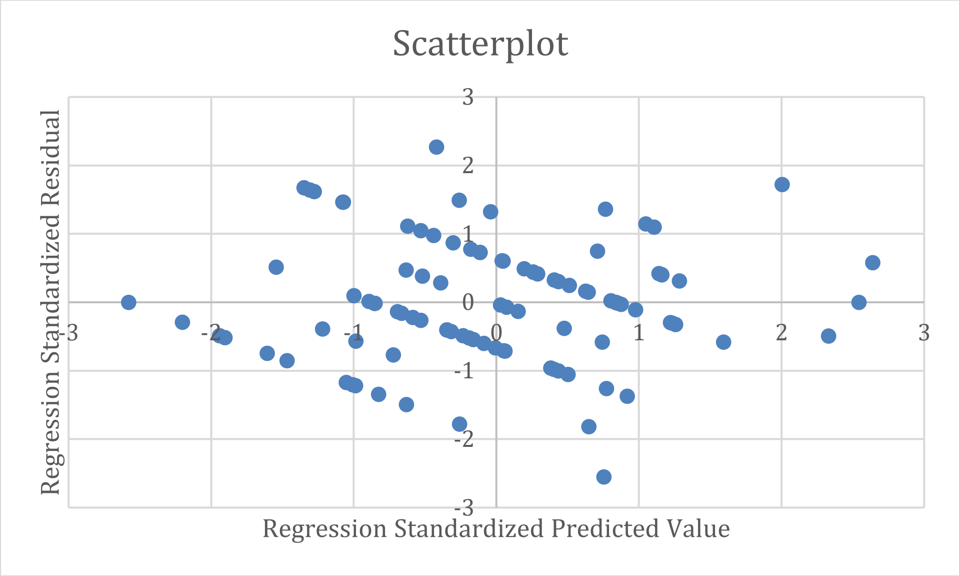
0,00
0,50
1,00
1,50
2,00

Appendix VII.b: Assumption constant variance of the error items



Appendix VII.c: Assumption independence of the error items

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2,813	0,245		11,482	0,000					
	Cannot	-0,241	0,329	-0,082	-0,734	0,465	-0,080	-0,081	-0,069	0,708	1,412
	Hardly	-0,689	0,234	-0,334	-2,946	0,004	-0,246	-0,311	-0,278	0,692	1,444
	Nor	-0,423	0,238	-0,195	-1,774	0,080	-0,118	-0,193	-0,167	0,733	1,364
	Can	0,859	0,650	0,137	1,321	0,190	0,201	0,145	0,124	0,831	1,204
	<=25 years	-0,026	0,233	-0,013	-0,112	0,911	-0,033	-0,012	-0,011	0,680	1,470
	41-55 years	-0,066	0,235	-0,031	-0,279	0,781	-0,101	-0,031	-0,026	0,704	1,421
	=>56 years	0,025	0,293	0,009	0,086	0,932	0,083	0,010	0,008	0,759	1,318
	Female	-0,258	0,193	-0,135	-1,339	0,184	-0,192	-0,147	-0,126	0,870	1,150
	Industry	-0,980	0,656	-0,156	-1,495	0,139	-0,164	-0,164	-0,141	0,817	1,224
	Trade	0,064	0,215	0,036	0,299	0,766	0,000	0,033	0,028	0,601	1,663
	Financial institutions	1,902	0,869	0,215	2,189	0,031	0,170	0,236	0,206	0,920	1,086

	Business services	0,368	0,307	0,131	1,199	0,234	0,123	0,132	0,113	0,748	1,337
	Education	-1,058	0,877	-0,120	-1,206	0,231	-0,172	-0,133	-0,114	0,903	1,107
	Health and welfare care	0,132	0,486	0,029	0,272	0,786	0,085	0,030	0,026	0,760	1,316
	Public administration / government	0,187	0,865	0,021	0,217	0,829	0,056	0,024	0,020	0,929	1,076
	Other services	-0,563	0,635	-0,090	-0,887	0,378	-0,083	-0,098	-0,084	0,872	1,147
	Other companies	0,213	0,871	0,024	0,245	0,807	0,056	0,027	0,023	0,916	1,092
2	(Constant)	2,530	0,666		3,800	0,000					
	Cannot	-0,340	0,358	-0,116	-0,950	0,345	-0,080	-0,107	-0,090	0,608	1,644
	Hardly	-0,674	0,242	-0,327	-2,789	0,007	-0,246	-0,301	-0,265	0,661	1,514
	Nor	-0,438	0,248	-0,202	-1,769	0,081	-0,118	-0,196	-0,168	0,691	1,447
	Can	0,921	0,712	0,146	1,293	0,200	0,201	0,145	0,123	0,706	1,417
	<=25 years	0,039	0,246	0,019	0,158	0,875	-0,033	0,018	0,015	0,622	1,607
	41-55 years	-0,060	0,244	-0,029	-0,248	0,805	-0,101	-0,028	-0,024	0,668	1,498

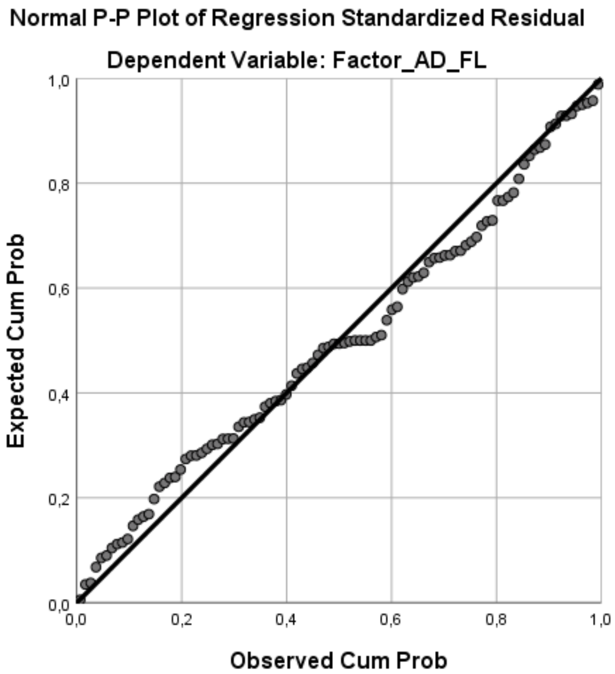
=>56 years	0,084	0,315	0,031	0,268	0,789	0,083	0,030	0,026	0,672	1,487
Female	-0,198	0,219	-0,104	-0,906	0,368	-0,192	-0,102	-0,086	0,687	1,455
Industry	-1,063	0,691	-0,169	-1,539	0,128	-0,164	-0,172	-0,146	0,750	1,333
Trade	0,081	0,221	0,046	0,365	0,716	0,000	0,041	0,035	0,579	1,726
Financial institutions	1,954	0,911	0,221	2,144	0,035	0,170	0,236	0,204	0,854	1,172
Business services	0,399	0,316	0,142	1,261	0,211	0,123	0,141	0,120	0,717	1,395
Education	-0,969	0,945	-0,110	-1,025	0,308	-0,172	-0,115	-0,098	0,793	1,261
Health and welfare care	0,066	0,498	0,015	0,133	0,895	0,085	0,015	0,013	0,737	1,357
Public administration / government	0,218	0,906	0,025	0,240	0,811	0,056	0,027	0,023	0,864	1,157
Other services	-0,323	0,674	-0,051	-0,480	0,633	-0,083	-0,054	-0,046	0,788	1,270
Other companies	0,006	0,901	0,001	0,007	0,995	0,056	0,001	0,001	0,873	1,146
Org_size_recoded	-0,025	0,105	-0,032	-0,243	0,809	0,026	-0,027	-0,023	0,532	1,881

	Factor_PiD	0,101	0,104	0,114	0,971	0,334	0,135	0,109	0,092	0,660	1,514
	Factor_HoA	-0,028	0,138	-0,022	-0,203	0,839	-0,123	-0,023	-0,019	0,750	1,334
3	(Constant)	1,266	0,828		1,529	0,130					
	Cannot	-0,095	0,343	-0,032	-0,276	0,784	-0,080	-0,032	-0,024	0,551	1,813
	Hardly	-0,526	0,244	-0,255	-2,151	0,035	-0,246	-0,241	-0,187	0,539	1,856
	Nor	-0,384	0,241	-0,177	-1,592	0,116	-0,118	-0,181	-0,138	0,607	1,646
	Can	0,687	0,661	0,109	1,040	0,302	0,201	0,119	0,090	0,683	1,463
	<=25 years	-0,040	0,239	-0,020	-0,167	0,868	-0,033	-0,019	-0,015	0,549	1,823
	41-55 years	-0,085	0,231	-0,040	-0,367	0,714	-0,101	-0,042	-0,032	0,621	1,611
	=>56 years	-0,169	0,294	-0,062	-0,575	0,567	0,083	-0,066	-0,050	0,640	1,563
	Female	-0,203	0,201	-0,106	-1,009	0,316	-0,192	-0,116	-0,088	0,679	1,473
	Industry	-0,187	0,683	-0,030	-0,274	0,785	-0,164	-0,032	-0,024	0,640	1,562
	Trade	0,159	0,204	0,090	0,778	0,439	0,000	0,089	0,068	0,567	1,763
	Financial institutions	1,809	0,845	0,204	2,141	0,036	0,170	0,240	0,186	0,827	1,209
	Business services	0,500	0,290	0,178	1,725	0,089	0,123	0,195	0,150	0,712	1,405
	Education	-0,417	0,884	-0,047	-0,471	0,639	-0,172	-0,054	-0,041	0,755	1,324

Health and welfare care	0,115	0,455	0,026	0,252	0,802	0,085	0,029	0,022	0,735	1,360
Public administration / government	-0,350	0,850	-0,040	-0,412	0,681	0,056	-0,048	-0,036	0,818	1,223
Other services	-0,429	0,618	-0,068	-0,693	0,490	-0,083	-0,080	-0,060	0,781	1,280
Other companies	0,293	0,847	0,033	0,345	0,731	0,056	0,040	0,030	0,824	1,214
Org_size_recoded	-0,074	0,098	-0,092	-0,758	0,451	0,026	-0,087	-0,066	0,509	1,964
Factor_PiD	0,009	0,098	0,010	0,094	0,925	0,135	0,011	0,008	0,624	1,602
Factor_HoA	0,036	0,133	0,029	0,274	0,785	-0,123	0,032	0,024	0,675	1,481
Factor_RA	-0,122	0,130	-0,102	-0,938	0,351	0,094	-0,108	-0,082	0,635	1,574
Factor_Trial	0,156	0,110	0,156	1,418	0,160	0,398	0,162	0,123	0,621	1,610
Factor_RD	0,429	0,125	0,375	3,421	0,001	0,482	0,367	0,297	0,628	1,592

a. Dependent Variable: Factor_AD_FL

Appendix VII.d: Assumption normality of the error term distribution



Appendix VII.e: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21,758	17	1,280	1,860	,034[b]
	Residual	55,732	81	0,688		
	Total	77,490	98			
2	Regression	22,755	20	1,138	1,621	,068[c]
	Residual	54,735	78	0,702		
	Total	77,490	98			
3	Regression	33,620	23	1,462	2,499	,002[d]
	Residual	43,870	75	0,585		
	Total	77,490	98			

a. Dependent Variable: Factor_AD_FL

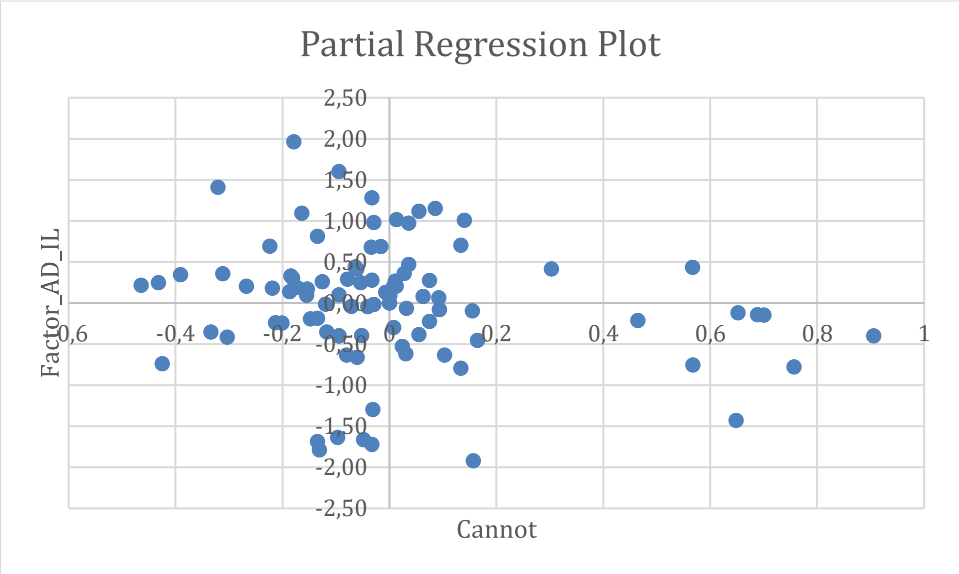
b. Predictors: (Constant), Other companies, Public administration / government, Education, Financial institutions, Other services, Industry, Can, Business services, Nor, Female, =>56 years, 41-55 years, Health and welfare care, Cannot, Hardly, <=25 years, Trade

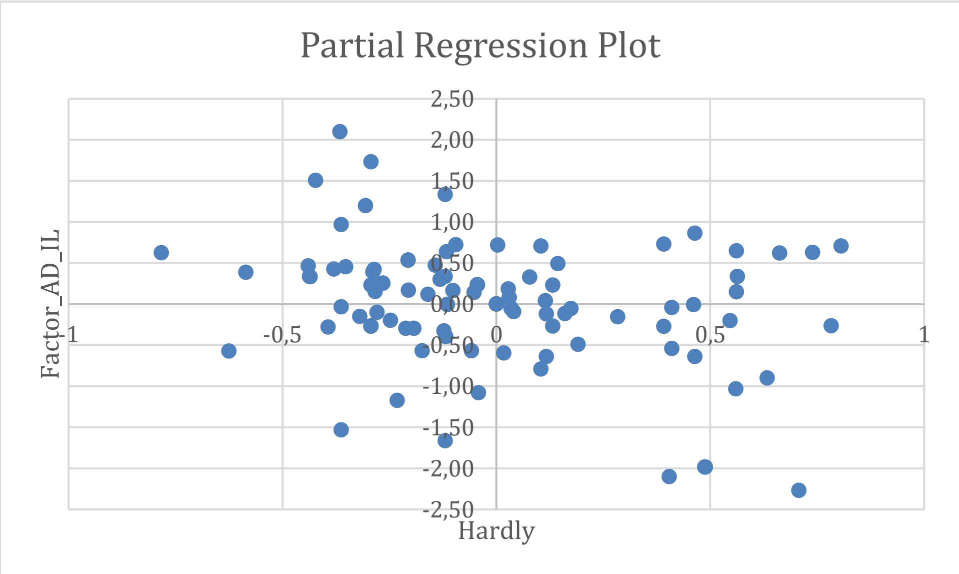
c. Predictors: (Constant), Other companies, Public administration / government, Education, Financial institutions, Other services, Industry, Can, Business services, Nor, Female, =>56 years, 41-55 years, Health and welfare care, Cannot, Hardly, <=25 years, Trade, Factor_HoA, Factor_PiD, Org_size_recoded

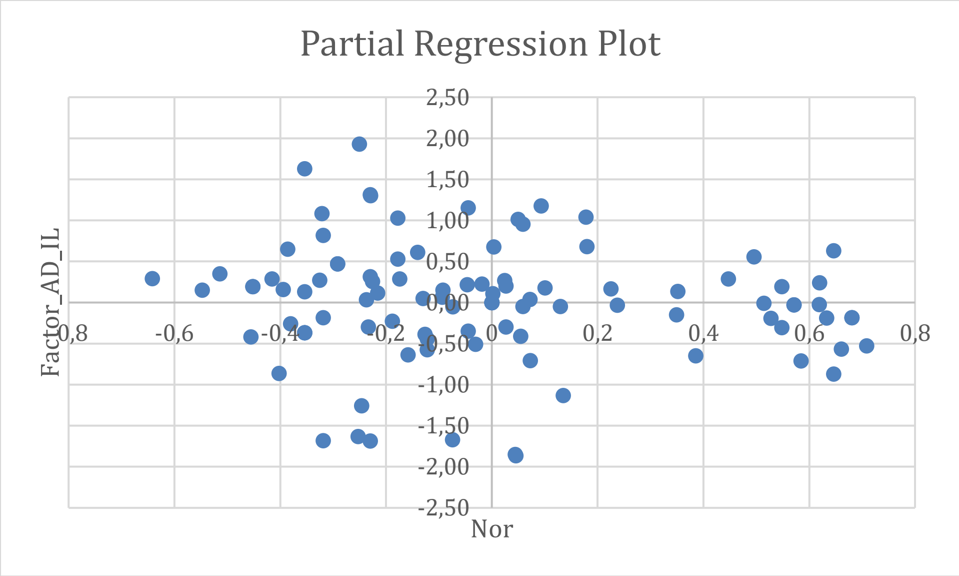
d. Predictors: (Constant), Other companies, Public administration / government, Education, Financial institutions, Other services, Industry, Can, Business services, Nor, Female, =>56 years, 41-55 years, Health and welfare care, Cannot, Hardly, <=25 years, Trade, Factor_HoA, Factor_PiD, Org_size_recoded, Factor_RD, Factor_RA, Factor_Trial

Appendix VIII: Regression analysis adoption decision on individual-level

Appendix VIII.a: Assumption linearity






Partial Regression Plot
Factor_AD_IL
Nor
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1,50
1,00
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0,00
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-1,50
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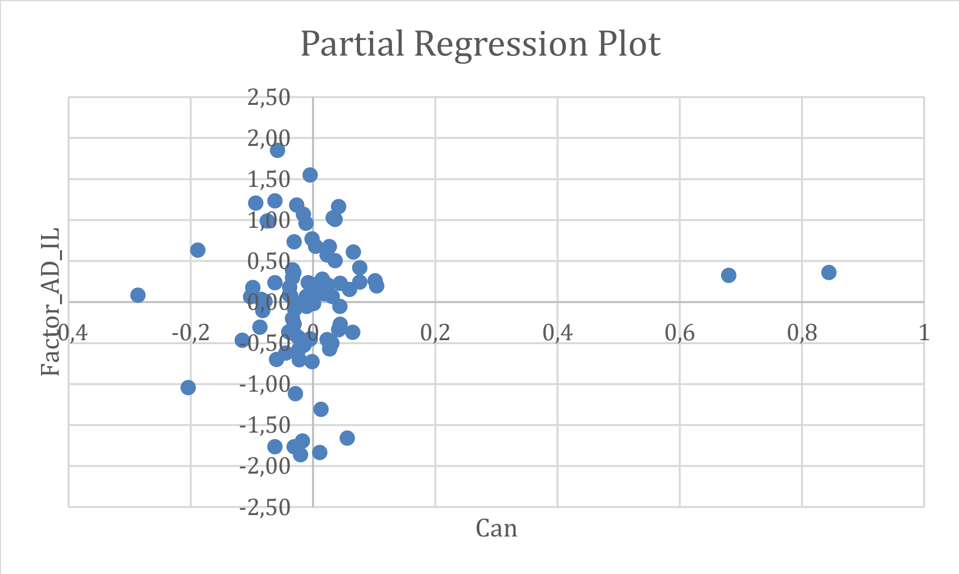
-0,8
-0,6
-0,4
-0,2
0
0,2
0,4
0,6
0,8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Factor_AD_IL
Can
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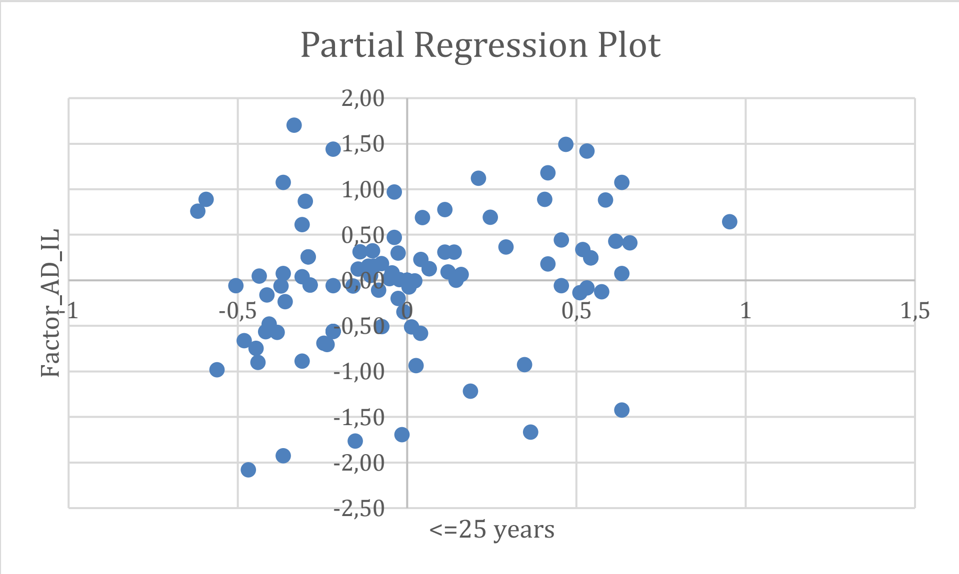
-2,50
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1


Partial Regression Plot
Factor_AD_IL
<=25 years
2,00
1,50
1,00
0,50
0,00
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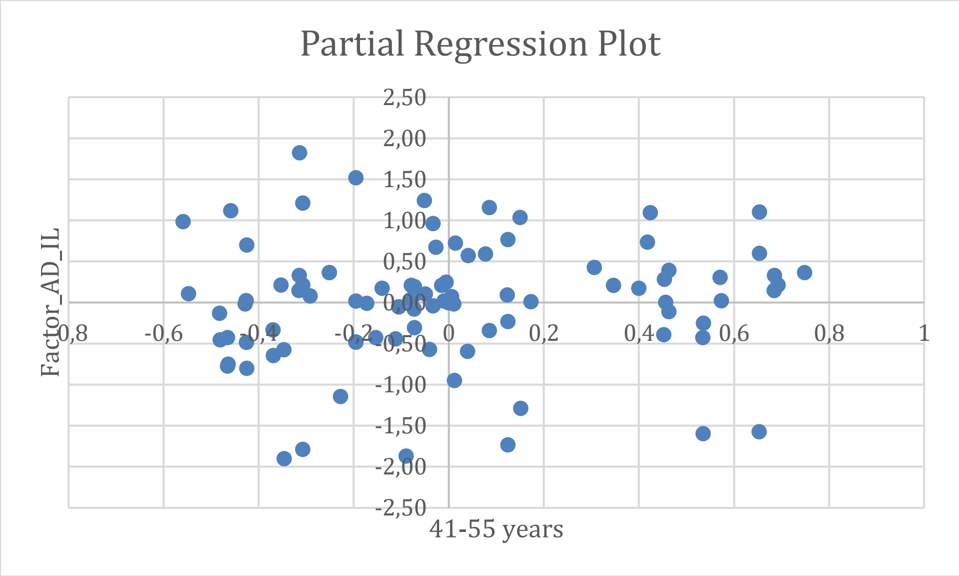
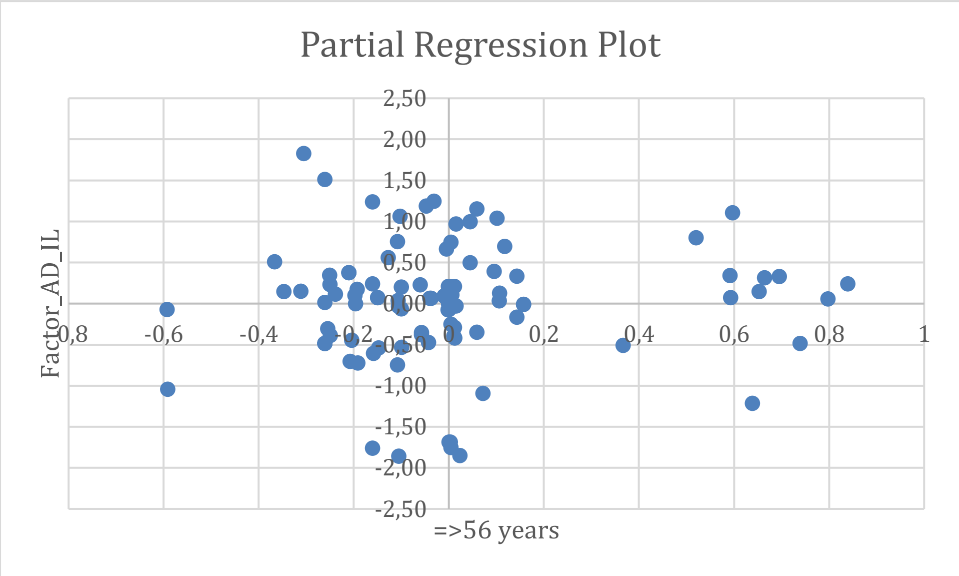
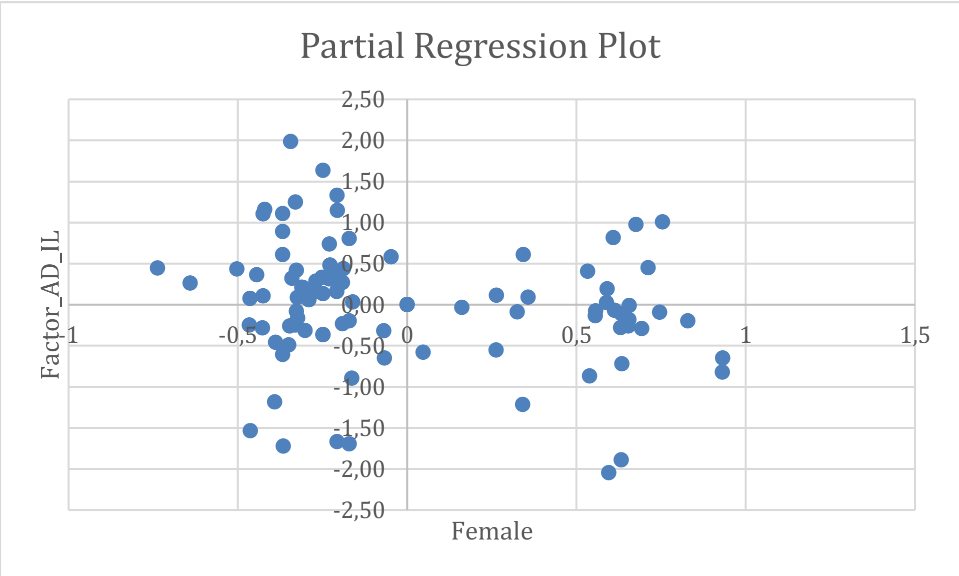
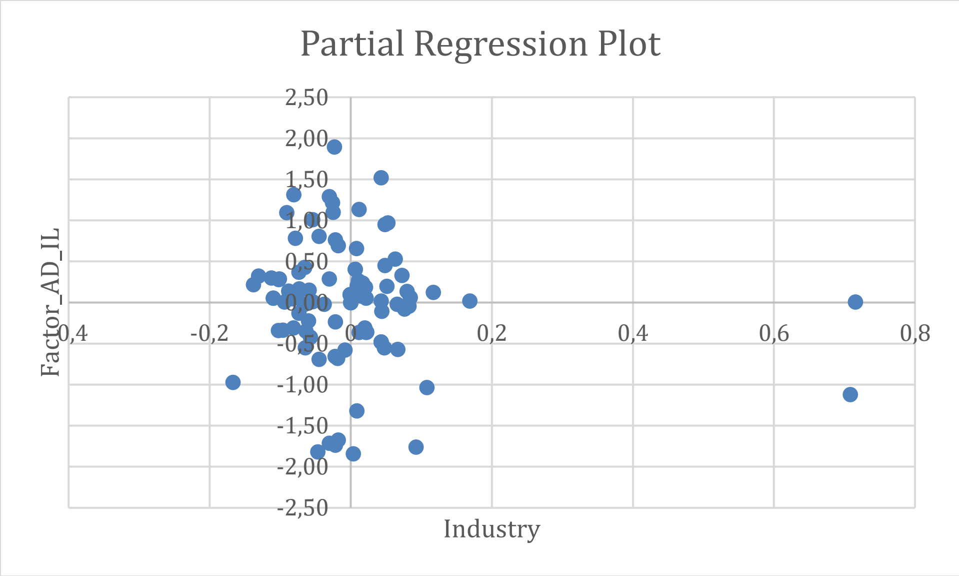
-1,00
-1,50
-2,00
-2,50
-1
-0,5
0
0,5
1
1,5


Partial Regression Plot
Factor_AD_IL
41-55 years


Partial Regression Plot
Factor_AD_IL
=>56 years


Partial Regression Plot
Factor_AD_IL
Female


Partial Regression Plot
Factor_AD_IL
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
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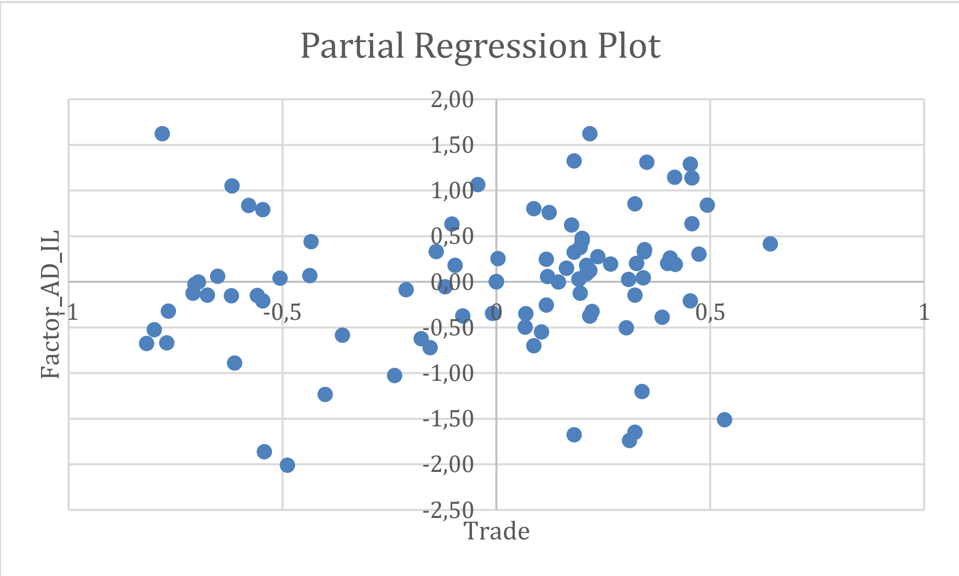
0,6
0,8
Industry


Partial Regression Plot
Factor_AD_IL
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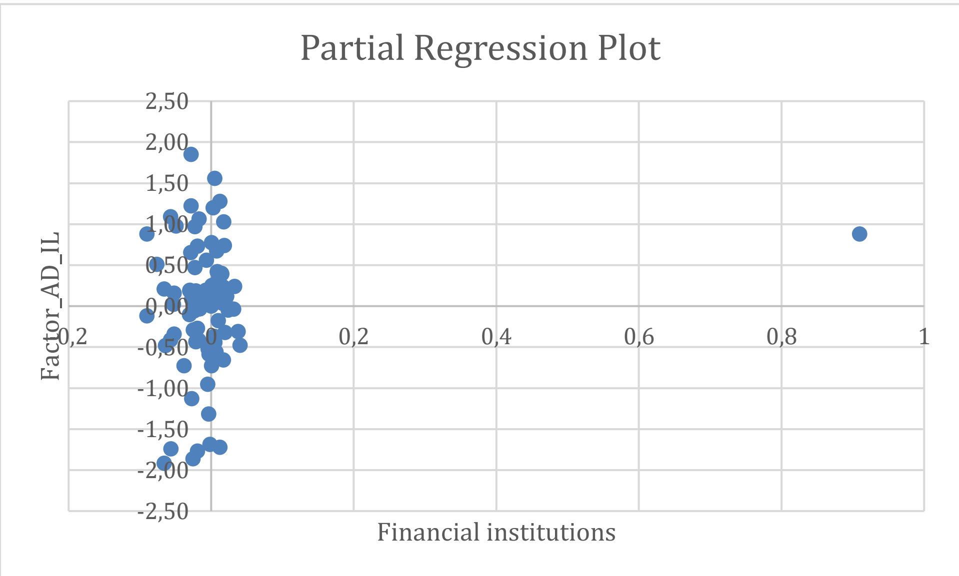
-1,00
-1,50
-2,00
-2,50
-1
-0,5
0
0,5
1
Trade


Partial Regression Plot
Factor_AD_IL
2,50
2,00
1,50
1,00
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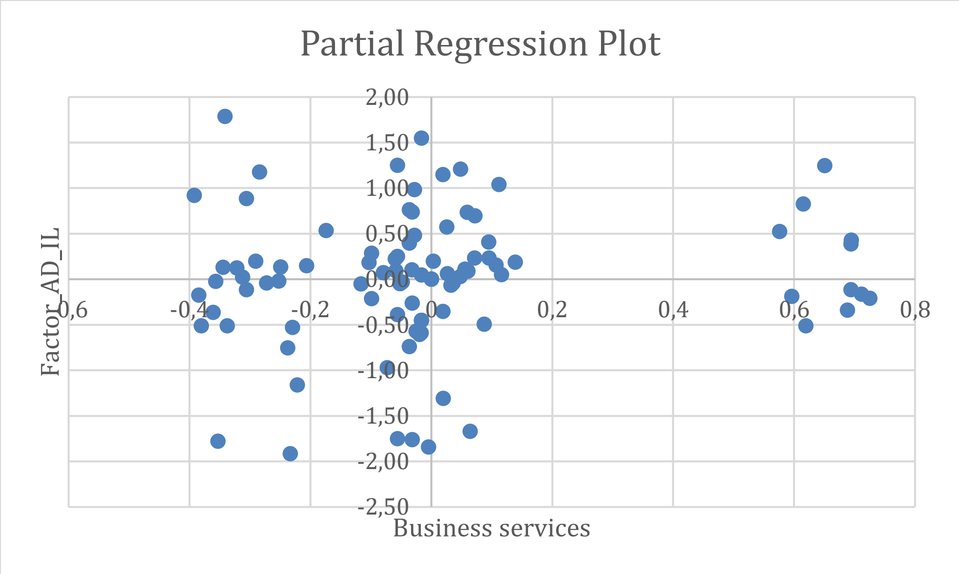
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,2
0
0,2
0,4
0,6
0,8
1
Financial institutions


Partial Regression Plot
Factor_AD_IL
Business services
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0,00
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-1,00
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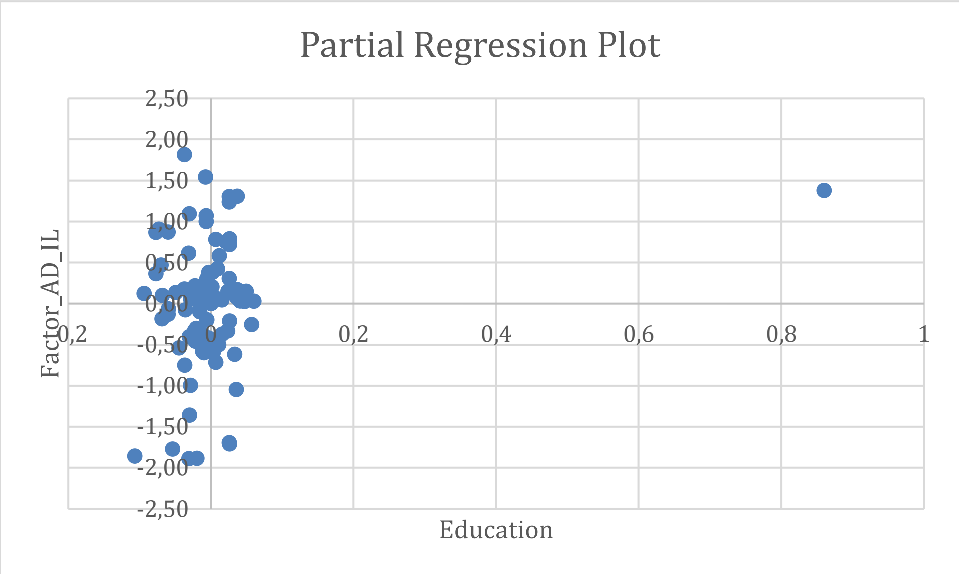
0,6
0,8


Partial Regression Plot
Factor_AD_IL
Education
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1,50
1,00
0,50
0,00
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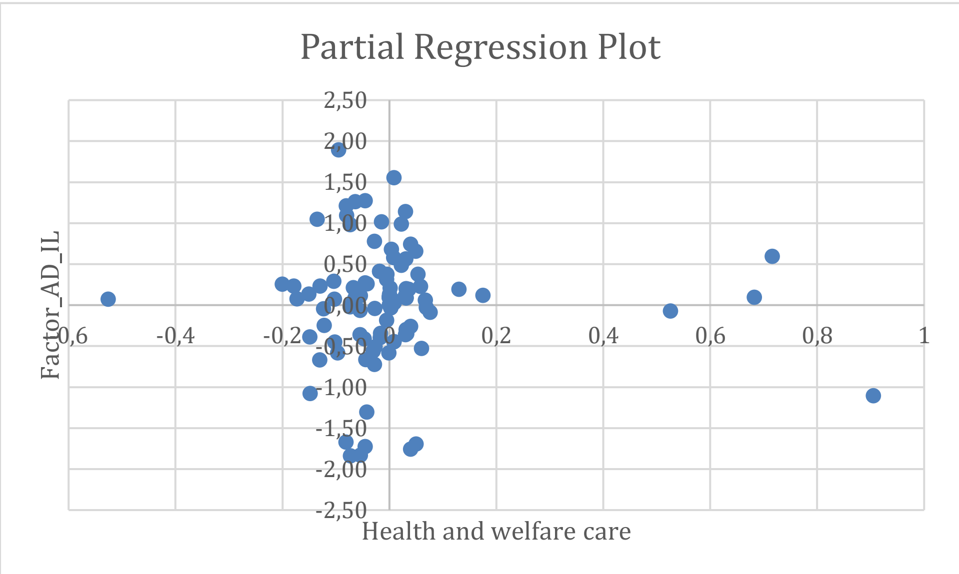
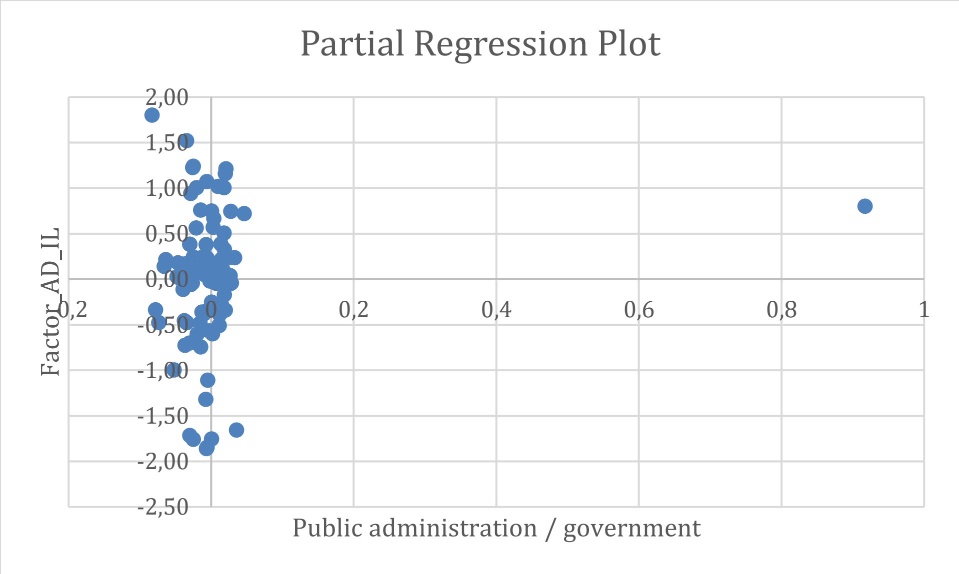
0
0,2
0,4
0,6
0,8
1


Partial Regression Plot
Factor_AD_IL
Health and welfare care
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,6
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1


Partial Regression Plot
2,00
1,50
1,00
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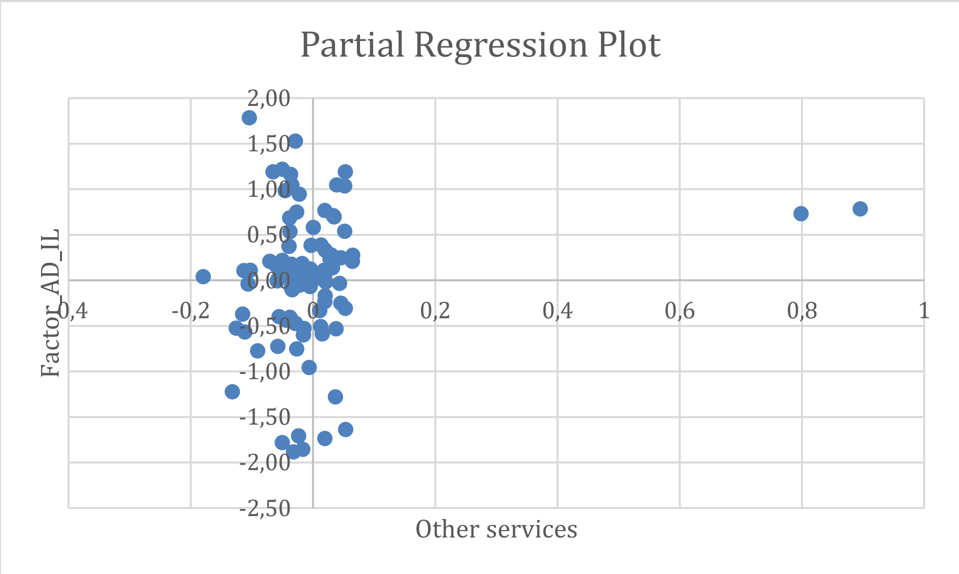
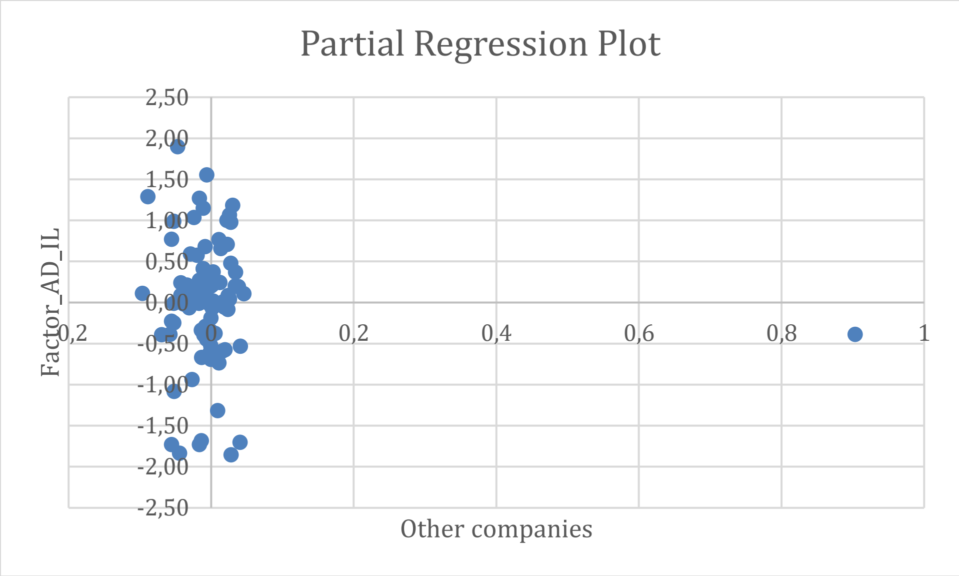
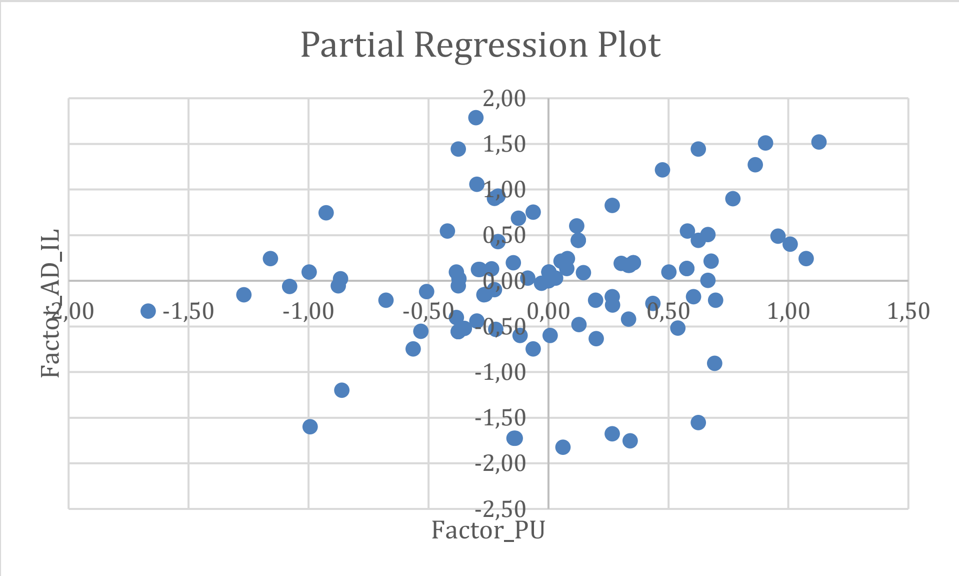
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,2
0
0,2
0,4
0,6
0,8
1
Factor_AD_IL
Public administration / government


Partial Regression Plot
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,4
-0,2
0
0,2
0,4
0,6
0,8
1
Factor_AD_IL
Other services


Partial Regression Plot
2,50
2,00
1,50
1,00
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-0,2
0
0,2
0,4
0,6
0,8
1
Factor_AD_IL
Other companies


Partial Regression Plot
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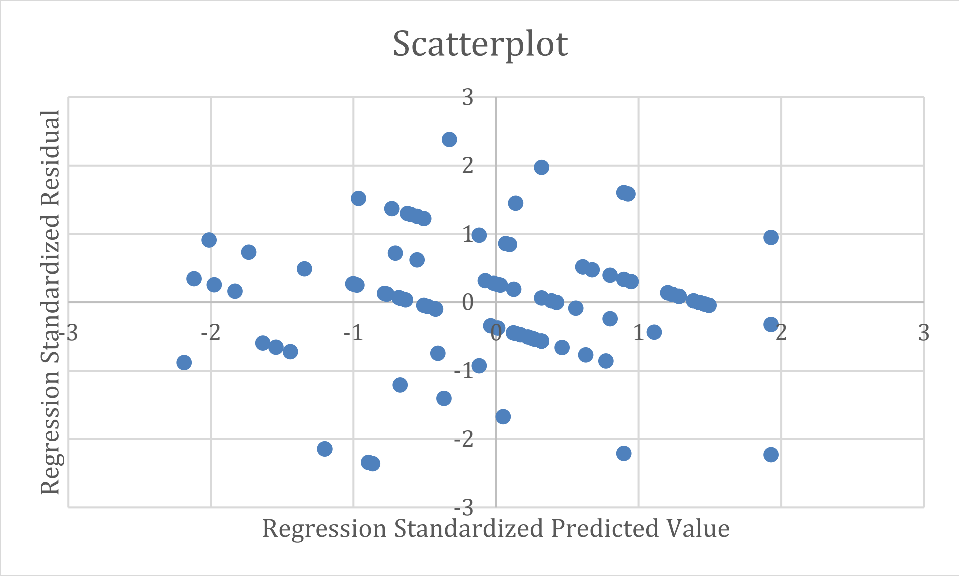
0,50
0,00
-0,50
-1,00
-1,50
-2,00
-2,50
-2,00
-1,50
-1,00
-0,50
0,00
0,50
1,00
1,50
Factor_AD_IL
Factor_PU

Appendix VIII.b: Assumption constant variance of the error items



Appendix VIII.c: Assumption independence of the error items

Coefficients[a]

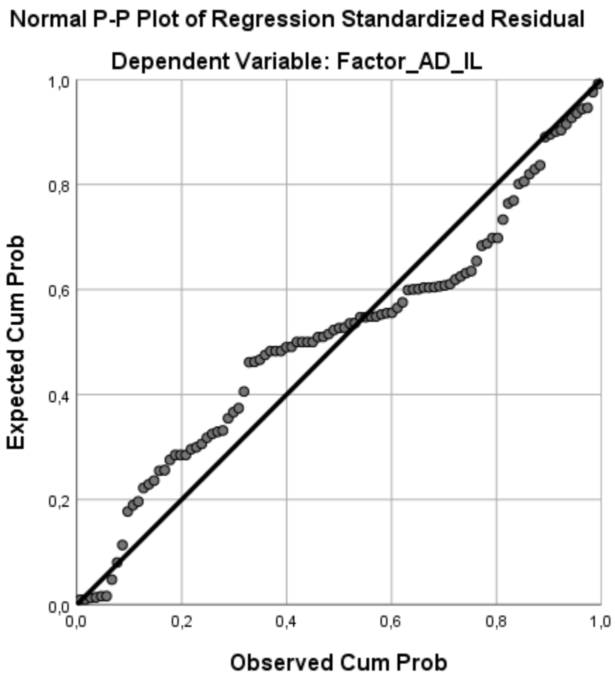
Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	3,212	0,237		13,578	0,000					
	Cannot	-0,584	0,317	-0,204	-1,841	0,069	-0,170	-0,200	-0,171	0,708	1,412
	Hardly	-0,733	0,226	-0,363	-3,247	0,002	-0,216	-0,339	-0,302	0,692	1,444
	Nor	-0,309	0,230	-0,146	-1,342	0,183	-0,016	-0,147	-0,125	0,733	1,364
	Can	0,772	0,628	0,126	1,229	0,223	0,118	0,135	0,114	0,831	1,204
	<=25 years	0,620	0,225	0,312	2,760	0,007	0,156	0,293	0,257	0,680	1,470
	41-55 years	0,249	0,227	0,121	1,094	0,277	-0,031	0,121	0,102	0,704	1,421
	=>56 years	0,044	0,283	0,017	0,156	0,876	-0,034	0,017	0,015	0,759	1,318
	Female	-0,344	0,186	-0,184	-1,845	0,069	-0,275	-0,201	-0,172	0,870	1,150
	Industry	-0,348	0,633	-0,057	-0,549	0,584	-0,089	-0,061	-0,051	0,817	1,224
	Trade	0,344	0,208	0,199	1,655	0,102	0,113	0,181	0,154	0,601	1,663
	Financial institutions	0,901	0,839	0,104	1,073	0,286	0,083	0,118	0,100	0,920	1,086

	Business services	0,305	0,296	0,111	1,030	0,306	0,050	0,114	0,096	0,748	1,337
	Education	1,272	0,847	0,147	1,502	0,137	0,083	0,165	0,140	0,903	1,107
	Health and welfare care	-0,012	0,469	-0,003	-0,025	0,980	-0,068	-0,003	-0,002	0,760	1,316
	Public administration / government	0,788	0,835	0,091	0,943	0,348	0,083	0,104	0,088	0,929	1,076
	Other services	1,002	0,613	0,163	1,635	0,106	0,077	0,179	0,152	0,872	1,147
	Other companies	-0,332	0,841	-0,038	-0,395	0,694	0,025	-0,044	-0,037	0,916	1,092
2	(Constant)	2,257	0,533		4,232	0,000					
	Cannot	-0,501	0,315	-0,175	-1,593	0,115	-0,170	-0,175	-0,146	0,696	1,437
	Hardly	-0,607	0,231	-0,301	-2,631	0,010	-0,216	-0,282	-0,241	0,640	1,562
	Nor	-0,219	0,230	-0,103	-0,949	0,345	-0,016	-0,106	-0,087	0,705	1,419
	Can	0,451	0,637	0,073	0,708	0,481	0,118	0,079	0,065	0,778	1,286
	<=25 years	0,516	0,227	0,259	2,277	0,025	0,156	0,247	0,208	0,644	1,552
	41-55 years	0,170	0,227	0,083	0,750	0,455	-0,031	0,084	0,069	0,682	1,466

=>56 years	0,155	0,284	0,058	0,546	0,586	-0,034	0,061	0,050	0,730	1,370
Female	-0,324	0,183	-0,174	-1,772	0,080	-0,275	-0,194	-0,162	0,867	1,153
Industry	-0,784	0,659	-0,128	-1,189	0,238	-0,089	-0,132	-0,109	0,727	1,376
Trade	0,323	0,204	0,187	1,580	0,118	0,113	0,174	0,144	0,600	1,667
Financial institutions	0,966	0,825	0,112	1,171	0,245	0,083	0,130	0,107	0,919	1,088
Business services	0,259	0,292	0,094	0,889	0,377	0,050	0,099	0,081	0,743	1,346
Education	1,601	0,848	0,185	1,888	0,063	0,083	0,206	0,173	0,869	1,151
Health and welfare care	-0,173	0,468	-0,039	-0,371	0,712	-0,068	-0,041	-0,034	0,737	1,357
Public administration / government	0,876	0,822	0,101	1,066	0,290	0,083	0,118	0,097	0,927	1,079
Other services	0,894	0,605	0,145	1,478	0,143	0,077	0,163	0,135	0,865	1,157
Other companies	-0,430	0,828	-0,050	-0,519	0,605	0,025	-0,058	-0,047	0,913	1,096
Factor_PU	0,289	0,145	0,222	1,989	0,050	0,269	0,217	0,182	0,669	1,495

a. Dependent variable: Factor_AD_IL

Appendix VIII.d: Assumption normality of the error term distribution



Appendix VIII.e: ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22,070	17	1,298	2,023	,019[b]
	Residual	51,975	81	0,642		
	Total	74,045	98			
2	Regression	24,520	18	1,362	2,200	,009[c]
	Residual	49,525	80	0,619		
	Total	74,045	98			

a. Dependent Variable: Factor_AD_IL

b. Predictors: (Constant), Other companies, Public administration / government, Education, Financial institutions, Other services, Industry, Can, Business services, Nor, Female, =>56 years, 41-55 years, Health and welfare care, Cannot, Hardly, <=25 years, Trade

c. Predictors: (Constant), Other companies, Public administration / government, Education, Financial institutions, Other services, Industry, Can, Business services, Nor, Female, =>56 years, 41-55 years, Health and welfare care, Cannot, Hardly, <=25 years, Trade, Factor_PU