Explanations, trust and what a "dead sparrow" has to do with it

An experimental study on the influence of explanations about the technological background of a blockchain based government project on citizen trust in that project with unexpected findings.

Abstract

This thesis set out to examine how citizen trust in a blockchain based government project is affected by receiving an explanation on the technological background of the project. Interest in blockchain technology and its use within government and public services has been increasing worldwide, making citizen trust in its use a relevant research topic if the promised benefits of this relatively new technology are to be fully reaped. For this study, a survey experiment was conducted in which participants received either no explanation, an explanation addressing either blockchain technology generally or its utilisation for a specific use case, or both these explanations. As the specific use case a real-life project, the EnergieKnip, was used – a project initiated in the Netherlands, for which blockchain technology is used as the underlying technology. The results did not show any significant effect of receiving an explanation on participants' trust in the EnergieKnip. Because of a rather low sample size and thus low power of the conducted tests, it was however not possible to draw confident conclusions from these results. However, the study unexpectedly revealed valuable insights on the attitudes of citizens towards the EnergieKnip, which show, among other things, how insufficient communication led to negative sentiments toward the project.

Keywords: Blockchain, survey experiment, citizen trust, explanations

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1. Introduction

Interest in blockchain technology and its use within government and public services has been increasing worldwide in the past years (Berryhill, Bourgery & Hanson, 2018, pp. 20–24; Cagigas, Clifton, Diaz-Fuentes & Fernández-Gutiérrez, 2021; Ølnes, Ubacht & Janssen, 2017). In this context, it is of both scientific and societal relevance to study how 'citizen trust' towards this new technology and its use within the public sector can be established and increased. From a societal perspective, establishing and increasing this trust is important so that the promised benefits of using blockchain technology can be fully realised. Furthermore, this research will add to the literature on trust in the use of blockchain technology, which has thus far primarily focused on blockchain applications in the private sector. As will be argued below, understanding of a technology can increase trust in that technology. If this is so, then how might providing different explanations increase understanding and subsequently trust? How citizen trust in a blockchain based government project is affected by explaining to citizens what blockchain technology is and how it is used within the project, is therefore at the heart of this thesis. To this end, a survey experiment was conducted in the context of the EnergieKnip, a project recently initiated in the municipality of Emmen in the Netherlands, for which blockchain technology is used as the underlying technology.

1.2 The effect of knowledge on trust in the literature

Past research identified people's experience with and knowledge about (new) technology and how it works as an influencing factor for establishing and increasing trust in that technology (Dupuis, Toohey, Grimstad, Follong & Bucher, 2021; Glikson & Woolley, 2020; Hoff & Bashir, 2015; Kizilcec, 2016; Wang, Chen & Jiang, 2009; Wang & Benbasat, 2007). Concerning blockchain technology specifically, there has only been a small number of studies examining potential factors leading to trust in the technology generally or in its specific applications (Dupuis et al., 2021; Ostern, 2018). Most blockchain related research thus far has focused on potential areas of application in the public and private sector (Cagigas et al., 2021; Duan, Zhang, Gong, Brown & Li, 2020; Rizal Batubara et al., 2019; Tandon, Dhir, Islam & Mäntymäki, 2020; Upadhyay, 2020), including analyses of benefits, risks, and challenges of blockchain use in these areas, or on drivers of blockchain adoption (Chengyue, Prabhu, Goli & Sahu, 2021; Kamarulzaman et al., 2021; Knauer & Mann, 2020; Lee, Kriscenski & Lim, 2019; Liu & Ye, 2021). The findings from the few studies focusing on trust influencing factors seem to confirm the relation between knowledge and experience on the one hand and trust on the other (Arli, van Esch, Bakpayev & Laurence, 2020; Ostern, 2018; Sas & Khairuddin, 2015) that has also been observed with regards to other technology.

These findings link well with what Simmel (2011) and Luhmann (1979) have written about familiarity as a precondition for trust, with familiarity referring to a certain level of understanding about something based on learning or previous interactions. When it comes to trust in technology, understanding is thus achieved either through interacting with the technology or by learning about it. In the context of a blockchain based project within the public sector, it therefore makes sense to increase citizens' understanding about blockchain technology and how it is used in order to establish and/or increase trust in the project. In this thesis, the focus will be on providing explanations as a means for increasing understanding and the subsequent effect on trust.

1.3 Research question and aim

The aim of this thesis is therefore to examine the use of explanations about the technological background of a blockchain based government project to influence citizen trust in the project in a positive way. The object of trust (the project) then is not one individual or one institution but the specific project that is initiated by a (local) government, possibly working together with other parties, and that is based on a new technology. With this in mind, it is argued here that citizen trust in this specific project can be seen as a form of what Easton (1975) called 'specific political trust' in contrast to 'diffuse political trust'. This is because specific trust is based on citizen satisfaction with outputs and performance of a particular incumbent political authority (Easton, 1975), and a blockchain based project that is initiated by a (local) government can arguably be seen as output of this government.

Based on the research aim, this thesis aims to answer the following research question:

How do different explanations about the technological background of a blockchain based government project influence citizens trust in the project in contrast to not receiving an explanation and one another?

In chapter 2, the concept of 'trust' is defined as consisting of two dimensions: 'trusting beliefs' and 'trusting intentions' . The first refers to believing that the trustee will behave in a way that is, or has intentions or attributes that are, beneficial to the trustor, and the latter means the trustor's willingness to act on these beliefs and depend on the trustee (McKnight & Chervany, 2001; McKnight, Choudhury & Kacmar 2002; McKnight, Cummings & Chervany, 1998). Based on this, the following two sub-questions were developed:

1. How do different explanations about the technological background of the EnergieKnip influence citizens' trusting beliefs toward the Energieknip in contrast to not receiving an explanation and one another?
2. How do different explanations about the technological background of the EnergieKnip influence citizens' trusting intentions toward the EnergieKnip in contrast to not receiving an explanation and one another?

1.4 Societal and scientific relevance

Scientific relevance

Past research on blockchain applications and trust therein focused on blockchain applications in the private sector, either in a business context or concerning transactions between private individuals (Dupuis et al., 2021; Ostern, 2018; Sas & Khairuddin, 2015; Völter et al., 2021). This is arguably because blockchain technology is a relatively new technology and because governments and related public institutions have only recently started to use it. The focus in these studies then was on people as consumers as opposed to people as citizens. As people take on different roles in different settings, such as consumer vs. citizen, which can affect their behaviour and/or thinking, it is therefore relevant to examine if the findings from past research also show in the context of blockchain applications in the public sector. Moreover, the low number of studies on this topic generally requires further research to verify the made observations.

Societal relevance

Answering the research question is of societal relevance for reasons related to citizen acceptance of blockchain technology and its responsible use in government, and the complicated nature of

blockchain technology. The increasing interest in the use of blockchain technology from governments stems from the benefits this technology is expected to bring for governments themselves, civil servants and citizens, such as increased traceability, efficiency and transparency, easier record keeping and better protection of sensitive data (Cagigas et al., 2021). These benefits can only be fully realized however when citizens come to accept its use and are thus willing to actually use blockchain based services. Acceptance or adoption[1] of technological innovations in both a public and private sector context, e.g., concerning e-government or e-commerce, has in turn been shown to depend on trust towards these technologies and their use (Gefen, 2000; Gefen, Karahanna & Straub, 2003; Pavlou, 2003; Vance, Elie-Dit-Cosaque & Straub, 2008; Vorm & Combs, 2022), a finding that has also been confirmed in the context of blockchain technology (Chengyue et al., 2021; Dupuis et al., 2021; Liu & Ye, 2021). In terms of societal relevance, it is therefore important to analyse how this trust can be positively influenced so that the benefits of the adoption of blockchain technology in the public sector can be realised.

Furthermore, it has been found that a majority of people do not understand blockchain applications well (Dupuis et al., 2021). In the general population, a majority of people have either not heard of blockchain technology or are not able to explain what it is and how it works (Dupuis et al., 2021) and only a small fraction are already using it consciously (Knauer & Mann, 2020). Often, the awareness of the blockchain based cryptocurrency Bitcoin is higher than that of blockchain technology itself (Knauer & Mann, 2020). Overall, blockchain is often perceived as a technology that is difficult to understand, use, and control due to its complexity (Dupuis et al., 2021; Knauer & Mann, 2020). In line with Ostern's (2018) findings, one can assume that this perceived complexity and lack of awareness of blockchain technology generally increase the likelihood of citizens experiencing a low level of trust in the technology and its applications as a consequence of a lack of understanding. Hoff and Bashir (2015) show that the complexity of a technology is influential with regards to the formation of trust. Specifically, a higher complexity typically means that people are less likely to understand how it works and consequently to trust it. In light of these findings, it could be discussed whether governments should be transparent about the use of blockchain technology or if, alternatively, citizens should be kept in the dark about the use of blockchain to not risk a potential decrease in trust (Zavolokina, Zani & Schwabe, 2020). Concerning the latter option, Glikson and Woolley (2020, p. 33) have argued in the context of the use of artificial intelligence, that hiding the use of algorithms could be seen as ethically wrong and lead to a negative impact on users' long-term trust. With regards to blockchain technology, one could make the same arguments. If a government or related institution tries to hide the use of blockchain technology, that could raise ethical concerns and negatively impact citizen trust not only in blockchain technology but more so in that government or institution itself if citizens do find out about its use. Generally, a loss of trust in governmental institutions should be avoided as it can be harmful to the institutions' democratic legitimacy. In addition, transparency is generally one of the common good governance principles according to which governments and related institutions are expected to act (Brinkerhoff & Goldsmith, 2005), which in this case would mean to be transparent about the use of blockchain technology. Therefore, instead of keeping citizens in the dark, being transparent about the use of blockchain technology is arguably the ethically correct choice for governments in light of prevalent good governance principles and moreover the smarter choice to avoid the risk of fostering a lack of trust in government and/or related institutions. Yet, since the problem of complexity and lack of understanding still exists, being transparent about the use of

[1] Acceptance in the cited studies has been defined as use intentions or actual use.

blockchain technology in government should go hand in hand with trying to increase citizen understanding of blockchain technology, as otherwise citizens might experience a low level of trust in the blockchain application, which could ultimately endanger the success of the project or service for which blockchain technology is used. This further underlines the relevance of research on how that could or should be done.

In the following, chapter two presents the theoretical framework based on the relevant literature, including the development of hypotheses. Chapter three then discusses the research design, including an introduction to the EnergieKnip as selected case, and other methodological aspects. The results of the research are presented in chapter four. Finally, in the last chapter, the results are discussed and an overall conclusion is drawn.

2. Theoretical framework

In ~~this~~ the following, a brief explanation of blockchain technology will be given before turning to the theoretical framework of this thesis, as some basic knowledge of blockchain technology will help the reader to follow what is written in this and the following chapters. The theoretical framework focuses first on how the technological background of a blockchain based project can be explained. Next, it will be looked at how trust can be defined in the context of a blockchain based government project. Finally, potential relationships between explanations about the technological background of a blockchain based project and citizen trust in it are examined. This will lead to three hypotheses which will be the basis for the empirical analysis.

2.1 Blockchain technology

This section will provide a brief explanation of what blockchain technology is. The intention is not to lay out in detail all technological specifics but merely to describe and explain the main elements, concepts, and mechanisms to give the reader a general understanding of what blockchain technology is and how it works[2].

Simply put, a blockchain is a shared (or distributed), immutable, and digital ledger with which data, typically concerning transactions between members of a network, can be recorded and tracked (Berryhill et al., 2018; IBM, n.d.). As such, blockchains belong to the category of distributed ledger technology (Berryhill et al., 2018). Transactions can involve both tangible and intangible assets, such as a house or intellectual property (IBM, n.d.). Data is stored on the blockchain by being recorded in blocks of data after being cryptographically secured and then verified by a majority of communication points in the blockchain network, also called nodes, through a consensus mechanism (Berryhill et al., 2018; Kim, 2021). These blocks form a chain of blocks that are cryptographically connected (Berryhill et al., 2018; Kim, 2021).

To facilitate fast and secure transactions, a smart contract can be used. A smart contract is a piece of software stored on the blockchain that contains a set of rules which define necessary conditions for a transaction to take place and executes transactions automatically only if these conditions are met (Berryhill et al., 2018; Rizal Batubara, Ubacht & Janssen, 2019).

The distributed and immutable nature of the ledger are seen as the two key features of blockchains (Berryhill et al., 2018; Kim, 2021). Distributed means that identical versions of the ledger are saved by every network member in contrast to traditional, centralised databases and subsequently, all network members have access to the ledger and the data recorded on it (Berryhill et al., 2018; IBM, n.d.). As it is nearly impossible to change data once they are recorded on the ledger, blockchains are said to be immutable[3] (IBM, n.d.; Kim, 2021). These attributes make a blockchain less vulnerable to manipulations or cyber-attacks and more transparent than traditional ways of storing data (Cagigas et al., 2021; IBM, n.d.).

[2] For a more detailed and technical explanation see Berryhill et al. (2018) and Kim (2021).
[3] The exact explanation for this immutability has to do with the cryptographic connection between blocks and the consensus mechanism used. For a more detailed explanation see the literature mentioned in footnote 2.

2.2 Explanations

This section will discuss how the technological background of a blockchain based project can be explained. Thereby it will be discussed what exactly explanations about the technological background of a blockchain based project could include and deal with.

An explanation usually involves an agent (the explainer) that explains an event or other subject (the explanandum) to someone (the explainee) (Miller, 2019). In the context of this thesis and the conducted survey experiment, there is no specific explainer, however, and the explainee is the respective citizen that participates in the survey. What is of more interest here is the explanandum to be explained and how exactly, i.e., through what means, that is done. The subsequent sections will first discuss the explanandum and then analyse relevant literature regarding the means, leading to a definition of the term 'explanation' in the context of this thesis.

2.2.1 The explanandum, the means and a definition

Explanandum

Based on the main research question, the overall explanandum is the technological background of a blockchain based government project. This can further be split in two more specific explananda. What can be explained with regards to the technological background is not only blockchain technology generally but also its utilisation for a certain use. These two subjects will hereafter also be called 'general explanandum' and 'case specific explanandum'.

Means for explanation

Looking at research in the fields of artificial intelligence and information security, one can distinguish two overall types of explanations based on different means that are often used and discussed in contrast to one another (Binns et al., 2018; Dodge, Liao, Zhang, Bellamy & Dugan, 2019; Kizilcec, 2016; Pieters, 2011; Wang & Benbasat, 2007). They are discussed under different labels but refer to the same or similar means for each type: 'how, procedural, global or transparency' explanations and 'why, substantial, local or justification' explanations. Wang and Benbasat (2007) used how and why explanations for their research about recommendation agents, with the first describing the logical processes involved in reaching a recommendation and the latter justifying both the importance and purpose of the recommendation agent's questions as well as the final recommendation given. Procedural and substantial explanations are used for example by Kizilcec (2016) in his research about algorithm-based decision-making regarding grades for university students that are composed of peer-grading in combination with an algorithm. The procedural explanation described the general procedure of how a grade was achieved (peer-grading plus algorithm) whereas the substantial explanation gave information on why a student received her particular grade (the raw peer grades and how they were adjusted by the algorithm). Global and local explanations were used for research on algorithmic decision-making as well (Binns et al., 2018; Dodge et al., 2019; Grimmelikhuijsen, 2022). Global explanations describe how the system works generally and local explanations focus on the underlying reasons of a specific decision, thereby justifying why the system came to this decision. Lastly, Pieters (2011) discusses explanations in the context of artificial intelligence generally and information security (electronic voting). He differentiates between justification explanations that offer reasons (e.g., for a decision made or for why electronic voting is beneficial) and transparency explanations that describe something in detail (e.g., how a decision is made or security measures implemented for electronic voting). In summary, how, procedural, global or transparency explanations

all describe something in detail such as how an output (i.e., a recommendation, decision) was reached or the inner logics of a system; why, substantial, local or justification explanations all provide reasons for something such as why a particular output was reached. The means used are therefore 'describing something in detail' and 'providing reasons for something', ~~echoing the means identified from the general definition above (giving details and reasons).~~

In addition to these two means, Sørmo, Cassens and Aamodt (2005) also touch on two other means when categorizing explanations for case-based reasoning systems. First, the category of conceptualization explanations refers to clarifying the meaning of both concepts and terms used by the system, generally or in a specific context. Second, the category of learning explanations involves presenting general information to the users of the system that tells them what the basic elements of the system are and/or what the system is (used) for, enabling users to potentially transfer and apply what they have learned to different contexts. The means used here are 'clarifying concepts or terms' and 'giving general information on what basic elements of the technology are or what the technology is (used) for'. Another category the authors mention is that of relevance explanations which refers to giving reasons as to why a question that is asked by the system (to the user) is relevant, in that way justifying the system's strategy. However, the means here is one that has already been discussed, i.e., providing reasons for something.

In summary, the literature identifies four means that can be used for explanations in the context of technologies: 1) describing something in detail, 2) providing reasons for something, 3) clarifying concepts/terms, and 4) giving general information on basic elements of a technology or its purpose.

What the exact information is that could potentially be the focus of these means in the context of this thesis, e.g., the *something* or what *element*, will now be discussed in turn, with both the general and case specific explanandum in mind.

The first means, describing in detail, could concentrate on how blockchain technology functions technically, i.e., how exactly data is stored on the blockchain and how the verification process works. Moreover, this means could deal with describing in detail how blockchain technology is used for the EnergieKnip. The second means, providing reasons for something, could focus on why blockchain technology is beneficial, for example with regards to it being less vulnerable to manipulations or cyber-attacks and more transparent than traditional ways of storing data based on the technology's key attributes. Additionally, reasons could refer to why blockchain technology is used for the EnergieKnip, instead of other technologies for example. The third means, clarifying concepts/terms, could deal with important concepts or terms such as 'cryptography', ' consensus mechanism', 'smart contract', either concerning blockchain technology generally or with regards to the technology's usage in the EnergieKnip, for example what the term 'transactions' involves. Lastly, the fourth means, giving information on basic elements of a technology or its purpose, could focus on a blockchain being a digital ledger or blockchain technology's usage for tracking and recording transactions (or data generally).

To conclude, it can be said that the first three means can be used to explain both the general and the case specific explanandum. The fourth means, however, can only be used for explaining the general explanandum.

Defining explanation and how explanations can be differentiated

After discussing the explanandum and means, the term 'explanation' in the context of this thesis can be defined as the information that is given to an explainee to explain the general explanandum

(blockchain technology generally) or the case specific explanandum (blockchain technology's usage in the EnergieKnip), with information referring to one of the four means identified. To explain something can therefore mean different things based on the kind of information, i.e., the means, included in the explanation, leading to four types of explanations: 1) how explanations, 2) why explanations, 3) clarification explanations, and 4) element/purpose explanations. Importantly, what means can be used to explain the two explananda differs per subject. Additionally, the kind of information given can sometimes reflect two means at the same time (Nothdurft, Heinroth & Minker, 2013; Sørmo et al., 2005), for example when giving information on a basic element of a technology at the same time clarifies a term which refers to that element.

Based on this definition, explanations about the technological background of a blockchain based government project can differ based on what aspect of the technological background they explain (the explanandum) or based on how they explain the technological background (the means used/type). This thesis focuses on the explanandum as differentiation:

1. General explanandum: explanation about blockchain technology generally using *how, why, clarifying,* and/or *element/purpose* explanations.
2. Case specific explanandum: explanation about blockchain technology's usage in the project using *how, why,,* and/or *clarifying* explanations.

In this thesis, 'explanation' is therefore operationalized as an explanation that addresses either the general explanandum, the case specific explanandum or both.

2.2.2 Conclusion

In this chapter two explananda were identified. First, the 'general explanandum' which refers to blockchain technology in general. Second, the 'case specific explanandum' which refers to the usage of blockchain technology in the project. Further, it was shown that the use of different means to explain something leads to different explanation types. To summarise, the technological background of a blockchain based government project can be explained by addressing the general explanandum or the case specific explanandum, using different explanation types. Section 2.4 will discuss how explanations addressing these two subjects relate to the concept of 'trust' which will first be defined in the next section.

2.3 Trust

This section looks at how trust can be defined in the context of a blockchain based government project. This will be done by first looking at trust as a multidimensional construct before addressing 'citizen trust' in particular and how trust is formed.

2.3.1 Definition of trust: a multidimensional construct and its foundations

Trust as trusting beliefs and trusting intentions

Trust is difficult to define as there exist a lot of different definitions that vary based on for example the scientific domain within which the phenomenon of trust is studied (Keymolen, 2016). McKnight and Chervany (2002) developed a typology of trust definitions, resulting in three types of trust: trust in general others based on research in psychology and economics, trust in the situation or structures based on research in sociology, and trust in specific others based on research in social psychology and economics. Easton (1975) differentiated between 'diffuse' and 'specific political trust' (called 'political support' by the author), where specific trust refers to trust in a specific, incumbent political authority while diffuse trust refers to trust in the political system generally. This differentiation is in line with what McKnight and Chervany (2002) called trust in specific others vs. trust in structure. This thesis focuses on the former type since the object of trust, i.e., the trustee, is a 'specific other', a specific blockchain-based project initiated by a specific authority (i.e., the municipality of Emmen)[4]. Key aspects found in most definitions are that trust is a psychological state that comprises a willingness to be vulnerable based on positive and favourable expectations that the trustor has about the intentions or behaviour of the trustee, having taken under consideration the characteristics of the trustee (McKnight, Carter, Thatcher & Clay, 2011; McKnight & Chervany, 2001; Rousseau, Sitkin, Burt & Camerer, 1998). Based on these key aspects, when speaking of trust in specific others, trust is often defined as a multidimensional construct consisting of 'trusting beliefs' and 'trusting intentions', where the first refers to believing that the trustee will behave in a way that is, or has intentions or attributes that are, beneficial to the trustor, and the latter meaning the trustor's willingness to act on these beliefs and depend on the trustee (McKnight & Chervany, 2001; McKnight, Choudhury & Kacmar 2002; McKnight, Cummings & Chervany, 1998). These two dimensions, i.e., trusting beliefs and trusting intentions, have been validated to be different theoretical concepts (McKnight et al., 2002) and to both be necessary components for trust to be present (Doney, Cannon & Mullen, 1998; Schlosser, White & Lloyd, 2006), thereby confirming the idea of trust as a multidimensional construct. Trusting beliefs moreover consist of several sub-dimensions. In the literature, three dimensions have been recognized as central dimensions: ability beliefs (also referred to as competence or expertise), benevolence beliefs, and integrity beliefs (Mayer, Davis & Schoorman, 1995; McEvily & Tortoriello, 2011). Ability beliefs are defined as believing that "the other party has the ability or power to do for one what one needs done" (McKnight & Chervany, 2001, p. 49); benevolence beliefs consist of believing that "one believes that the other party cares about one and is motivated to act in one's interest" (McKnight & Chervany, 2001, p. 49); integrity beliefs refer to believing that "the other party makes goodfaith agreements, tells the truth, acts ethically, and fulfils promises" (McKnight & Chervany, 2001, p. 49).

[4] One could argue that in this case the trustee also reflects trust in structures, that is trust in 'the government' or in blockchain technology in general.

Citizen trust

When it comes to citizen trust in government or particular government related entities, in contrast to customer trust in a business for example, there are some particularities to consider. The first is that citizen trust develops and exists in a different context in that individuals as customers usually are less dependent on a business as they are as citizens on their government, as there are several businesses to choose from for a desired service or product (Perry & Rainey, 1988). Second, concerning the three sub-dimensions of trusting beliefs, those dimensions differ concerning what they refer to in the two contexts. This is especially the case for 'integrity beliefs' and 'benevolence beliefs'. With 'integrity beliefs', it can be argued that governments are expected (by law and societal norms) to adhere to different values or to adhere to some values to a different, greater extent than businesses, for example regarding transparency or accountability. This then has an influence on what acting in an integer or ethically correct way means. With regards to 'benevolence beliefs', a business is expected to act in the interest of individual customers whereas a government is expected to act in the interest of citizens in general (in the public interest) and thus not in the interest of a specific individual (Grimmelikhuijsen & Knies, 2017; Perry & Rainey, 1988).

To conclude, as a general definition 'trust' is often defined to be a psychological state that comprises a willingness to be vulnerable (trusting intentions) based on positive and favourable expectations that the trustor has about the intentions or behaviour of the trustee, having taken under consideration the characteristics of the trustee (trusting beliefs). More specifically for this thesis, trust is then defined as consisting of both citizens' trusting beliefs concerning a blockchain based government project, namely beliefs that the project is functioning in a manner beneficial to the public interest and that it has, or was created with, attributes or intentions beneficial to citizens, and citizens' trusting intentions: the willingness of citizens to act on these beliefs, namely a willingness to participate in the project.

Trust as cognition-based and affect-based

Next to being a multidimensional construct that consists of trusting beliefs and trusting intentions, an important aspect of the concept of trust is moreover how it is formed. In the literature, trust is said to be formed based on cognitive (rational) as well as affective (emotional) foundations (Lewis & Weigert, 1985; McAllister, 1995). Cognitive foundations refer to intellectual perceptions about the trustee while affective foundations are emotional reactions to, or emotional ties with, the trustee. With regards to the cognitive base, Lewis and Weigert (1985) state "we cognitively choose whom we will trust (…) and we base the choice on what we take to be 'good reasons', constituting evidence of trustworthiness" (p. 970). They call this a cognitive process that is in line with what Luhmann (1979) and Simmel (2011) describe as cognitive familiarity with the trustee. Familiarity means to have an understanding (or knowledge) of something, that is based on previous interactions, experiences or learning (Gefen, 2000, p. 727). The level of understanding or knowledge can be somewhere between total knowledge and total ignorance, with total knowledge making trust obsolete and total ignorance making trust impossible (Lewis & Weigert, 1985, p. 970). Likewise, Luhmann (1979, p. 33) argues that in order to trust, one needs at least some information to base trust on. He thus sees familiarity as a precondition of (cognition-based) trust.

2.3.2 Conclusion

Trust was defined as a multidimensional construct consisting of two related but different dimensions: trusting beliefs concerning intentions, behaviour or attributes of the trustee and trusting intentions,

a willingness to depend on the trustee. Moreover, trust is based on cognitive as well as affective foundations. Citizen trust in a blockchain based government project thus consists of trusting beliefs concerning intentions, the functioning or attributes of the project as well as of trusting intentions to act based on these beliefs, both based on cognitive and affective foundations. As will be further laid out in chapter 3, trust as dependent variables will thus be measured by four separate but related variables reflecting the three sub-dimensions of trusting beliefs as well as trusting intentions.

2.4 Relationship between explanations and citizen trust

This section discusses potential relationships between explanations about the technological background of a blockchain based project and citizen trust in the project. Both the relationship between explanations and trust generally as well as specifically regarding different explanations in terms of the explanandum will be addressed. This will be done by looking at relevant findings from previous research and based on the theoretical background presented in sections 2.2 and 2.3.

So far, there has been only one study in which a relation between explaining the technological background of a blockchain application and trust in that application has been tested (Völter et al., 2021). This study was conducted in a business context, however, and did not test different kinds of explanations. Other research that tested the effect of explanations on trust in a technology context used explanations that differ based on the type of explanation but not the explanandum (Kizilcec, 2016; Nothdurft, Richter & Minker; Wang & Benbasat, 2007). Nevertheless, these studies can give an indication about what the general influence of explanations on trust could be in a blockchain context.

Development of hypotheses

In section 2.3, it was stated that trust is based on cognitive as well as affective foundations. In the following it will be argued that explanations about the technological background of a blockchain based government project can influence citizen trust in the project through the cognitive trust base.

As discussed above, cognitive-based trust is formed as a result of familiarity, i.e., an understanding or knowledge based on interactions, experiences or learning. Therefore, understanding of a blockchain based project, and subsequently trust in it, can be increased through interactions such as participation, other experiences related to the project or through learning about it. One way to learn about it could arguably be to receive information about it. In section 2.2, it was demonstrated that an explanation consists of *information*, i.e., the means used to explain something. Thus, explanations about the technological background of a blockchain based government project are likely to positively influence (cognitive-based) trust in the project by means of increasing understanding of it.

Previous research has confirmed a positive relationship between familiarity and trust in the context of e-commerce and blockchain use for financial transactions. Both Wang et al. (2009) and Gefen (2000) observed a positive influence of familiarity on trust in e-commerce. Similarly, studies looking at trust in cryptocurrency and blockchain based payment systems generally, found that technical understanding is an important factor for trust (Arli et al., 2020; Ostern, 2018; Sas & Khairuddin, 2015).

Furthermore, research about artificial intelligence supports a positive relationship between explanations and trust. Nothdurft et al. (2014) examined the effect of two types of explanations, how and why explanations, on trust in algorithmic decision-making. They found that both types of explanations have a positive effect on trust. Likewise, Wang and Benbasat (2007) observed a positive effect of both how and why explanations on trust in recommendation agents. A positive influence of providing an explanation on trust was also found by Kizilcec (2016) and Rader (2018), in both cases concerning a how explanation. Lastly, providing a how explanation about a blockchain application for supply chain management was shown to increase trust in the application as well (Völter, Urbach & Padget, 2021).

Empirical evidence thus supports that explanations about the technological background of a blockchain based government project are likely to positively influence trust in the project. Figure 1

visualizes this relationship and shows potential causal relations in the form of hypotheses. These hypotheses are explained below.

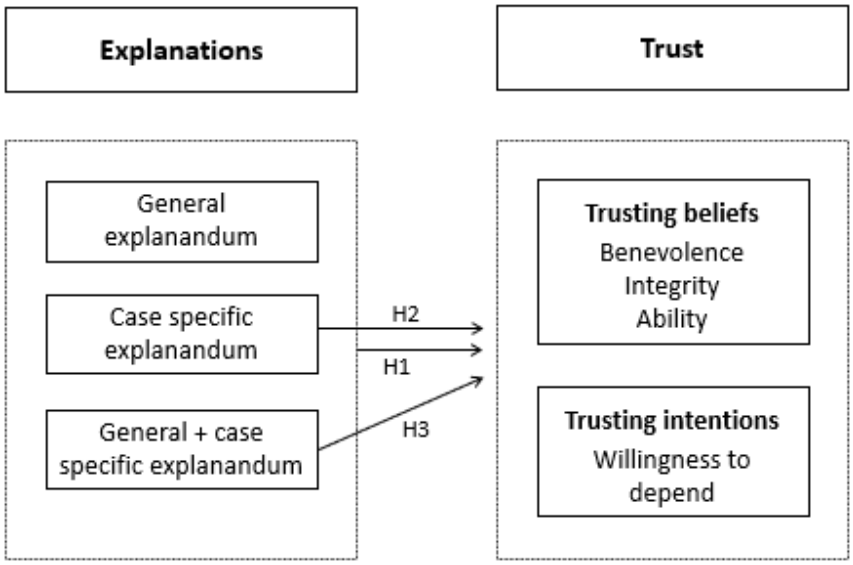

Figure 1: Relationship explanations and trust

Based on the argumentation and research findings presented above, a first hypothesis can be developed about the relationship between explanations about the technological background of a blockchain based government project and citizen trust in the project. Receiving an explanation, either one that addresses a 'general explanandum', a 'case specific explanandum' or both, can be expected to lead to higher trust compared to not receiving an explanation.

Hypothesis 1: Receiving any explanation will have a positive effect on citizen trust (i.e., the three trusting beliefs as well as trusting intentions) in a blockchain based government project compared to not receiving an explanation.

As stated in section 2.2, this thesis will focus on differentiating explanations about the technological background of a blockchain based government project based on the explanandum that they address. Since most studies focusing on the effect of explanations on trust differentiate explanations by explanation types, the empirical evidence is scarce with regards to the differentiation used in this thesis. As mentioned, there has thus far only been one study testing the effect of explanations about the technological background of a blockchain application on trust in that application (Völter et al., 2021). This study used an explanation mostly addressing the 'case specific explanandum' and observed that this explanation increased trust. However, did not make a comparison with other kinds of explanations. It can therefore not be said if this finding means that addressing the 'case specific explanandum' is more effective at increasing trust than addressing the 'general explanandum'. However, one might argue that understanding about the usage of blockchain technology in a blockchain based government project is more relevant to citizen trust in the project than understanding about the technology in general. This argument is based on the fact that citizen trust here concerns not blockchain technology per se or an application of it where its use is rather evident, such as with Bitcoin, but an application where its usage is more 'hidden', and therefore citizens might find an explanation dealing with the usage of blockchain technology in the project more

relevant than an explanation about blockchain technology in general. This leads to the second hypothesis.

Hypothesis 2: Receiving an explanation that addresses the 'case specific explanandum' will have a greater positive effect on citizen trust (i.e., the three trusting beliefs as well as trusting intentions) in a blockchain based government project compared to receiving an explanation that addresses the 'general explanandum'.

In section 2.2 it was argued that the technological background of a blockchain based government project does not only concern blockchain technology itself but also its usage in the project. From this follows that familiarity with the technological background, and subsequently with the project as a whole, as a precondition for cognition-based trust concerns both these aspects, the technology itself and its usage in the specific context. Consequently, receiving an explanation addressing both the 'general explanandum' and the 'case specific explanandum' should be more effective at increasing trust in the project than receiving an explanation that addresses only one of the two explananda, as this is likely to lead to a higher level of understanding. This leads to the third hypothesis.

Hypothesis 3: Receiving an explanation that addresses both the 'general explanandum' and the 'case specific explanandum' will have a greater positive effect on citizen trust (i.e., the three trusting beliefs as well as trusting intentions) in a blockchain based government project compared to receiving an explanation that addresses only one of these explananda.

Conclusion

In this section, three hypotheses on the relation between explanations about the technological background of a blockchain based project and citizen trust in it were developed. Receiving any explanation is expected to have a positive effect on citizen trust in a blockchain based government project compared to not receiving an explanation. Moreover, receiving an explanation that addresses the 'case specific explanandum' is hypothesized to have a greater positive effect on citizen trust in a blockchain based government project compared to receiving an explanation that addresses the 'general explanandum'. Lastly, receiving an explanation that addresses both explananda is predicted to have a greater positive effect on citizen trust in a blockchain based government project compared to receiving an explanation that addresses only one of the explananda.

3. Methodology

This chapter describes and discusses the research design, including the specific method used to answer the sub-questions, as well as other relevant methodological aspects. First, the chosen research method is discussed before presenting the selected case for this study and outlining the design of the survey experiment. Second, the operationalisation of variables is described before, third, addressing the sample selection and providing a short sample description. Lastly, it is outlined how data was analysed and validity and reliability aspects are discussed.

3.1 Research design

This section starts with a general discussion of the chosen research method, a survey experiment, including its advantages and disadvantages, after which the EnergieKnip is presented as selected case and the general design of the survey experiment is described.

3.1.1 The research method: a survey experiment

The research question that is central to this thesis asks about the effect of an independent variable (IV) on a dependent variable (DV), i.e., the effect of explanations about the technological background of a blockchain based government project (IV) on citizen trust in the project (DV). Therefore, this research aims to examine potential causal effects between the independent and dependent variables. For this reason, conducting a survey experiment was chosen as a research method, since in experimental designs such as this the independent variable(s) can be manipulated by the researcher so that its effect on the dependent variable(s) can be measured (Giannatasio, 2008, p. 111). The objective of an experiment, then, is to be able to trace back differences between experimental groups, with regards to the dependent variable(s), to the experimental treatment. In a survey experiment, the experimental treatment takes place by means of different vignettes after which a questionnaire is answered. Participants are randomly assigned to an experimental group without them being aware of this procedure.

This research reflects a one-way independent design. 'One-way' refers to the fact that there is one independent variable, the explanations about the technological background of the EnergieKnip with the different categories 'general explanandum', 'case specific explanandum' and 'both explananda'. An independent, also called between-groups, design means that different participants were randomly assigned to different experimental groups, instead of participants being confronted with all categories of the IV in turn (Field, 2013, p. 358).

One advantage of survey experiments is that they are usually less expensive and easier to implement than some other methods, such as laboratory experiments. Moreover, they allow, as mentioned, for an analysis of causal effects. Lastly, surveys, and thus also survey experiments, generally make it possible to include a large number of participants in the research in a relatively short time, which can make the research results more representative for the population of interest.

A disadvantage of survey experiments can be that participants might fill out the survey in an environment that might negatively influence their attention while participating, e.g., in their homes. In this case, they might be more easily distracted by outside influences or do other activities in-between questions. A general disadvantage with surveys is the possibility of response set bias which means that participants repeatedly choose the same answer option without really reading the questions or statements (Robbins, 2008, p. 262). One way to address these two issues related to attention is to include a so-called attention check in the survey to be able to filter out those

participants who did not pass this test. Such a check was thus included in the survey experiment, which is further discussed in section 3.2.3 below. Lastly, surveys pose the risks of self-selection, which could weaken the representativeness of the results, and non-response. To prevent non-response, a pop-up window appeared when participants clicked on a button that would lead them to the next question if they did not fully answer a question(s). They were made aware of the missing answer and given the chance to go back to the question.

The vignettes that are used in a survey experiment to apply the experimental treatment can be based on hypothetical, or artificial, and real-life cases. For this research, the real-life case of the EnergieKnip was chosen. An advantage of using a real-life case is that participants, especially if the case applies to them, are usually better able to relate to the presented situation or setting, which is important for the validity of vignette research (Bryman, 2016, p. 260).

3.1.2 The selected case: the EnergieKnip

This section introduces the selected case. The first part explains the EnergieKnip in general and the second part explains how it makes use of blockchain technology.

The EnergieKnip in Emmen

In January 2022 the EnergieKnip was launched in the municipality of Emmen, which is located in the northeast of the Netherlands and has about 100,000 inhabitants (BlockchainLab Drenthe, 2022). The project is part of a general effort by the national government to reduce energy expenditure in order to reach the UN's global climate goals (IOTA Foundation, 2022). As integral part of the project, the BlockchainLab Drenthe developed the eKnip app in cooperation with the municipality, through which citizens can answer several questionnaires with 27 questions in total about energy saving measures and behaviour in their homes and their energy use, e.g., with regards to solar panels or double glazed windows (BlockchainLab Drenthe, 2022; van Winkoop, 2022b). Next to answering the questionnaires, citizens can receive points worth up to 50€ per household through the app which can be used to buy energy saving products at local hardware stores. The local business owners in turn receive money from the municipality for the points spent at their stores (BlockchainLab Drenthe, 2022). This is financed through a subsidy that was provided by the national government to improve the energy efficiency of residential houses (BlockchainLab Drenthe, 2022). The design of the EnergieKnip makes it seem that receiving the subsidy is linked to filling out the questionnaires. Officially, however, the conditions of the subsidy do not stipulate that receiving the financial support of up to 50€ per household is tied to any such actions by citizens, every household was, until the subsidy was fully spent, eligible. QR codes needed to unlock the app were physically (on cardboards, see figure 2) distributed to citizens starting from the beginning of January 2022 to all households in Emmen, starting with those neighbourhoods with the lowest average income and the oldest houses (BlockchainLab Drenthe, 2022).

Figure 2: Cardboard distributed to households, source: https://energieknip.nl/#how-it-works

With the EnergieKnip, the municipality pursues several goals that bring benefits to citizen, local business owners, the municipal government itself and for the environment (BlockchainLab Drenthe, 2022; IOTA Foundation, 2022). The first is to make citizens more aware of potential energy saving measures in their homes and to encourage and financially support them to take action to reduce their overall energy consumption by making their homes more energy efficient. Second, it supports local business owners who get revenue and potentially new customers. Third, for the municipality, the answered questionnaires provide valuable data on existing energy saving measures in the different neighbourhoods that can be used to effectively design future energy saving policies. Finally, reduced CO2 emissions as a result of a reduced energy consumption by citizen is beneficial to the environment.

In order to be in accordance with GDPR, the developers ensure that several steps were taken so that all data is collected anonymously (BlockchainLab Drenthe, 2022). The distributed QR codes were generated randomly and distributed randomly per neighbourhood, so that it is not possible to identify a specific household by means of the used QR code. This also means that all collected data can be used on an aggregate, neighbourhood level only so that individual answers cannot be traced backed to individual households. Moreover, no personal data, such as names or addresses, are collected according to the official website (https://energieknip.nl) .

Thus far, the EnergieKnip has been considered a successful project. The whole subsidy amount of 150.000€ was claimed in less than two weeks, which lead to another subsidy batch of the same amount being provided in February 2022 (this time financed by the municipality and not the national government) and subsequently claimed just as quick (van Winkoop, 2022b). This is in stark contrast to previous years, when the subsidy was distributed by means of paper vouchers. In 2021 for example, only 16% of the grant was claimed in a period of seven months (van Winkoop, 2022b).

How the EnergieKnip makes use of blockchain technology

The EnergieKnip makes use of blockchain technology by using a specifically for this project created and blockchain based local currency that is legally and financially backed by the national subsidy (BlockchainLab Drenthe, 2022). The points received after answering the questionnaires represent coins of this currency which are transferred from the municipality to citizens, and from citizens to business owners based on a smart contract, and these transactions are recorded on the blockchain (BlockchainLab Drenthe, 2022). The business owners then regularly receive the subsidy money (in €) from the municipality with help of a payment robot based in exchange for coins received from citizens

(BlockchainLab Drenthe, 2022). To send and receive the coins, every household, business owner and the municipality each have their own digital wallet (BlockchainLab Drenthe, 2022). For the households and business owners, these digital wallets are unlocked by scanning the QR codes they received (BlockchainLab Drenthe, 2022). Moreover, through the QR code, every household has an anonymous ID that is stored on the blockchain together with the corresponding data received through the questionnaires (BlockchainLab Drenthe, 2022). Figure 3 visualizes the whole process.

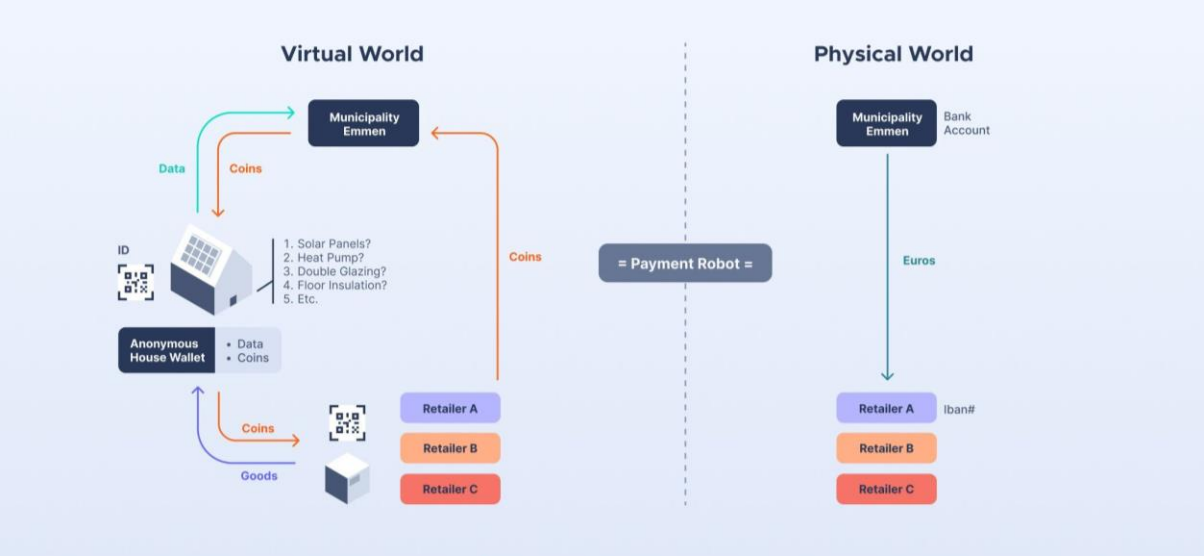

Figure 3: The EnergieKnip process, source: https://blog.iota.org/building-a-local-green-currency-on-iota/

Another aspect concerning the technology behind the EnergieKnip is that it uses IOTA-protocol, which technically means that it is not blockchain but IOTA based (BlockchainLab Drenthe, 2022). However, IOTA and blockchain both belong to distributed ledger technology and therefore share for the most part the same attributes and mechanisms. In fact, the EnergieKnip and the corresponding app are referred to as blockchain project and blockchain based app, respectively, by several *sources* reporting about the project and even the developers themselves (van Winkoop, 2022a, 2022b; Wester, 2022). Therefore, the terms 'blockchain based' and 'blockchain' are used in this thesis when referring to the EnergieKnip.

The only difference between the two is that IOTA allows for faster processing of transactions due to a different data structure (data is stored in a web-like tangle instead of as a chain of blocks) and uses a different kind of consensus mechanism, which makes transactions feeless and far less energy consuming (IOTA Foundation, n.d.). Because of this very low energy consumption, IOTA was chosen by the developers (BlockchainLab Drenthe, 2022; IOTA Foundation, 2022).

3.2.3 Design of the survey experiment

The survey experiment consisted of different blocks, containing an introduction, the experimental treatment, a questionnaire, and a short debriefing at the end (see also appendix A for the full survey). The introduction consisted of general information about the study (without revealing the experimental nature) and a privacy statement before asking participants to give consent for participation and use of anonymised survey data, and then giving general information about the procedure of the survey. The second block, the experimental treatment, then consisted of the different vignettes. Every vignette contained general information about the EnergieKnip and its

privacy measures[5] and in addition to that, based on the experimental group a participant was randomly allocated to, either no further information (control group) or an explanation that addressed the 'general explanandum' (treatment group 1), the 'case specific explanandum' (treatment group 2), or both (treatment group 3). The specific content of these explanations will be outlined in section 3.3.2 which covers the operationalisation of the independent variable. The full vignettes for each group can be seen in appendix A. The third block of the survey experiment contained a questionnaire to measure the dependent variables as well as relevant control variables and to collect demographic information, and at last gave participants the opportunity to give feedback on the survey. This block also included a manipulation check to check if the treatment manipulation worked as intended, and the attention check. The attention check consisted of the following item: "*Please note: choose "Don't know" for this statement."* (scale: 1 – 7). Six participants failed the test and were thus excluded from the analyses. In the debriefing participants were informed about the experimental nature of the study and its aim. The survey design and experimental treatment are visualised in figure 4.

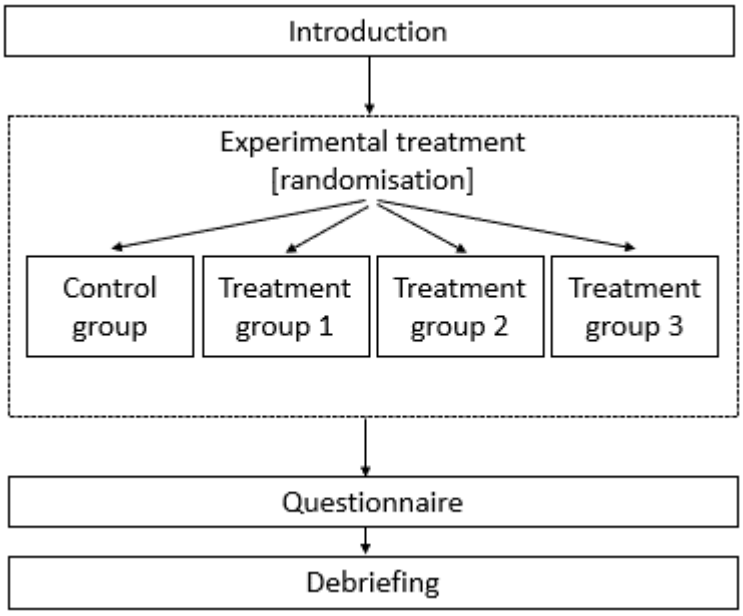

Figure 4: Survey design including experimental treatment

3.3 Operationalisation

This section ~~chapter~~ first describes how the two dimensions of 'citizen trust', are operationalised. Trusting beliefs are measured based on three variables: ability beliefs, benevolence, beliefs, and integrity beliefs. For the dimension trusting intentions, the construct 'willingness to depend' is used as a variable. Next, the operationalisation of the independent variable, i.e., 'explanation', is discussed and how that is reflected in the vignettes that were used in the survey experiment. Lastly, the manipulation check and operationalisation of the control variables are discussed.

[5] Information on privacy measures was included for two reasons. First, since the EnergieKnip is a real-life project and participants were actual citizens of Emmen, it was considered important to accurately inform participants about how their privacy rights are dealt with. Second, mentioning that and how privacy is secured was seen as a way to prevent any related concerns on the side of participants from influencing the results of the analyses.

3.3.1 Dependent variable

Trusting beliefs

For the dimension trusting beliefs, three 7-point Likert scales were used to measure ability beliefs, benevolence beliefs, and integrity beliefs. The measuring items for these scales were taken from Dimitriadis and Kyrezis (2010, adapted from McKnight et al., 2002). For the ability and integrity scales, one item each was omitted. These original items deal with aspects related to the context of the study, i.e., phone/internet banking, that are not or only hardly applicable to the EnergieKnip context, namely the service level a bank is offering to its customers and how the bank will treat customers in case there is a problem with a transaction. This led to three items each for ability and integrity beliefs and four items for the benevolence beliefs scale. Moreover, the items were adapted for the specific context of this study and then translated to Dutch. This translation (for these items and all other parts of the survey) was checked by two Dutch-speaking researchers, including this thesis' supervisor, to ensure the correct translation and use of words.

Construct	Items
Ability beliefs	1. I believe that the ek project makes use of useful technology. 2. I believe that every aspect of the ek project is designed so as to function reliably. 3. I believe that the technology used for the ek project functions effectively.
Integrity beliefs	1. I believe that the ek project is characterized by integrity. 2. I believe that the ek project keeps its promises. 3. I believe that the ek project is characterized by transparency.
Benevolence beliefs	1. I believe that the energieknip is set up so as to meet my needs and interests as a citizen of Emmen. 2. I believe that for the ek, measures have been taken to make participation secure. 3. I believe that participation in the EnergieKnip will not have any negative consequences for me. 4. I believe that the ek is set up in good will regarding secure participation.

Trusting intentions

For the dimension trusting intentions, the construct 'willingness to depend', measured with a three 7-point Likert scale, was used. This construct and scale consisting of four items were originally developed by McKnight et al. (2002) in the context of e-commerce to measure a customer's willingness to depend on an online vendor. The items were adapted to the specific context and then translated to Dutch as well.

Construct	Items
Willingness to depend	1. If the ek is continued, I would feel comfortable participating (again). 2. I think I could always rely on the EnergieKnip's technology to handle any data collected in a secure manner. 3. I feel that I could count on the ek to work as it is supposed to. 4. Should the municipality of Emmen launch a different project based on the same technology, I would most likely participate.

To test the reliability of all four scales, Cronbach's alpha was computed for all scales. A Cronbach's alpha of 0,7 – 0,8 or higher is commonly seen as sufficient to ensure reliability of a scale (Field, 2013, p. 709). Table 1 shows the results for all scales.

Construct	Cronbach's alpha	Items
Ability beliefs	0,84	3
Integrity beliefs	0,84	3
Benevolence beliefs	0,77	4
Willingness to depend	0,75	4

Table 1: Cronbach's alphas for the dependent variable constructs

For the third construct, the Cronbach's alpha did not increase after deleting items. For the other three, the Cronbach's alpha got slightly higher when deleting one item each. For 'integrity beliefs', deleting item two led to a value of 0,90; for 'ability beliefs', deleting item two led to a value of 0,87; for 'willingness to depend', deleting item one led to a value of 0,80. Regarding the first two, it was decided to nonetheless keep the item in question. First, because the initial Cronbach's alpha already is relatively high and a deletion would only lead to a slight increase. Second, because in both cases the value for the correlation between the item and the total score of the scale is relatively high (0,58 and 0,63) and considerably above the value of 0,3, below which one should consider dropping the item (Field, 2013, p. 713). With regard to the construct 'willingness to depend' however, the initial Cronbach's alpha is not as high and the correlation value (0,33) is only slightly above 0,3. Therefore, it was decided to conduct all pertaining analyses with and without including this item to see if there are any substantial differences in the results.

Since the measuring items for all constructs were adapted, conducting a factor analysis would have been desirable to ensure construct validity. Because of the rather low number of respondents (see section 3.4) this could not be done however. Nonetheless, all the original items have been used and tested for validity in past research which generally increases their validity as long as items are not changed substantially. A more detailed discussion of validity and reliability of used constructs in this research is done in section 3.6 below.

3.3.2 Independent variable

In section 2.2 it was stated that the independent variable, 'explanation', was operationalized as an explanation that addresses either the general, the case specific or both explananda. In the latter case, the vignette simply included both explanations that were developed for each of the explananda. Furthermore, section 2.2 discussed what types of explanations could be used. In the following, it will be outlined how this is reflected in the different explanations that were used in the experiment.

General explanandum

An explanation addressing the 'general explanandum' was defined as explaining blockchain technology generally using how, why, clarifying, and/or element/purpose explanations. Figure 5 shows the explanation used in the experiment. Some words were written in bold to make it easier to read the text.

What is a blockchain?

A blockchain is a **shared, immutable, and digital ledger through which transactions** between members of a network **can be tracked and recorded.** Transactions include **financial transactions**, such as payments with digital currency, but also the **exchange of important data** between two parties, such as property records.

The ledger is **shared** because all network members have access to it and because transactions are recorded by every member of the network instead of being recorded in one central place only.

A blockchain is **immutable** because a transaction cannot be changed or tampered with once it is recorded in the shared ledger.

For fast and safe transactions, a '**smart contract'** can be used. This means that a set of rules that define necessary conditions for a transaction to take place is stored on the blockchain and transactions are executed automatically only if these conditions are met.

These attributes are expected to make transactions **more transparent** and **less susceptible** to cyber-attacks or fraud.

Figure 5: Explanation 'general explanandum'

The first paragraph of this explanation reflects an element/purpose explanation and a clarifying explanation. Information is given on a central element, i.e., the digital ledger, and the purpose of tracking and recording transaction. Thereafter, it is clarified what the term 'transaction' refers to. Clarifications are also given in the next three paragraphs on what the terms 'shared', 'immutable', and 'smart contract' mean in the context of blockchain technology. The last sentence can be seen as a why explanation, as it points to reasons for why blockchain technology could be seen as beneficial to other technologies.

In summary, the explanation includes element/purpose explanations, clarifying explanation, and why explanations. Wallbach, Lehner, Roethke, Elbert and Benlian (2020) and Ostern (2018) found that the immutability and decentralisation attributes of a blockchain positively influence user trust in the technology, which is why it made sense to focus on these attributes by using clarifying explanations. Alternatively, how explanations on these attributes could have been included instead but since that would have been very technical and thus rather complicated explanations, which might be difficult to process and understand for lay people, it was chosen to not do that. For the same reason, other how explanations, e.g., on how exactly data is stored on the blockchain or how the verification process works, were not included either. Generally, the aim was to develop an explanation that is not too long and/or complicated to prevent respondents from quitting before finishing the survey. Therefore, the overall intention was to develop an explanation that is not too long and provides elementary/basic information on blockchain technology and its characteristics that (ideally) leads to a basic understanding among readers.

Case specific explanandum

An explanation addressing the 'case specific explanandum' was defined as explaining blockchain technology's usage in the project using how, why, and/or clarifying explanations. Figure 6 shows the explanation used in the experiment. Again, some words were written in bold to make it easier to read the text.

How is the project and EnergieKnip app based on blockchain technology?

The points received for answering the questionnaires represent coins of a specifically for this project created and **blockchain based local currency** which can only be used for predefined products (energy saving products).

Transactions with these coins were recorded on the blockchain. They took place when:

- coins were sent to every participating households' **anonymous digital wallet (the eKNIP)** after completing the questionnaires
- coins were sent from the eKNIP **to a local retailer's digital wallet** in exchange for energy saving products

The households' digital wallets were unlocked by scanning the QR code that every household received randomly.

Through the QR code, every house or apartment has an **anonymous ID** which is stored on the blockchain together with the corresponding data received through the questionnaires.

The **local retailers** where the coins could be redeemed at, in turn received money (in Euros) from the municipality for coins spent at their stores as recorded on the blockchain.

Figure 6: Explanation 'case specific explanandum'

The first sentence and paragraph reflects a how explanation in that it describes how blockchain technology is used, namely by using a blockchain based local currency. The next paragraph clarifies the term 'transaction' in the context of the EnergieKnip by giving information on what transactions include (coins, data in questionnaires). At the same time, this paragraph also reflects a how explanation by describing how blockchain technology is used, namely by recording and facilitating transactions between for example citizens and shop owners. Moreover, it describes when transactions take place. The rest of the explanation uses how explanations as well, e.g., describing how the blockchain is used to record the questionnaire responses linked to the QR-code (or ID) or to determine how much money shop owners receive from the municipality.

In summary, the explanation includes how and clarifying explanations. A why explanation on why blockchain technology was used for the EnergieKnip, instead of other technologies for example, was not included simply because there was no such information available to the researcher and since the EnergieKnip is a real-life project, making something up that is not verifiably true was not an option. Similarly to the first explanation, the overall intention was to develop an explanation that is not too long and (ideally) provides readers with a basic understanding of blockchain technology's usage in the EnergieKnip.

3.3.3 Manipulation check

To control if the experimental manipulation was successful, the following question was included after measuring the dependent variables:

To what extent do the following statements apply to the information you just read about the EnergieKnip?

1. *I learned something about the technological background of the ek project.*
2. *The technology on which the ek project is based on was explained in a sufficient way.*
3. *I understand how the ek project makes use blockchain technology.*
4. *I received sufficient information about the technology that is used for the ek project*.

An analysis of variance[6] (ANOVA) was conducted for every statement to compare the experimental groups in terms of participants' scores for the statements.

All ANOVAs turned out to be non-significant[7] which means that the scores on the manipulation check statements did not significantly differ based on the category of the independent variable and that therefore the experimental manipulation did not have the desired effect. Because of the small sample size in this study, the statistical power of the tests to detect an effect is however very low (see also section 3.4.1) so that it cannot be ruled out that the manipulation actually was successful and would have been identified as such with a larger sample size. Generally, the position of the manipulation check within the survey might have had an effect, since it was placed after the questions measuring the dependent variables which constituted a rather long part of the questionnaire. Therefore, participants might not have remembered as much about the information that was included in the vignettes once they reached the manipulation check as if it was placed right at the beginning of the questionnaire. The choice to put the manipulation check after measuring the dependent variables was made to prevent potential effects on the dependent variables. In light of the results, it might however still have been better to place it right after the vignettes or to randomly vary the position per respondent.

3.3.4 Other questions

As mentioned, next to the questions to measure the dependent variables and the manipulation check, the survey also included several other questions. These were questions to measure relevant control variables, including demographic variables. Furthermore, participants were given the possibility to provide feedback on the survey.

Questions on control variables

Relevant control variables in this research that could have an effect on the dependent variable and therefore should be controlled for in the analyses, included people's trust towards technology in general, trust in the local government, and past interaction with the EnergieKnip. The first was included as past research found that people's general disposition towards technology influences their trust in a specific technology (Dimitriadis & Kyrezis, 2010; Hoff & Bashir, 2015). This variable was operationalised by using the construct 'Trusting stance – General technology' (McKnight et al., 2011, adapted from McKnight et al. 2002), consisting of three items and measured on a 7 – point Likert scale.

Construct	Items
Trusting stance – General technology	1. My typical approach is to trust new technologies until they prove to me that I shouldn't trust them. 2. I usually trust in technology until it gives me a reason not to trust it. 3. I generally give a technology the benefit of the doubt when I first use it.

The Cronbach's alpha for this scale was computed to be 0,90, thus supporting its reliability.

As the EnergieKnip is a local government project, it can be assumed that trust in the municipality could have an influence on the dependent variable as well. This variable, 'trust in municipality', was operationalised by asking survey respondents to indicate to what extent they agree with the following

[6] For detailed information on ANOVAs see for example Field (2013).

[7] For item 1: F (3, 30) = 0,323, p = 0,809; item 2: F (3, 29) = 0,478, p = 0,700; item 3: F (3, 30) = 0,771, p = 0,520; item 4: F (3, 30) = 0,539, p=0,659.

statement (7 – point Likert scale): *"In general, I trust the local government."*. Lastly, the variable measuring past interaction with the EnergieKnip was operationalised by asking *"Have you used the EnergieKnip app in the past? (e.g., to fill in questionnaires or to use points to buy energy saving products)"*. As discussed in section 2.3, cognitive-based trust is formed as a result of familiarity, i.e., an understanding or knowledge based on *interactions*, experiences or learning. Therefore, this variable, 'interaction', was included. Furthermore, three demographic questions were asked to measure the variables 'gender', 'year of birth' and 'education' and to be able to provide descriptive information on the demographic makeup of the sample:

- What is your gender?
- What is your year of birth?
- What is your last reached level of education?

In past research, age (Bellemare & Kröger, 2007; Clark & Eisenstein, 2013; Li & Fung, 2013), education (Bellemare & Kröger, 2007; Hooghe, Marien & de Vroome, 2012) and gender (Bellemare & Kröger, 2007; Buchan, Croson & Solnick, 2008) were shown to have an influence on trust in a variety of contexts. Regarding age, Li and Fung (2013) for example found that age is positively related to trust in general and trust in specific individuals, such as friends or strangers, across 38 countries. Moreover, Bellemare and Kröger (2007) state that there is a general consensus in the literature that education is an important covariate of trust, with higher education being correlated with higher trust, and go on to conform this with their research on generalised and political trust. Regarding gender, the findings are inconclusive, sometimes finding that men trust more than women and sometimes the other way around.

3.4 Sample selection and description

3.4.1 Sample selection

The population of interest for this study consisted of all adult citizens of the municipality of Emmen. Ideally, the survey would be distributed to a simple random sample chosen from this population. However, this was not possible as there was no (accessible) list including all these citizens (and their contact information to distribute the survey to them) from which such as sample could be chosen. Therefore, a convenience sample was used which means that respondents were contacted on basis of their accessibility to the researcher (Northrop & Arsneault, 2008, p. 225). Using such a nonprobability sample negatively affects external validity as it means that results cannot be generalized to the whole population (Giannatasio, 2008). With help of the program *G*Power 3.1* the desired sample size was calculated to be 489, based on expected effect size and desired statistical power and error margin of a test. The statistical power of a test refers to its ability to find an effect if one genuinely exists (Field, 2013, p. 69). With the calculated sample size, statistical power would be 0,80, meaning there is an 80% chance of detecting an effect if one actually exists. The calculation is based on this value of 0,80 as desired statistical power, an error range of 0,05 and an effect size of 0,15, which represents a small effect (Field, 2013, p. 80).

After informing the municipality of Emmen about the research, 3000 invitations to the survey were distributed by hand to households in Emmen on two days, resulting in 40 respondents[8], i.e., a response

[8] According to the software used for the survey (Qualtrics), 31 participants started the survey but did not complete it. Of those 31, seven were allocated to the control group, six each were allocated to treatment group 1 and 2, and nine were allocated to treatment group 3. Three people quit the survey before being allocated to a treatment or the control group.

rate of 1,3% (see appendix B for the invitation letter). On the first day ca. 2800 invitations were distributed resulting in 35 respondents; on the second day ca. 200 invitations were distributed which resulted in an additional 5 respondents. For the second day, one piece of small candy was attached to each invitation letter in an attempt to increase the response rate. This effort was, in relative terms, slightly successful as it doubled the response rate from 1,25% to 2,5%. The very low number of respondents means that potential tests to analyse the data would not nearly have the desired statistical power of 0,80. This means that with this amount of data, chances to detect any genuinely existing effects would be very low. In other words, the chance of a Type II error, i.e., missing an effect in the population that genuinely exists would be high (Field, 2013, p. 69). The consequence of this for the analysis of results is further discussed in section 3.5 below.

3.4.2 Sample description

Out of the 40 respondents, 25 were male and 13 female. Two people preferred not to name their gender. The median year of birth was 1957 and a majority of respondents (24) had achieved a high level of education (undergraduate, graduate or doctoral degree). In appendix D the descriptive statistics for the variables 'education level' and 'year of birth' are shown in more detail.

Experimental groups

The 40 respondents were evenly allocated to the four experimental groups so that ten respondents each were put in the control group and each of the three treatment groups. After filtering out those who failed the attention check, the control group and treatment group 3 consisted of eight respondents and treatment group 1 and 2 of nine respondents. All the experimental groups thus have an almost equal number of respondents, which is desired in an experiment.

3.5 Data analysis

To analyse if there are significant differences in means between the control and treatment groups, a one-way analysis of covariance (ANCOVA) for the variable 'willingness to depend', and a one-way multivariate analysis of covariance (MANCOVA), including as DVs 'ability beliefs', 'integrity beliefs', and 'benevolence beliefs', was conducted, each with the control variables named in section 3.3.4 as covariates to control for their influence on the DVs[9]. A MANCOVA is beneficial to conducting three separate ANCOVAs for each of the three trusting beliefs as it decreases the chance of a Type I error and moreover takes into account potential relationships between the three separate beliefs (Field, 2013, pp. 624–625). For example, it might not be possible to distinguish the experimental groups by looking at only one trusting belief but the groups might be distinguished by a combination of their trusting beliefs across all beliefs.

For the ANCOVA it was moreover planned to test the three hypotheses by means of specified contrasts in the case of significant results. Similarly, for the MANCOVA it was planned to conduct separate ANCOVAs and contrasts for dependent variables for which a significant difference in means is found. However, the tests did not show any significant results (see chapter four), as expected based on the low sample size and thus low statistical power as discussed above. Because of this low statistical power of the tests, it is difficult to draw conclusions regarding any causal relations between variables. Next to the inferential statistics, the descriptive statistics will also be provided in the results section.

Furthermore, the comments written by some survey respondents in the feedback box at the end of the survey unexpectedly yielded interesting insights. These findings and potential consequences

[9] For more information on ANCOVAs and MANCOVAs see for example Field (2013).

thereof on the main analyses will thus be covered in the results chapter and the subsequent discussion as well.

3.6 Validity and reliability

This section will first discuss the reliability of this research and thereafter different types of validity.

3.6.1 Reliability

Reliability refers to whether or not results of a study can be consistently replicated and more specifically if used measuring instruments produce stable and consistent results (Bryman, 2016, p. 158). The use of measuring items that have been used in past research as stated in section 3.3 generally increases their reliability since this means that they have been tested and found to be reliable in the past. Moreover, internal consistency of scales was confirmed by calculating their Cronbach's alpha which was found to be above 0,7 in all cases.

3.6.2 Validity

Internal validity

Internal validity addresses the question of whether the IV caused the results with regards to the DV, and is specific to the experiment (Giannatasio, 2008). In experiments, internal validity is usually assumed to be high (Bryman, 2016, p. 44). Moreover, the measurement of relevant control variables increases internal validity since their influences on the DVs can thus be controlled for during the analyses. The random allocation of participants to experimental groups in this study also decreased the probability that differences in the DVs are ~~not~~ due to differences in demographic characteristics. Giannatasio (2008, pp. 115-118) mentions several threats to internal validity. First, 'history' refers to events occurring outside of the controlled experiment that could influence the DVs. One such event for this study, was potentially the outrage or disappointment some participants felt related to their experiences with the EnergieKnip, which became apparent through the feedback some participants gave at the end of the survey. This will be further described and discussed in the subsequent chapters. Second, 'maturation' refers to effects on the DVs based on changes of participants' characteristics over time. For this study, the experiment was conducted over the span of two weeks so that the chance of maturation effects having occurred is small. Third, 'test effects' can influence the DVs when participants are influenced by the fact that they are tested and are aware of being tested (Hawthorne effect). For this study, participants filled out the survey in their private settings and not in a laboratory setting in which the presence of a researcher can have an influence on participants' responses. Thus, the threat of test effects is rather small as well. Lastly, 'biases' refer to effects resulting out of experimental groups consisting of different participants in terms of their characteristics. This threat was addressed by the random distribution to the experimental groups. However, self-selection of respondents, i.e., that only a specific type of respondent decided to participate in the first place, could have increased the chance of this threat occurring.

External validity

External validity refers to the extent to which results can be generalised to different contexts (Giannatasio, 2008). External validity is often low in experimental designs because of the controlled and artificial environment that is created (Giannatasio, 2008). Langer and Landers (2021) also mentioned this aspect as a limitation of survey experiments as they often do not accurately reflect real-world conditions and processes, which then negatively affects the results' generalizability. As the use case in this research is not artificial, external validity is increased whereas the use of a convenience sample and the low sample size strongly decreases it.

Validity of measurement tools

The validity of measurement tool in particular addresses the question of whether they actually measure what they are supposed to measure (Field, 2013, p. 12). Content validity addresses the degree to which individual items and scales reflect the construct being measured as well as cover the full range of a construct (Field, 2013, p. 13). Construct validity refers to if constructs used to measure the DVs relate well to relevant theory (Giannatasio, 2008, p. 114). The fact that the used scales and their items in this study are based on past research contributes to these types of validity. Additionally, the DV was operationalised in such a way that the resulting variables cover the two dimensions of trust which have in turn been sufficiently validated in past research. Furthermore, to examine construct validity in this case, it can be tested 1) if each measured trusting belief is more related with other beliefs than with other constructs and 2) if the constructs 'trusting beliefs' and 'trusting intentions' are more highly correlated with one another than with other constructs (McKnight et al., 1998). To do this, a correlation analysis was conducted including the constructs 'trusting beliefs' (each belief separately), 'trusting intentions' (with an without item 1), 'trust in municipality', and 'trusting stance'.

	Trusting Belief - Benevolence	Trusting Belief - Integrity	Trusting Belief - Ability	Trusting intentions	Trusting intentions without item 1	Trusting stance	Trust in municipality
Trusting Belief - Benevolence	1	0.795**	0.736**	0.727**	0.733**	0.020	0.219
Trusting Belief - Integrity		1	0.801**	0.819**	0.864**	0.012	0.344*
Trusting Belief - Ability			1	0.792**	0.807**	0.200	0.396*
Trusting intentions				1	0.942**	0.188	0.360*
Trusting intentions without item 1					1	0.112	0.412*

Table 2: Correlation among constructs using Pearson's r, N = 34
***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 2 shows that all 'trusting beliefs' and 'trusting intentions' are significantly more highly correlated with one another than with the other two constructs. Moreover, each trusting belief correlates more with other beliefs than with 'trusting stance' and 'trust in municipality'. Regarding the construct 'trusting intentions', this is not fully the case though. 'Benevolence beliefs' correlates slightly more with the other beliefs than with 'trusting intentions' but 'integrity beliefs' correlate slightly more with 'trusting intentions' than with the other beliefs. Moreover, 'ability beliefs' correlates slightly more with 'trusting intentions' than with 'benevolence beliefs' and, depending on whether item 1 is included in the trusting intentions scale, slightly more or less with 'trusting intentions' than with 'integrity beliefs'. These results are not surprising since 'trusting beliefs' and 'trusting intentions' are

both dimensions of the overall concept of 'trust'. Overall, it can be said the results support the construct validity of the trusting beliefs and intentions constructs more than they undermine it[10].

[10] Inspecting relevant scatterplots showed that there are also no non-linear relationships between any of the trust constructs (DVs) and the other two constructs.

4. Results

This chapter presents the results of the conducted analyses. As mentioned in the introduction, two sub-questions were developed based on the conceptualisation of 'trust' in chapter two, the answers to which were intended to give insights on potential causal relationships between explanations on the technological background of the EnergieKnip and citizen trust in the EnergieKnip:

1. How do different explanations about the technological background of the EnergieKnip influence citizens' trusting beliefs toward the Energieknip in contrast to not receiving an explanation and one another?
2. How do different explanations about the technological background of the EnergieKnip influence citizens' trusting intentions toward the EnergieKnip in contrast to not receiving an explanation and one another ?

The first part of this chapter will therefore first focus on citizens' 'trusting beliefs'. Thereafter, the second sub-question is addressed by looking at citizens' 'trusting intentions'. As mentioned in section 3.5, it is however difficult to draw conclusions regarding any causal relations between variables from the results, and thus to examine the developed hypotheses and answer the empirical sub-questions, because of the low sample size and thus low statistical power of the tests. The second part of this chapter presents the unexpected findings with regards to the negative sentiments of respondents toward the EnergieKnip that became apparent through the feedback box of the survey.

4.1 Trusting beliefs and trusting intentions

4.1.1 Trusting beliefs

As outlined in the previous chapters, 'trusting beliefs' were measured with the three separate constructs*:* 'ability beliefs', 'benevolence beliefs', and 'integrity beliefs'. To examine if receiving an explanation significantly influenced participants' 'trusting beliefs', a one-way MANCOVA was conducted. The descriptive statistics (N = 33[11]) for each DV are shown in table 3.

[11] One participant was excluded from the analysis because of a missing value for the covariate 'gender'.

	Experimental group	Mean	SD
DV: Ability beliefs	Control group	5,08	1,39
	Treatment 1 (general)	4,59	1,63
	Treatment 2 (case specific)	4,67	0,94
	Treatment 3 (both explanations)	4,73	1,86
	Total	4,76	1,44
DV: Integrity beliefs	Control group	4,54	1,34
	Treatment 1 (general)	3,15	1,33
	Treatment 2 (case specific)	3,75	1,23
	Treatment 3 (both explanations)	3,92	1,82
	Total	3,82	1,47
DV: Benevolence beliefs	Control group	5,25	1,34
	Treatment 1 (general)	4,33	1,33
	Treatment 2 (case specific)	4,88	1,02
	Treatment 3 (both explanations)	4,56	2,11
	Total	4,74	1,47

Table 3: Descriptive statistics 'trusting beliefs'

Using Pillai's trace, the MANCOVA revealed that there was no significant effect of receiving an explanation on participants' 'trusting beliefs', V = 0,301; *F* (9, 66) = 0,818; p = 0,602. For one of the covariates, 'trust in municipality', the significance value was slightly above 0,05 that is commonly seen as the cut-off value for statistical significance, V = 0,269; *F* (3, 20) = 2,450; p = 0,093. The means of the DVs adjusted for the covariates are shown in table 4.

	Experimental group	Mean	Std. Error
DV: Ability beliefs	Control group	4,62	0,53
	Treatment 1 (general)	4,95	0,55
	Treatment 2 (case specific)	4,78	0,53
	Treatment 3 (both explanations)	4,68	0,53
DV: Integrity beliefs	Control group	4,22	0,54
	Treatment 1 (general)	3,31	0,56
	Treatment 2 (case specific)	3,74	0,54
	Treatment 3 (both explanations)	4,07	0,54
DV: Benevolence beliefs	Control group	4,89	0,62
	Treatment 1 (general)	4,44	0,63
	Treatment 2 (case specific)	5,06	0,61
	Treatment 3 (both explanations)	4,62	0,61

Table 4: Means adjusted for covariates 'trusting beliefs'

4.1.2 Trusting intentions

To examine if receiving an explanation significantly influenced participants' 'trusting intentions', a one-way ANCOVA was conducted. The descriptive statistics (N = 33[12]) are shown in table 5, with the numbers in brackets showing the descriptive statistics for when item 1 was excluded from the scale.

Experimental group	Mean	SD
Control group	4,91 (4,88)	1,74 (1,66)
Treatment 1 (general)	4,17 (4,39)	1,56 (1,70)
Treatment 2 (case specific)	4,22 (4,17)	1,31 (1,41)
Treatment 3 (both explanations)	4,56 (4,13)	1,72 (2,05)
Total	4,45 (4,39)	1,54 (1,66)

Table 5: Descriptive statistics 'trusting intentions'

The ANCOVA revealed that there was no significant effect of receiving an explanation on participants' 'trusting intentions', F (3, 22) = 0,023; p = 0,995. There was however an almost significant effect of the covariate 'trust in municipality', F (1, 22) = 4,120; p = 0,055; r = 0,37. When excluding item 1 from the scale, the only substantial difference is that the effect of the covariate 'trust in municipality' becomes significant, F (1, 22) = 5,838; p = 0,024; r = 0,43. The means adjusted for the covariates are shown in table 6 (again with the numbers in brackets showing the adjusted means for when item 1 was excluded from the scale).

Experimental group	Mean	Std. Error
Control group	4,59 (4,43)	0,62 (0,66)
Treatment 1 (general)	4,35 (4,63)	0,63 (0,67)
Treatment 2 (case specific)	4,43 (4,38)	0,61 (0,65)
Treatment 3 (both explanations)	4,47 (4,10)	0,47 (0,65)

Table 6: Means adjusted for covariates 'trusting intentions'

4.1.3 Conclusion

The conducted tests did not show any significant effect of receiving an explanation on participants' 'trusting beliefs' or 'trusting intentions'. Because of the low sample size and thus low power of the tests, it is however not possible to draw confident conclusions from these results regarding the three hypotheses developed in chapter 2, and to conclusively answer the two sub-questions. It is possible that there is no effect from the IV on the DVs but it also possible that existing effects were simply not detectable. Nonetheless, with these data, there is no support for the three hypotheses, both concerning 'trusting beliefs' and 'trusting intentions'. Consequently, regarding the two sub-questions, it could not be observed that receiving an explanation about the technological background of the EnergieKnip had an effect on citizens' trusting beliefs and trusting intentions toward the EnergieKnip.

4.2 Participants' sentiments towards the EnergieKnip

This section presents findings that resulted from looking at the comments that participants made though the feedback opportunity at the end of the survey experiment. The comments overwhelmingly

[12] One participant was excluded from the analysis because of a missing value for the covariate 'gender'.

consisted of negative feedback regarding the EnergieKnip or showed citizens' disappointment or confusion with it (for all comments see appendix C). In total, 17 out of 40 participants chose to make a comment concerning the EnergieKnip itself. Out of those 17, twelve comments displayed some kind of negative sentiments towards and/or confusion with the EnergieKnip, which is almost a third of all participants.

In all these cases, the issue at hand was that the subsidy granted by the national government as well as the second batch provided by the local government were limited to 150.000€ each, so that, once all of the money was claimed and distributed to citizens in the form of points, no points were left to be distributed to additional households whose residents filled out the questionnaires in the eKnip app. In this way, the EnergieKnip was 'too successful' as many households could not make use of the EnergieKnip even if they wanted to. Moreover, since the QR-codes needed to unlock the app were distributed to those neighbourhoods with the lowest average income and the oldest houses first, some neighbourhoods did in practice not get a chance to get any points at all because they were already distributed before they received the QR-codes. Additionally, the design of the EnergieKnip and the corresponding app gave the impression that receiving the subsidy is directly tied to answering the questionnaires when in fact this is not the case as described in section 3.1.2. As a consequence, people apparently reacted rather negatively when they did not receive the subsidy (or points) once they filled out the questionnaires.

4.2.1 A 'dead sparrow', 'pure inequality' or just 'worthless'?

In many comments, participants voiced their frustrations, disappointment or outright anger over not getting any points or subsidy. As participant 1 wrote "Blockchain and the app are great, but why is the municipality of Emmen rolling it out, when the money is spent immediately? I have been waiting for 3 months for the money to become available. Worthless"[13]. Similarly, another comment reads: "When I received the card, I could already not use it anymore. So why do you still send it? Making someone happy with a dead sparrow. That's a shame!!!" (participant 10). Participant 23 displayed even more anger and made a connection to subsidies in general:

> Making people happy with a dead bird or an empty coin bank. Ridiculous, and then even devoting a whole radio programme to it to show how well it works. Ridiculous initiative because it does not apply to everyone and the budget or the pot with subsidy is distributed by the municipality in the so-called disadvantaged neighbourhoods. And who is going to pay for that? Please abolish all kinds of subsidies !!!!! (participant 23)

One participant even demanded that all their provided answers through the questionnaires (in the eknip app) get deleted: "Pure inequality: I filled in the questionnaires immediately after receiving the flyer and all the points had already been distributed. I will never again take part in such nonsense initiatives and want all filled in answers to be deleted" (participant 34).

Some other participants seemed to be more confused than angry, for example: "I have filled in the questions but no points are awarded, not for 6 weeks. No idea if the EnergieKnip works" (participant 19) or "One uncertainty in this knip, I think, is that if you have scored the required points and you want the voucher, then all of a sudden everything is gone and then what .....?" (participant 26).

[13] All comments in this and subsequent sections were translated from Dutch to English by the author of this thesis; the Dutch originals can be found in appendix C.

4.2.2 Effect on trust

Participants were not asked to provide feedback on the EnergieKnip or their experiences with it and it was also made clear in the introduction to the experiment that this study is independent of the EnergieKnip and the municipality; it was however communicated that the municipality was informed of the survey. The fact that so many participants still chose to voice their opinions in this way emphasises their negative experiences with the EnergieKnip. In light of this, it can reasonably be assumed that these experiences negatively affect people's trust in the EnergieKnip. To test this statistically, non-parametric Mann-Whitney tests[14] were conducted to analyse if trust, that is 'trusting beliefs' and 'trusting intentions', significantly differs between participants whose comments display negative sentiments towards the EnergieKnip and those that either did not comment or whose comments do not show such negative sentiments.

Trusting beliefs

'Benevolence beliefs' did not differ sigificantly between participants who showed negative sentiments (*Mdn* = 4) and those that did not (*Mdn.* = 5,25), *U* = 81,00; *z* = -1,68; p = 0,098; r = -0,29. Similarly, 'ability beliefs' did not differ significantly between participants who showed negative sentiments (*Mdn* = 4,67) and those that did not (*Mdn.* = 5,33) either, *U* = 92,00; *z* = -1,28; p = 0,214; r = -0,22. However, for 'integrity beliefs' there are highly significant differences between participants who showed negative sentiments (*Mdn* = 2,67) and those that did not (*Mdn.* = 4), *U* = 52,00; *z* = -2,76; p = 0,005; r = -0,47.

Trusting intentions

For 'trusting intentions' (with item 1), the test showed that there is no sigificant difference between participants who showed negative sentiments (*Mdn* = 3,25) and those that did not (*Mdn.* = 5,25), *U* = 79,50; *z* = -1,74; p = 0,084; r = -0,30. However, when item 1 is not included in the scale, 'trusting intentions' differ sigificantly between participants who showed negative sentiments (*Mdn* = 3) and those that did not (*Mdn.* = 5), *U* = 64,00; *z* = -2,31; p = 0,021; r = -0,40. Because of the low sample size, low statistical power is again a potential issue regarding the tests that produced non-significant results.

In conclusion, these results show that the participants' frustrations, anger or confusion with the EnergieKnip did have an effect on their trust in the EnergieKnip, at least to some extent. This finding will be further discussed in the next chapter.

4.2.3 Other insights

Overall, when looking at the comments, several themes can be identified. The first and most prominent one has already been discussed in section 4.2.1. Because they did not get any points after filling in the questionnaires in the eknip app, many participants voiced their anger, disappointment or confusion. Apparently, the way that the EnergieKnip was designed and the municipality's communication about it led many to expect that they would in any case receive points in exchange for filling out questionnaires.

Second, another critical issue seems to be that some neighbourhoods, namely those with a low average income and older buildings, received the invitation to participate in the EnergieKnip earlier than others, thereby giving households in these neighbourhoods a greater chance to receive the

[14] A non-parametric test instead of a t-test was chosen because the required normality assumption for t-tests was not fully met for the dependent variables.

subsidy. For two participants this seems to be one of the main reasons for their frustrations, showing resentment or envy towards people living in those neighbourhoods and/or people receiving welfare benefits generally. One of them is participant 30:

> To our surprise, we did not get 1 point or coin. We phoned the municipality and were told that people from disadvantaged neighbourhoods had been given the points and coins and that the money had now run out. If this is their intention, why do they send a letter to everyone. And make you happy with a dead sparrow. People on benefits live off our taxes, get all kinds of subsidies, 800 euros for the high energy and now this benefit as well. We have a moderate income and have to cough it all up ourselves. ... Then it would be nice for [us] too to have a benefit for once, such as the EnergieKnip.

Similarly, participant 23:

> Ridiculous initiative because it does not apply to everyone and the budget or the pot with subsidy is distributed by the municipality in the so-called disadvantaged neighbourhoods. And who is going to pay for that? Please abolish all kinds of subsidies !!!!!

Third, connected to this issue, these two comments also show discontent with the use of tax money for subsidies in general or their (in the participants' views) unfair distribution.

Fourth, a few participants also commented that they had no interest in participating in the EnergieKnip because for them personally, the subsidy would be of no use as their homes are already well equipped in terms of energy saving measures and/or because they already made use of other related subsidies in the past. Interestingly, participant 20 mentioned in this context that he/she would have preferred if the invitations to participate in the EnergieKnip were sent to homes with poor isolation, as they were, but evidently the distribution strategy of the municipality was at least initially not (well) communicated, which also became apparent though other comments (e.g., the comment from participant 30 mentioned above).

At last, there were also participants who made positive remarks, namely about the use of blockchain technology but also the EnergieKnip generally, even if followed by critique. Participant 7 for example calls the EnergieKnip a "nice blockchain solution".

To conclude, even though these findings do not contribute to what is the main issue of interest of this thesis, how explanations affect citizen trust in the context of a blockchain based government project, they reveal valuable insights on the attitudes of the citizens of Emmen towards the EnergieKnip. This will be further discussed in the next chapter.

5. Discussion and conclusion

In this chapter, the results are discussed and an overall conclusion is drawn. The discussion will first focus on the results concerning the influence of explanations on trust in the EnergieKnip before the findings stemming from analysing the participants' comments are addressed. Thereafter, the findings' scientific relevance and practical implications are dealt with. Finally, limitations of this study and suggestions for future research are pointed out.

5.1 Explanations and trust

In light of the increasing interest in and use of blockchain technology within public administration (Berryhill et al., 2018; Cagigas et al., 2021), the aim of this thesis was to study how providing citizens with explanations about the technological background of a blockchain based government project influences their trust in such a project. In chapter four it was concluded that, based on the results of this study/survey experiment, no such influence could be observed in the case of the EnergieKnip. One factor that likely contributed to this finding has already been mentioned. Namely, the low statistical power to detect a genuinely existing effect caused by the low sample size. This is not to say that it should be assumed that a genuine effect exists that could just not be detected. But just the same it can also not be confidently said that such an effect does not exist. Another point of discussion in this context is the influence of participants' negative emotions towards the EnergieKnip on their trust in the EnergieKnip. As shown in the last chapter, participants' frustrations, anger or confusion with the EnergieKnip did have a significant influence on 'integrity beliefs' and 'trusting intentions'. Despite the low sample size, this effect could be detected which demonstrates its magnitude. Indeed, the effect size is r = -0,40 for 'trusting intentions' and r = -0,47 for 'integrity beliefs' which reflects a medium to large effect[15]. The kind of trust that is affected here is affect-based trust in contrast to cognition-based trust, as affective foundations of trust refer to emotional reactions to the trustee (Lewis & Weigert, 1985; McAllister, 1995). This effect can be seen as a threat to the internal validity of the survey experiment and its results, as was already hinted at in section 3.6.2. In other words, the dependent variable, citizen trust in the EnergieKnip, was influenced by participants' emotional reactions to the EnergieKnip to a rather strong extent, which could potentially have suppressed any (smaller) effects of receiving explanations on trust. Additionally, this potential influence on validity might have been made possible in the first place, or increased, by self-selection of participants. Those citizens who hold negative feelings towards the EnergieKnip perhaps decided to participate in the survey experiment to a disproportionally high degree, possibly because they wanted to voice their anger or disappointment in this way.

In conclusion, it can be said that the results of the survey experiment do not allow to give a conclusive answer to the main research question of this thesis. Nonetheless, this study yielded some unexpected but interesting findings with regards to citizens' attitudes towards the EnergieKnip which will be discussed next.

[15] Commonly values are interpreted as follows: r = 0,10 is seen as a small effect, r = 0,30 as a medium effect and r = 0,50 as a large effect (Field, 2013, p. 82).

5.2 Communication is key

The analysis of the open field comments revealed that even though the EnergieKnip is being considered a success by the municipality and developers, this view is not shared by all of the citizens, for different reasons. At least in some cases this seems to be based on a deeper feeling of discontent with the government, specifically in this case concerning the distribution of taxes, that translates to how they view a local project such as the EnergieKnip. Another reason is the fact that not everyone who filled out the questionnaires would necessarily receive the subsidy (because of a limited budget) and moreover, that this was not clearly communicated upfront. Communication in general, or rather the lack thereof, seems to be a major point that contributed to citizens' negative emotions and opinions. This becomes evident not only through the comments that show frustration, disappointment or confusion about not getting the subsidy but also in those that do not. For example, as described in section 4.2.3, in some comments it was said that there was no interest to participate in the EnergieKnip, and thus to fill out the questionnaires in the app, because citizens saw no benefit for them. As mentioned, one of the main objectives of the municipality with the EnergieKnip was to gather data on existing energy saving measures in the different neighbourhoods of Emmen that can be used to effectively design future energy saving policies. With this objective in mind, it would be beneficial for the municipality if as many citizens as possible fill out these questionnaires, even if they do not want to make use of the subsidy. In the app there is in fact also an option to 'give back' points that citizens received but do not want to use. Clear communication about this could thus have contributed to more citizens filling out the questionnaires and thus the municipality receiving more valuable data. A last issue were insufficient communication shows is the distribution strategy for invitations to participate in the EnergieKnip as mentioned in section 4.2.3. In conclusion, the main insight here is that communication, e.g., regarding the EnergieKnip's goals, the chosen distribution strategy and the available budget, is, also in this context, key for a successful outcome.

5.3 Scientific relevance and practical implications

Scientific relevance

In terms of scientific relevance, one aspect to mention concerns the results of the tests conducted to analyse whether participants' negative sentiments towards the EnergieKnip affect their trust in the project. As stated, the detected significant effects can be attributed to the affective foundations of trust. Importantly, the effects were fairly large. This demonstrates that the affective foundation of trust in this case seemingly had a rather strong influence on trust overall. Moreover, significant effects were found for 'integrity beliefs' and 'trusting intentions' but not for the other two trusting beliefs. In the literature, 'benevolence beliefs' and 'integrity beliefs' are sometimes seen as a reflection of affect-based trust rather than cognition-based trust and vice versa for 'ability beliefs' (Chopra & Wallace, 2003; Dimitriadis & Kyrezis, 2010). This is only partly supported by the results of this research, as there were significant effects on 'integrity beliefs' but not on 'benevolence beliefs'. Again, these results, that is the non-significant ones, have to be treated with caution, however, because of the low statistical power of the tests. With regards to the qualitative findings, these give valuable insights into what kind factors influence citizens' attitudes towards government and government projects. These were for example false expectations, feelings of being treated unfairly or the subjective mis- or disuse of taxes.

Practical implications

When it comes to practical implications for society or governments in particular, the qualitative findings emphasize most of all that for a public sector project such as the EnergieKnip to be received

positively by all those affected, it is important for the initiating party to make an effort to be as clear and open about the project as reasonably possible so that false expectations can be prevented. In the case of the Energieknip this concerns for example its shortcomings in terms of the limited budget and that this means that not everyone can get the subsidy, as well as the chosen distribution strategy by the municipality. Furthermore, the resentment towards people living in disadvantaged neighbourhoods and discontent with how subsidies are distributed shows that it might at times be beneficial for general citizen trust in government to try to find a way to also lessen the financial burden for those households that earn a medium income and are usually not seen as in need of government support, especially in economically difficult times like these, or to otherwise communicate to citizens that their needs are seen and will be addressed. Finally, the findings show that participants generally either do appreciate the use of blockchain technology for the EnergieKnip or at least did not mention this as a reason for their negative opinions. This is at least an indication that citizen generally have a neutral or even positive attitude towards blockchain technology and its use within government. Consequently, it is even more important that the success of projects involving blockchain technology is not hindered by factors such as a lack of communication. Otherwise, the promises of using blockchain technology may go unfulfilled.

5.4 Limitations and suggestions for future research

Arguably the main limitation of this research was the low number of participants. This limitation had several consequences. The first is that the conducted tests only had a very low power to detect any genuinely existing effects. Moreover, not only was the chance to detect genuinely existing effects low, but this also means that it cannot be ruled out that those kind of effects do not exist and thereby making it impossible to potentially falsify the hypotheses. Third, the low power naturally affected the manipulation check as well, which made it difficult to examine if the manipulation of the independent variable was successful. Last, because of the low sample size it was also not possible to conduct a factor analysis which would have been desirable to ensure validity of the study. Another limitation is the use of a convenience sample. The significant results that were detected therefore have a rather low external validity. Following both these limitations, one suggestion for future research is to repeat this study, or conduct a similar one, with both a sufficient sample size and a probability sample.

Another possibility for future research would be to differentiate explanations about the technological background of a blockchain based government project based on means used/types instead of based on the explanandum as in this study. As mentioned in chapter 2, past research indicates that this can be expected to influence citizen trust in such a project to different extents as well.

As discussed above, participants' rather negative attitudes towards the EnergieKnip had a negative influence on their trust in the EnergieKnip, negatively affecting the experiment's internal validity. In light of this issue, for future research on the use of blockchain technology in government or the public sector generally and citizen trust in this new technology and its use within the public, it might be favourable to construct the research design in way so that the object of trust is not the use case, such as the EnergieKnip, as a whole but instead purely blockchain technology and its usage in the use case. In this way, perhaps threats to internal validity such as in this study that have to do with factors unrelated to blockchain technology and its use itself can be prevented.

A final suggestion for future research pertains to the qualitative findings of this study. The insights revealed through the open field comments give a first indication concerning citizens' attitudes towards the EnergieKnip and the government more generally, and the reasons behind them. Future research

could further follow up on these findings through the use of qualitative methods, both in the specific context of the EnergieKnip and also with regards to government and government projects more generally.

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Appendix

Appendix A: Survey Experiment

English version

[Intro]

Hartelijk dank voor uw deelname aan dit onderzoek over het EnergieKnip project. Dit onderzoek is onderdeel van mijn masterscriptie binnen de opleiding Bestuurskunde aan de Universiteit van Tilburg en de gemeente Emmen is op de hoogte van ons onderzoek.

Dit onderzoek kijkt naar de mening van bewoners van Emmen over het EnergieKnip project. De resultaten zullen nuttig zijn voor een succesvolle uitvoering van dit soort projecten in de toekomst. Deelname aan dit onderzoek zal ongeveer 10 tot 15 minuten duren.

Privacy statement

Participation in this study is completely voluntary. You can stop taking the survey at any time. By clicking "continue" in the bottom right corner, you agree that your answers will be used for analysis in this study. The answers you provide will be treated confidentially and anonymously. Moreover, your answers will only be used for group level analyses. If you have any questions about the study, you can contact c.mohrmann@tilburguniversity.edu or g.meyers@tilburguniversity.edu.

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[Information about procedure of survey]

You will now be presented with information about the EnergieKnip project. After reading this information you will be asked to answer a few questions. Please read the provided information carefully.

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[Randomizer: random assignment to group]

[Vignette 1: Control group]

Information about the EnergieKnip

The EnergieKnip was initiated by the municipality of Emmen and makes use of **blockchain technology.** The EnergieKnip app was developed by the Blockchainlab Drenthe in cooperation with the municipality of Emmen.

Through the EnergieKnip app citizens were able to **answer questionnaires** about their homes, energy use and energy saving measures, and receive **50€ worth of vouchers** in the form of (digital) points which could then be used to buy energy saving products at local hardware stores. The vouchers were financed by a **subsidy** issued by the city council of Emmen to improve the energy efficiency of residential houses. The data collected through the questionnaires will **help the municipality to gather information** about the current energy saving measures in Emmen.

The following steps were taken to make sure that all data collected through the questionnaires is recorded anonymously and that your privacy is protected in line with GDPR:

1. **Data were collected on a neighbourhood level only**, meaning that it cannot be traced backed to individual households, only to specific neighbourhoods
2. **QR codes** needed to unlock the app were generated randomly and distributed randomly per neighbourhood, so that it is **not possible to identify a specific household** by means of the used QR code
3. **No personal data** (e.g. names, address, telephone number) were collected

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[Vignette 2: Treatment 1]

Information about the EnergieKnip project

The EnergieKnip was initiated by the municipality of Emmen and makes use of **blockchain technology**. The EnergieKnip app was developed by the Blockchainlab Drenthe in cooperation with the municipality of Emmen.

Through the EnergieKnip app citizens were able to **answer questionnaires** about their homes, energy use and energy saving measures, and receive **50€ worth of vouchers** in the form of (digital) points which could then be used to buy energy saving products at local hardware stores. The vouchers were financed through a **subsidy** that was provided by the national government to improve the energy efficiency of residential houses. The data collected through the questionnaires will **help the municipality to gather information** about the current energy saving measures in Emmen.

The following steps were taken to make sure that all data collected through the questionnaires is recorded anonymously and that all participants' privacy is protected in line with GDPR:

1. **Data were collected on a neighbourhood level only**, meaning that it cannot be traced backed to individual households, only to specific neighbourhoods
2. **QR codes** needed to unlock the app were generated randomly and distributed randomly per neighbourhood, so that it is **not possible to identify a specific household** by means of the used QR code
3. **No personal data** (e.g. names, address, telephone number) were collected

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What is a blockchain?

A blockchain is a **shared, immutable, and digital ledger through which transactions** between members of a network **can be tracked and recorded**. Transactions include **financial transactions**, such as payments with digital currency, but also the **exchange of important data** between two parties, such as property records.

The ledger is **shared** because all network members have access to it and because transactions are recorded by every member of the network instead of being recorded in one central place only.

A blockchain is **immutable** because a transaction cannot be changed or tampered with once it is recorded in the shared ledger.

For fast and safe transactions, a '**smart contract'** can be used. This means that a set of rules that define necessary conditions for a transaction to take place is stored on the blockchain and transactions are executed automatically only if these conditions are met.

These attributes are expected to make transactions **more transparent** and **less susceptible** to cyber-attacks or fraud.

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[Vignette 3: Treatment 2]

Information about the EnergieKnip

The EnergieKnip was initiated by the municipality of Emmen and makes use of **blockchain technology.** The EnergieKnip app was developed by the Blockchainlab Drenthe in cooperation with the municipality of Emmen.

Through the EnergieKnip app citizens were able to **answer questionnaires** about their homes, energy use and energy saving measures, and receive **50€ worth of vouchers** in the form of (digital) points which could then be used to buy energy saving products at local hardware stores. The vouchers were financed through a **subsidy** that was provided by the national government to improve the energy efficiency of residential houses. The data collected through the questionnaires will **help the municipality to gather information** about the current energy saving measures in Emmen.

The following steps were taken to make sure that all data collected through the questionnaires is recorded anonymously and that all participants' privacy is protected in line with GDPR:

1. **Data were collected on a neighbourhood level only**, meaning that it cannot be traced backed to individual households, only to specific neighbourhoods

2. **QR codes** needed to unlock the app were generated randomly and distributed randomly per neighbourhood, so that it is **not possible to identify a specific household** by means of the used QR code
3. **No personal data** (e.g. names, address, telephone number) were collected

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How is the EnergieKnip based on blockchain technology?

The points received for answering the questionnaires represent coins of a specifically for this project created and **blockchain based local currency** which can only be used for predefined products (energy saving products).

Transactions with these coins were recorded on the blockchain. They took place when:

- coins were sent to every participating households' **anonymous digital wallet (the eKNIP)** after completing the questionnaires
- coins were sent from the eKNIP **to a local retailer's digital wallet** in exchange for energy saving products

The households' digital wallets were unlocked by scanning the QR code that every household received randomly.

Through the QR code, every house or apartment has an **anonymous ID** which is stored on the blockchain together with the corresponding data received through the questionnaires.

The **local retailers** where the coins could be redeemed at, in turn received money (in Euros) from the municipality for coins spent at their stores as recorded on the blockchain.

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[Vignette 4: Treatment 3]

Information about the EnergieKnip project

The EnergieKnip was initiated by the municipality of Emmen and makes use of blockchain technology. The EnergieKnip app was developed by the Blockchainlab Drenthe in cooperation with the municipality of Emmen.

Through the EnergieKnip app citizens were able to **answer questionnaires** about their homes, energy use and energy saving measures, and receive **50€ worth of vouchers** in the form of (digital) points which could then be used to buy energy saving products at local hardware stores. The vouchers were financed through a **subsidy** that was provided by the national government to improve the energy

efficiency of residential houses. The data collected through the questionnaires will **help the municipality to gather information** about the current energy saving measures in Emmen.

The following steps were taken to make sure that all data collected through the questionnaires is recorded anonymously and that all participants' privacy is protected in line with GDPR:

1. **Data were collected on a neighbourhood level only**, meaning that it cannot be traced backed to individual households, only to specific neighbourhoods
2. **QR codes** needed to unlock the app were generated randomly and distributed randomly per neighbourhood, so that it is **not possible to identify a specific household** by means of the used QR code
3. **No personal data** (e.g. names, address, telephone number) were collected

--- page split ---

What is a blockchain?

A blockchain is a **shared, immutable, and digital ledger through which transactions** between members of a network **can be tracked and recorded**. Transactions include **financial transactions**, such as payments with digital currency, but also the **exchange of important data** between two parties, such as property records.

The ledger is **shared** because all network members have access to it and because transactions are recorded by every member of the network instead of being recorded in one central place only.

A blockchain is **immutable** because a transaction cannot be changed or tampered with once it is recorded in the shared ledger.

For fast and safe transactions, a '**smart contract'** can be used. This means that a set of rules that define necessary conditions for a transaction to take place is stored on the blockchain and transactions are executed automatically only if these conditions are met.

These attributes are expected to make transactions **more transparent** and **less susceptible** to cyber-attacks or fraud.

--- page split ---

How is the EnergieKnip based on blockchain technology?

The points received for answering the questionnaires represent coins of a specifically for this project created and **blockchain based local currency** which can only be used for predefined products (energy saving products).

Based on a smart contract, **transactions** took place and were recorded on the blockchain when:

- coins were sent to every participating households' **anonymous digital wallet (the eKNIP)** after completing the questionnaires
- coins were sent from the eKNIP **to a local retailer's digital wallet** in exchange for energy saving products

The households' digital wallets were unlocked by scanning the QR code that every household received randomly.

Through the QR code, every house or apartment has an **anonymous ID** which is stored on the blockchain together with the corresponding data received through the questionnaires.

The **local retailers** where the coins could be redeemed at, in turn received money (in Euros) from the municipality for coins spent at their stores as recorded on the blockchain.

--- page split ---

[Survey questions]

After reading the information about the EnergieKnip project, please answer the following questions:

[Trusting beliefs] (Likert scale 1 – 7)

To what extent do you agree or disagree with the following statements? There are no right or wrong answers.

[Benevolence]

1. I believe that the EnergieKnip is set up so as to meet my needs and interests as a citizen of Emmen.
2. I believe that for the EnergieKnip, measures have been taken to make participation secure.
3. I believe that participation in the EnergieKnip will not have any negative consequences for me.
4. I believe that the EnergieKnip is set up in good will regarding secure participation.

[Integrity]

1. I believe that the EnergieKnip is characterized by integrity.
2. I believe that the EnergieKnip keeps its promises.
3. I believe that the EnergieKnip is characterized by transparency.

[Ability]

1. I believe that the EnergieKnip project makes use of useful technology.
2. I believe that every aspect of the EnergieKnip is designed so as to function reliably.
3. I believe that the technology used for the EnergieKnip project functions effectively.

--- page split ---

[Trusting intentions] (Likert scale: 1 – 7)

To what extent do you agree or disagree with the following statements? There are no right or wrong answers.

1. If the ek is continued, I would feel comfortable participating (again).

2. I think I could always rely on the EnergieKnip's technology to handle any data collected in a secure manner.

3. I feel that I could count on the EnergieKnip to work as it is supposed to.

4. Should the municipality of Emmen launch a different project based on the same technology, I would most likely participate.

--- page split ---

[Manipulation check] (Likert scale: 1 – 5)

To what extent do the following statements apply to the information you just read about the EnergieKnip?

1. I learned something about the technological background of the EnergieKnip.

2. The technology on which the EnergieKnip is based on was explained in a sufficient way.

3. I understand how the EnergieKnip makes use blockchain technology.

4. I received sufficient information about the technology that is used for the EnergieKnip.

--- page split ---

[Control variables]

[Trusting stance; Trust in municipality] (Likert scale: 1 – 7)

To what extent do you agree or disagree with the following statements?

1. My typical approach is to trust new technologies until they prove to me that I shouldn't trust them.
2. I usually trust in technology until it gives me a reason not to trust it.

3. I generally give a technology the benefit of the doubt when I first use it.
4. In general, I trust the local government.

--- page split ---

[Demographic questions]

What is your gender?

- Man
- Woman
- Diverse
- Don't want to say

What is your year of birth?

What is your last reached level of education?

- Basisonderwijs
- VMBO, HAVO-, VWO-onderbouw, MBO-1
- HAVO, VWO, MBO-2, -3 of -4
- HBO-, WO-bachelor
- HBO-, WO-master, doctor
- Onbekend

--- page split ---

[Past participation in EnergieKnip]

Have you used the EnergieKnip app in the past? (e.g., to fill in questionnaires or to use point to buy energy saving products)

- Yes
- No
- I don't remember

[Open field feedback]

In case you have any remarks about this survey, you can mention them here.

--- page split ---

[Debriefing]

Thank you very much for taking part in this survey on the EnergieKnip.

Your help in this research contributes to learning how citizens of Emmen think about the EnergieKnip. This research tested the influence of the kind of explanation you received about the technological background of the EnergieKnip on your trust in the project. Because blockchain technology is expected to be used more and more in the public sector in the future, it is important to understand citizens' attitudes towards this technology and its use for public projects.

Importantly, the specific blockchain technology used for the EnergieKnip is characterised by very low energy consumption, which is why it was chosen for this project that aims to promote the use of energy-saving measures.

The answers you have given will be treated confidentially and anonymously. If you have further questions about the survey, please contact c.mohrmann@tilburguniversity.edu or g.meyers@tilburguniversity.edu.

Your answers have been saved, you can now close this window.

Dutch version

[**Intro**]

Hartelijk dank voor uw deelname aan dit onderzoek over de EnergieKnip. Dit onderzoek is onderdeel van mijn masterscriptie binnen de opleiding Bestuurskunde aan de Universiteit van Tilburg en de gemeente Emmen is op de hoogte van ons onderzoek.

Dit onderzoek kijkt naar de mening van bewoners van Emmen over de EnergieKnip. De resultaten zullen nuttig zijn voor een succesvolle uitvoering van dit soort projecten in de toekomst. Deelname aan dit onderzoek zal ongeveer 10 tot 15 minuten duren.

Privacyverklaring:

Deelname aan dit onderzoek is geheel vrijblijvend, en staat volledig los van de Energieknip zelf. U kunt op elk moment stoppen met het onderzoek. Door rechtsonder op 'verder' te klikken gaat u er mee akkoord dat uw antwoorden gebruikt worden voor analyse in dit onderzoek. De antwoorden die u geeft, zijn anoniem en zullen vertrouwelijk behandeld worden. Ook zullen uw antwoorden alleen worden gebruikt voor analyses op groepsniveau. Bij vragen over het onderzoek kunt u contact opnemen met c.mohrmann@tilburguniversity.edu of g.meyers@tilburguniversity.edu.

--- page split ---

[Information about procedure of survey]

U krijgt nu informatie over de EnergieKnip. Na het lezen van deze informatie wordt u gevraagd een aantal vragen te beantwoorden. Lees de verstrekte informatie zorgvuldig.

--- page split ---

[Randomizer: random assignment to group]

[Vignette 1: Control group]

Informatie over de EnergieKnip

De EnergieKnip is opgestart door de gemeente Emmen en maakt gebruik van **blockchain technologie**. De EnergieKnip app is ontwikkeld door het Blockchainlab Drenthe in samenwerking met de gemeente.

Met de EnergieKnip app kunnen inwoners **vragenlijsten beantwoorden** over hun huis of woning, energiegebruik en energiebesparende maatregelen, en **vouchers ter waarde van 50 euro in de vorm van (digitale) punten ontvangen** waarmee ze energiebesparende producten kunnen kopen bij plaatselijke bouwmarkten. De vouchers worden gefinancierd met een **subsidie** van de centrale overheid om de energie-efficiëntie van woonhuizen te verbeteren. De gegevens uit de vragenlijsten **helpen de gemeente informatie te verzamelen** over de huidige energiebesparende maatregelen in Emmen.

De volgende stappen werden ondernomen om ervoor te zorgen dat alle via de vragenlijsten verzamelde gegevens anoniem worden geregistreerd en dat de privacy van deelnemers wordt beschermd in overeenstemming met de Algemene verordening gegevensbescherming (AVG):

1. **De gegevens worden alleen op buurtniveau verzameld**, wat betekent dat de antwoorden niet kunnen worden herleid naar een person of adres, maar alleen naar specifieke buurten
2. **QR-codes** die nodig zijn om de app te ontgrendelen worden willekeurig gegenereerd en willekeurig per buurt verdeeld, zodat het **niet mogelijk is om een specifiek huishouden te identificeren** aan de hand van de gebruikte QR-code
3. Er worden **geen persoonlijke gegevens** (bv. namen, e-mailadres, telefoonnummer) verzameld

--- page split ---

[Vignette 2: Treatment 1]

Informatie over de EnergieKnip

De EnergieKnip is opgestart door de gemeente Emmen en maakt gebruik van **blockchain technologie**. De EnergieKnip app is ontwikkeld door het Blockchainlab Drenthe in samenwerking met de gemeente.

Met de EnergieKnip app kunnen inwoners **vragenlijsten beantwoorden** over hun huis of woning, energiegebruik en energiebesparende maatregelen, en **vouchers ter waarde van 50 euro in de vorm van (digitale) punten ontvangen** waarmee ze energiebesparende producten kunnen kopen bij plaatselijke bouwmarkten. De vouchers worden gefinancierd met een **subsidie** van de centrale overheid om de energie-efficiëntie van woonhuizen te verbeteren. De gegevens uit de vragenlijsten **helpen de gemeente informatie te verzamelen** over de huidige energiebesparende maatregelen in Emmen.

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1. **De gegevens worden alleen op buurtniveau verzameld**, wat betekent dat de antwoorden niet kunnen worden herleid naar een person of adres, maar alleen naar specifieke buurten
2. **QR-codes** die nodig zijn om de app te ontgrendelen worden willekeurig gegenereerd en willekeurig per buurt verdeeld, zodat het **niet mogelijk is om een specifiek huishouden te identificeren** aan de hand van de gebruikte QR-code
3. Er worden **geen persoonlijke gegevens** (bv. namen, e-mailadres, telefoonnummer) verzameld

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Wat is een blockchain?

Een blockchain is een **gedeeld, onveranderlijk en digitaal register waarin transacties** tussen actoren in een netwerk **kunnen worden getraceerd en geregistreerd.** Onder transacties **worden financiële**

handelingen verstaan, zoals betalingen met digitale munt, maar ook de **uitwisseling van cruciale gegevens** tussen twee partijen, zoals eigendomsbewijzen.

Het register is **gedeeld** omdat alle leden van het netwerk er toegang toe hebben en omdat transacties door elk lid van het netwerk worden geregistreerd in plaats van slechts op één centrale plaats.

Een blockchain is **onveranderlijk** omdat een transactie niet kan worden gewijzigd of gemanipuleerd zodra deze is geregistreerd in het gedeelde register.

Voor snelle en veilige transacties kan gebruik worden gemaakt van een **'smart contract'.** Dit houdt in dat **een reeks regels die de noodzakelijke voorwaarden voor een transactie definiëren**, wordt opgeslagen op de blockchain en dat transacties alleen automatisch worden uitgevoerd als aan deze voorwaarden is voldaan.

Er wordt verwacht dat deze eigenschappen de transacties transparanter zullen maken en minder vatbaar voor cyberaanvallen of fraude.

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[Vignette 3: Treatment 2]

Informatie over de EnergieKnip

De EnergieKnip is opgestart door de gemeente Emmen en maakt gebruik van **blockchain technologie**. De EnergieKnip app is ontwikkeld door het Blockchainlab Drenthe in samenwerking met de gemeente.

Met de EnergieKnip app kunnen inwoners **vragenlijsten beantwoorden** over hun huis of woning, energiegebruik en energiebesparende maatregelen, en **vouchers ter waarde van 50 euro in de vorm van (digitale) punten ontvangen** waarmee ze energiebesparende producten kunnen kopen bij plaatselijke bouwmarkten. De vouchers worden gefinancierd met een **subsidie** van de centrale overheid om de energie-efficiëntie van woonhuizen te verbeteren. De gegevens uit de vragenlijsten **helpen de gemeente informatie te verzamelen** over de huidige energiebesparende maatregelen in Emmen.

De volgende stappen werden ondernomen om ervoor te zorgen dat alle via de vragenlijsten verzamelde gegevens anoniem worden geregistreerd en dat de privacy van deelnemers wordt beschermd in overeenstemming met de Algemene verordening gegevensbescherming (AVG):

1. **De gegevens worden alleen op buurtniveau verzameld**, wat betekent dat de antwoorden niet kunnen worden herleid naar een person of adres, maar alleen naar specifieke buurten
2. **QR-codes** die nodig zijn om de app te ontgrendelen worden willekeurig gegenereerd en willekeurig per buurt verdeeld, zodat het **niet mogelijk is om een specifiek huishouden te identificeren** aan de hand van de gebruikte QR-code
3. Er worden **geen persoonlijke gegevens** (bv. namen, e-mailadres, telefoonnummer) verzameld

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Hoe maakt de EnergieKnip gebruik van blockchain technologie?

De punten die worden ontvangen voor het beantwoorden van de vragenlijsten vertegenwoordigen munten van een speciaal voor de EnergieKnip gecreëerde en **op de blockchain gebaseerde lokale munt** die aan slechts één doeleinde (energiebesparende producten) kon worden uitgegeven.

Transacties met deze munten worden geregistreerd op de blockchain. Deze transacties vinden plaats wanneer:

- munten worden bezorgd **aan de anonieme digitale portemonnee (de eKNIP)** van elk deelnemend huishouden na het invullen van de vragenlijsten
- munten werden overgemaakt van de eKNIP van een huishouden **naar de digitale portemonnee van een plaatselijke handelaar** in ruil voor energiebesparende producten

De digitale portemonnees van de huishoudens werden ontgrendeld door de QR-code te scannen die elk huishouden willekeurig had ontvangen.

Via de QR-code heeft elke woning een **anonieme ID** die wordt geregistreerd op de blockchain samen met de bijbehorende gegevens die via de vragenlijsten zijn ontvangen.

De **plaatselijke handelaren** waar de munten kunnen worden ingewisseld, ontvangen op hun beurt geld (in euro) van de gemeente voor munten die in hun bouwmarkten werden uitgegeven, zoals geregistreerd op de blockchain.

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[Vignette 4: Treatment 3]

Informatie over de EnergieKnip

De EnergieKnip is opgestart door de gemeente Emmen en maakt gebruik van **blockchain technologie**. De EnergieKnip app is ontwikkeld door het Blockchainlab Drenthe in samenwerking met de gemeente.

Met de EnergieKnip app kunnen inwoners **vragenlijsten beantwoorden** over hun huis of woning, energiegebruik en energiebesparende maatregelen, en **vouchers ter waarde van 50 euro in de vorm van (digitale) punten ontvangen** waarmee ze energiebesparende producten kunnen kopen bij plaatselijke bouwmarkten. De vouchers worden gefinancierd met een **subsidie** van de centrale overheid om de energie-efficiëntie van woonhuizen te verbeteren. De gegevens uit de vragenlijsten **helpen de gemeente informatie te verzamelen** over de huidige energiebesparende maatregelen in Emmen.

De volgende stappen werden ondernomen om ervoor te zorgen dat alle via de vragenlijsten verzamelde gegevens anoniem worden geregistreerd en dat de privacy van deelnemers wordt beschermd in overeenstemming met de Algemene verordening gegevensbescherming (AVG):

1. **De gegevens worden alleen op buurtniveau verzameld**, wat betekent dat de antwoorden niet kunnen worden herleid naar een person of adres, maar alleen naar specifieke buurten

2. **QR-codes** die nodig zijn om de app te ontgrendelen worden willekeurig gegenereerd en willekeurig per buurt verdeeld, zodat het **niet mogelijk is om een specifiek huishouden te identificeren** aan de hand van de gebruikte QR-code
3. Er worden **geen persoonlijke gegevens** (bv. namen, e-mailadres, telefoonnummer) verzameld

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Wat is een blockchain?

Een blockchain is een **gedeeld, onveranderlijk en digitaal register waarin transacties** tussen actoren in een netwerk **kunnen worden getraceerd en geregistreerd.** Onder transacties **worden financiële handelingen** verstaan, zoals betalingen met digitale munt, maar ook de **uitwisseling van cruciale gegevens** tussen twee partijen, zoals eigendomsbewijzen.

Het register is **gedeeld** omdat alle leden van het netwerk er toegang toe hebben en omdat transacties door elk lid van het netwerk worden geregistreerd in plaats van slechts op één centrale plaats.

Een blockchain is **onveranderlijk** omdat een transactie niet kan worden gewijzigd of gemanipuleerd zodra deze is geregistreerd in het gedeelde register.

Voor snelle en veilige transacties kan gebruik worden gemaakt van een **'smart contract'.** Dit houdt in dat **een reeks regels die de noodzakelijke voorwaarden voor een transactie definiëren**, wordt opgeslagen op de blockchain en dat transacties alleen automatisch worden uitgevoerd als aan deze voorwaarden is voldaan.

Er wordt verwacht dat deze eigenschappen de transacties transparanter zullen maken en minder vatbaar voor cyberaanvallen of fraude.

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Hoe maken de EnergieKnip project en app gebruik van blockchain technologie?

De punten die worden ontvangen voor het beantwoorden van de vragenlijsten vertegenwoordigen munten van een speciaal voor de EnergieKnip gecreëerde en op de **blockchain gebaseerde lokale munt** die aan slechts één doeleinde (energiebesparende producten) kon worden uitgegeven.

Op basis van een **‘smart contract’** vinden transacties met deze munten plaats en worden op de blockchain geregistreerd wanneer:

- munten worden bezorgd **aan de anonieme digitale portemonnee (de eKNIP)** van elk deelnemend huishouden na het invullen van de vragenlijsten
- munten worden overgemaakt van de eKNIP van een huishouden **naar de digitale portemonnee van een plaatselijke handelaar** in ruil voor energiebesparende producten

De digitale portemonnees van de huishoudens werden ontgrendeld door de QR-code te scannen die elk huishouden willekeurig had ontvangen.

Via de QR-code heeft elke woning een **anonieme ID** die wordt geregistreerd op de blockchain samen met de bijbehorende gegevens die via de vragenlijsten zijn ontvangen.

De **plaatselijke handelaren** waar de munten kunnen worden ingewisseld, ontvangen op hun beurt geld (in euro) van de gemeente voor munten die in hun bouwmarkten werden uitgegeven, zoals geregistreerd op de blockchain.

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[Survey questions]

Na het lezen van de informatie over de EnergieKnip, gelieve te antwoorden op de volgende vragen:

[Trusting beliefs] (Likert scale: 1 – 7)

In hoeverre bent u het eens met de volgende stellingen? Er zijn geen goede of foute antwoorden.

[Benevolence]
1. Ik vind dat de EnergieKnip zo is opgezet dat het voldoet aan mijn behoeften en belangen als inwoner van Emmen.
2. Ik vind dat er voor de EnergieKnip maatregelen zijn genomen om deelname veilig te maken.
3. Ik denk dat deelname aan de EnergieKnip **geen** negatieve gevolgen voor mij zal hebben.
4. Ik denk dat de EnergieKnip met goede bedoelingen is opgezet om een veilig gebruik te garanderen.

[Integrity]
1. Ik vind dat de EnergieKnip gekenmerkt wordt door integriteit.
2. Ik denk dat de EnergieKnip zijn beloften nakomt.
3. Ik vind dat de EnergieKnip gekenmerkt wordt door transparantie.

[Ability]
1. Ik vind dat de EnergieKnip gebruik maakt van nuttige technologie.
2. Ik denk dat elk aspect van de EnergieKnip zo is opgezet dat het betrouwbaar werkt.
3. Ik denk dat de voor de EnergieKnip gebruikte technologie doeltreffend functioneert.

--- page split ---

[Trusting intentions] (Likert scale: 1 – 7)

In hoeverre bent u het eens met de volgende stellingen? Er zijn geen goede of foute antwoorden.

1. Als de EnergieKnip wordt voortgezet, zou ik graag (opnieuw) meedoen.
2. Ik denk dat ik altijd kon vertrouwen op de EnergieKnip's technologie om alle verzamelde gegevens op een veilige manier te behandelen.
3. Ik heb het gevoel dat ik erop kan rekenen dat de EnergieKnip werkt zoals het hoort te werken.

4. Mocht de gemeente Emmen een ander project starten op basis van dezelfde technologie, dan zou ik zeer waarschijnlijk meedoen.

--- page split ---

[Manipulation check] (Likert scale: 1 – 5)

In hoeverre zijn de volgende stellingen van toepassing op de door u gelezen informatie over de EnergieKnip?

1. Ik heb iets geleerd over de technologische achtergrond van de EnergieKnip.
2. De technologie waarop de EnergieKnip is gebaseerd, werd duidelijk uitgelegd.
3. Ik begrijp hoe de EnergieKnip gebruik maakt van blockchaintechnologie.
4. Ik kreeg voldoende informatie over de technologie die gebruikt wordt voor de EnergieKnip.

--- page split ---

[Control variables]

[Trusting stance; Trust in municipality] (Likert scale: 1 – 7)

In hoeverre bent u het eens met de volgende stellingen?

1. Mijn plan is doorgaans om nieuwe technologieën te vertrouwen totdat bewezen wordt dat ik ze niet moet vertrouwen.

2. Ik heb meestal vertrouwen in technologie totdat het me een reden geeft om het niet te vertrouwen.

3. Over het algemeen geef ik een technologie het voordeel van de twijfel wanneer ik dit voor het eerst gebruik.

4. In het algemeen vertrouw ik de lokale overheid.

--- page split ---

[Demographic questions]

Wat is uw geslacht?

- Man
- Vrouw
- Anders
- Zeg ik liever niet

Wat is uw geboortejaar?

Wat is uw laatst behaalde onderwijsniveau?

- Basisonderwijs
- VMBO, HAVO-, VWO-onderbouw, MBO-1
- HAVO, VWO, MBO-2, -3 of -4
- HBO-, WO-bachelor
- HBO-, WO-master, doctor
- Onbekend

[Past participation in EnergieKnip]

Heeft u de EnergieKnip app al gebruikt? (bv. door het invullen van vragenlijsten of door punten te gebruiken om energiebesparende producten te kopen)

- Ja
- Nee
- Weet ik niet meer
- Zeg ik liever niet

--- page split ---

[Open field feedback]

Indien u nog opmerkingen heeft over dit onderzoek, vult u deze dan hieronder in.

--- page split ---

[Debriefing]

Hartelijk bedankt voor uw deelname aan het onderzoek over de EnergieKnip.

Uw deelname aan dit onderzoek draagt bij om te leren hoe burgers van Emmen denken over de EnergieKnip. In dit onderzoek is getest wat de invloed is van het soort uitleg dat u heeft gekregen over de technologische achtergrond van de EnergieKnip op uw vertrouwen in de EnergieKnip. Omdat verwacht wordt dat blockchain technologie in de toekomst steeds meer gebruikt zal worden in de publieke sector, is het belangrijk om de houding van burgers over deze technologie en het gebruik ervan voor publieke projecten te begrijpen.

Belangrijk is dat de specifieke blockchaintechnologie die voor de EnergieKnip wordt gebruikt, wordt gekenmerkt door een zeer laag energieverbruik, en daarom is gekozen voor de EnergieKnip, dat het gebruik van energiebesparende maatregelen wil bevorderen.

De antwoorden die u gegeven heeft, zijn anoniem en zullen vertrouwelijk behandeld worden. Bij verdere vragen over het onderzoek kunt u contact opnemen met c.mohrmann@tilburguniversity.edu of g.meyers@tilburguniversity.edu.

U mag dit venster sluiten.

Appendix B: Invitation letter

English version

Short survey about Emmen EnergieKnip. Participants needed!

Dear residents of Emmen,

We are conducting a study about the EnergieKnip that was initiated by the municipality of Emmen this year. This study is part of my master's thesis within the program of Public Governance at Tilburg University. The municipality of Emmen has been informed about this study.

For this study, we would like to invite you to complete a short questionnaire by Monday June 6th, which will take around 7-12 minutes. You can fill in the questionnaire by scanning the QR code below or by visiting this website: bit.ly/energieknip (or the long link below). All adult members of this household may fill this out.

The purpose of this study is to gain insight into residents' opinion about the EnergieKnip. The results will be useful for successful implementation of future projects of this kind.

Participation in this survey is completely voluntary and anonymous, and is independent of the Energieknip itself. In case of any questions about the survey, please contact us by e-mail (c.mohrmann@tilburguniversity.edu or g.meyers@tilburguniversity.edu) or by phone.

Thank you very much in advance for your cooperation,

Christin Mohrmann

Dr. Gert Meyers, Supervisor (013 466 4584)

Dutch version

TILBURG UNIVERSITY

Korte vragenlijst over de EnergieKnip Emmen. Deelnemers gezocht!

Beste inwoner van Emmen,

We voeren een onderzoek uit naar de EnergieKnip die dit jaar door de gemeente Emmen is opgestart. Dit onderzoek is onderdeel van mijn masterscriptie binnen de opleiding Bestuurskunde aan de Universiteit van Tilburg. De gemeente Emmen is op de hoogte van ons onderzoek.

Voor dit onderzoek willen we u uitnodigen om voor maandag 6 juni een korte vragenlijst in te vullen, wat 7-12 minuten zal duren. U kan de vragenlijst invullen door de QR code hieronder te scannen of deze website te bezoeken: bit.ly/energieknip (of de lange link hieronder). Alle volwassenen leden van dit huishouden mogen dit invullen.

Het doel van dit onderzoek is om inzicht te krijgen in de mening van bewoners over de EnergieKnip. De resultaten zullen nuttig zijn voor het succesvol opzetten van dit soort projecten in de toekomst.

Deelname aan dit onderzoek is geheel vrijblijvend en anoniem, en staat los van de Energieknip zelf. Bij vragen over het onderzoek kunt u ons per mail (c.mohrmann@tilburguniversity.edu of g.meyers@tilburguniversity.edu) of telefonisch contacteren.

Alvast erg bedankt voor uw medewerking,

Christin Mohrmann

Dr. Gert Meyers, Supervisor (013 466 4584)

SCAN ME

Link: tilburglawschool.eu.qualtrics.com/jfe/form/SV_0cerAX4stJ5PkTI

Appendix C: Participants' comments (English translations in brackets)

Participant 1
Blockchain en de app zijn helemaal prima, maar waarom rolt de gemeente Emmen het uit, terwijl het geld direct op is? Ik zit al 3 maanden te wachten tot het geld vrij komt. Waardeloos.

[Blockchain and the app are great, but why is the municipality of Emmen rolling it out, when the money is spent immediately? I have been waiting for 3 months for the money to become available. Worthless.]

Participant 3
Onze wijk heeft nooit gebruik kunnen maken van de actie. Alle vragen netjes ingevuld maar nooit de punten gekregen. Op het moment dat wij de brief kregen was het aantal punten al lang verdeeld onder andere wijken.

[Our neighbourhood has never been able to make use of the action. We filled in all the questions, but we never received the points. At the time we received the letter, the number of points had long since been distributed in other neighbourhoods.]

Participant 7
EnergieKnip voldoet. Mooie blockchain oplossing. Hiaten in deze uitvoering waren mijn inziens echter :
- beperkt budget vanuit de gemeente waardoor niet iedere burger aanspraak kon maken. Hierdoor ontvingen burgers in bepaalde woonwijken in eerste instantie geen QR code terwijl initieel anders was gecommuniceerd.
- Oplossing is (op dit moment) niet meest ideaal voor doelstelling alle burgers binnen de gemeente de mogelijkheid te geven te participeren. Dit vanwege afhankelijkheid smartphone en basiskennis IT.

[EnergieKnip works. Nice blockchain solution. However, shortcomings in this implementation were, in my opinion:
- Limited budget from the municipality so that not every citizen could make use of it. As a result, citizens in certain neighbourhoods did not receive a QR code in the beginning, while it had initially been communicated otherwise.
- The solution is (currently) not the most ideal for giving all citizens within the municipality the opportunity to participate. This is due to dependence on smartphones and basic IT knowledge.]

Participant 8
Voordat ik er gebruik van kon maken was het budget al leeg dus spijtig geen enkel pakket kunnen aanschaffen. Budget was weer veel te laag en dus onvoldoende.

[Before I could make use of it, the budget was already spent, so unfortunately I could not buy any package. Budget was again far too low and therefore insufficient.]

Participant 10
Op het moment dat ik de kaart binnenkreeg kon ik al nergens gebruik van maken. Waarom sturen jullie die kaart dan nog? Iemand blij maken met een dode mus. Jammer!!!

[When I received the card, I could already not use it anymore. So why do you still send it? Making someone happy with a dead sparrow. That's a shame!!!]

Participant 14.
De pot is ieder keer leeg als men het opzoekt. Waardeloos van de gemeente Emmen.

[The pot is empty every time you check it out. Worthless from the municipality of Emmen.]

Participant 18
Onderzoek prima, maar projekt Energieknip waardeloos.

[Study is great but project EnergieKnip worthless.]

Participant 19
Ik heb de vragen ingevuld maar er worden geen punten toegekend , al 6 wkn niet. Geen idee of de energie knip werkt.

[I have filled in the questions but no points are awarded, not for 6 weeks. No idea if the EnergieKnip works.]

Participant 20
Ik woon in een appartement met energielabel A. Eerder heb ik al provinciale subsidie gebruikt voor LED lampen. Ik had liever gezien dat de brieven gestuurd waren naar woningen met slechte isolatie. Aan deze subsidie had ik niets.

[I live in a flat with energy label A. I have previously used provincial subsidies for LED lamps. I would have preferred the letters to have been sent to homes with poor insulation. This subsidy was of no use to me.]

Participant 23
Op voorhand verloren energie. 50 euro per gezin. Budget nog niet voor 20 procent. 80 procent van de inwoners staat in de kou. Budget alreeds voor de 2e keer op terwijl er toch de energieknip app wordt rondgestuurd. Energieknip Emmen slaat helemaal nergens op. Mensen blij maken met een dood vogeltje ofwel een lege spaarpot. Belachelijk en dan ook nog een heel radio programma [*sic*] eraan wijden hoe goed het wel niet werkt. Belachelijke actie doordat het niet voor iedereen geldt en het budget ofwel de pot met subsidie door de gemeente zogenaamd wordt verdeeld in de achterstands [*sic*] wijken. En wie gaat dat betalen?. Schaf alle soorten van subsidies aub af !!!!!

[Energy lost in advance. 50 euros per family. Budget not even for 20 per cent. 80 percent of residents are out in the cold. Budget already used up for the 2nd time while the Energieknip app is sent around. EnergieKnip Emmen is completely nonsense. Making people happy with a dead bird or an empty coin bank. Ridiculous, and then even devoting a whole radio programme to it to show how well it works. Ridiculous initiative because it does not apply to everyone and the budget or the pot with subsidy is distributed by the municipality in the so-called disadvantaged neighbourhoods. And who is going to pay for that? Please abolish all kinds of subsidies !!!!!]

Participant 26
Alle vragen beantwoord, vraagstelling alleen over technologie heeft met de energieknip niet veel te maken. Ik denk dat als je mee wilt doen je de vragenlijst beantwoord en je verder niet bekommerd om de texhniek [*sic*] die er achter zit.
Een onduidelijkheid in deze knip vind ik, dat als je de benodigde punten hebt gescoord en je wil de voucher hebben, dan is alles ineens op en hoe dan verder.....?

[All questions answered, questions only about technology has not much to do with the EnergieKnip. I think that if you want to participate, you answer the questionnaire and don't worry about the technology behind it.
One uncertainty in this knip, I think, is that if you have scored the required points and you want the voucher, then all of a sudden everything is gone and then what .....?]

Participant 28.
Nooit bericht over gehad om mee te mogen doen.

[Never received any message to participate.]

Participant 30
Wij kregen de brief over de energieknip en zijn meteen aan de gang gegaan. Maar tot onze verbazing kregen wij niet 1 punt of munt.
We hebben met ge [*sic*] gemeente hierover gebeld en kregen te horen dat mensen uit minder bedeelde wijken de punten en munten hebben gekregen en dat het geld nu op is.
Als ze dit dan van plan zijn, waarom sturen ze dan iedereen een brief. En maken ze je blij met een dooie mus.
Mensen met een uitkering leven van ons belasting geld, krijgen allerlei subsidies , 800 euro voor de hoge energie en nu ook nog dit voordeeltje.
Wij hebben een midden inkomen en moeten alles zelf ophoesten. Ook het isoleren en straks een warmtepomp en wat nog meer.
Dan zou het voor ook leuk zijn om eens een voordeeltje te hebben zoals bijvoorbeeld de energieknip.

[We received the letter about the EnergieKnip and immediately went to work. But to our surprise, we did not get 1 point or coin.
We phoned the municipality and were told that people from disadvantaged neighbourhoods had been given the points and coins and that the money had now run out.
If this is their intention, why do they send a letter to everyone. And make you happy with a dead sparrow.
People on benefits live off our taxes, get all kinds of subsidies, 800 euros for the high energy and now this benefit as well.
We have a moderate income and have to cough it all up ourselves. Also the insulation and later a heat pump and what else.
Then it would be nice for [us] too to have a benefit for once, such as the EnergieKnip.]

Participant 32
Geen opmerking over dit onderzoek. Wel over de knip. Dar zit geen budget meer in om te besteden. Als je alles ingevuld hebt, krijg je niets. Heb de app gewist.

[No comment on this study. About the EnergieKnip, though. There is no budget left to spend. If you have filled in everything, you get nothing. Have deleted the app.]

Participant 33
Ik heb met name niet meegedaan met deze actie, omdat er al zoveel is gedaan op dit gebied in mijn huis (appartement), zodat ik niet weet wat nog meer te doen.

[I did not participate in this action in particular because so much has already been done in this area in my house (flat) that I do not know what else to do.]

Participant 34
Pure rechtsongelijkheid: Direct de enquetelijsten ingevuld na ontvangst van de flyer en alle punten waren al verdeeld. Ik doe nooit meer mee aan dergelijke onzininitiatieven en wil dat alle ingevulde antwoorden verwijdert worden.

[Pure inequality: I filled in the questionnaires immediately after receiving the flyer and all the points had already been distributed. I will never again take part in such nonsense initiatives and want all filled in answers to be deleted]

Participant 38
In mijn appartement (bouwjaar [year]) nauwelijks zinvolle mogelijkheden tot besparing van energie. Daarom geen interesse in het aanbod van de gemeente Emmen.

[In my flat (built in [year]) there are hardly any sensible possibilities to save energy. Therefore, I am not interested in the offer from the municipality of Emmen.]

Appendix D: Descriptive statistics for demographic variables of the sample

Year of birth	Frequency	Percentage (%)
≤ 1949	9	22,5
1950 - 1959	11	27,5
1960 - 1969	4	10,0
1970 - 1979	6	15,0
1980 - 1989	5	12,5
≥ 1990	2	5,0
Missing	3	7,5

Table 7: Year of birth respondents

Education level	Frequency	Percentage (%)
Basisonderwijs (primary school)	1	2,5
VMBO, HAVO-, VWO-onderbouw, MBO-1	4	10,0
HAVO, VWO, MBO-2, -3 of -4	11	27,5
HBO-, WO-bachelor	16	40,0
HBO-, WO-master, doctor	8	20,0

Table 8: Education level respondents