Association for Information Systems
AIS Electronic Library (AISeL)

2015

Trust in Digital Currency Enabled Transactions Model

Alex Zarifis
University of Mannheim,Germany, azarifis@mail.uni-mannheim.de

Xusen Cheng
University of International Business and Economics, China., xusen.cheng@gmail.com

Salomi Dimitriou
University of Nicosia, Cyprus,, s.dimitriou@unic-online.com

Leonidas Efthymiou
University of Nicosia, Cyprus,, l.efthymiou@unic-online.com

Follow this and additional works at: http://aisel.aisnet.org/mcis2015

Trust in Digital Currency Enabled Transactions Model

Completed Research

Alex, Zarifis, University of Mannheim, Mannheim, Germany, azarifis@mail.uni-mannheim.de

Xusen, Cheng, University of International Business and Economics, School of Information Technology and Management, Department of E-Business, Beijing, China, xusen.cheng@gmail.com

Salomi, Dimitriou, University of Nicosia, UNIC Online, Nicosia, Cyprus, s.dimitriou@unic-online.com

Leonidas, Efthymiou University of Nicosia, UNIC Online, Nicosia, Cyprus, l.efthymiou@unic-online.com

Abstract

This research extends theories of trust from e-commerce to incorporate digital currencies. In particular trust in business to consumer e-commerce transactions carried out using digital currencies such as Bitcoin is explored. A model of online trust is considered to be valid in this different transaction context but the significance of each construct changes and some extensions are necessary. The role of institutional trust in transactions has differences that are explored and new constructs are suggested. These new constructs are incorporated into a new digital currency enabled transactions trust model. The results support the validity of the role of the rate of adoption and reputation of digital currencies as part of situational normality. The nature of the digital currency itself, the digital currency payment system, the payment intermediary, the digital currency P2P infrastructure, self-imposed and external regulation are also considered valid as part of structural assurance. These findings can be used by those developing the related technology, the vendors and regulatory institutions to increase consumer trust in digital currency enabled transactions in order to extend adoption and use.

Keywords: Digital currency, trust, Bitcoin, e-commerce, business to consumer.

1 Introduction

While there are a number of perspectives on what constitutes a digital currency the most widely adopted view which is also the one used in this research is that they allow the transfer of value online without a traditional bank being involved (Hett, 2008). The terms cryptocurrencies and virtual currencies are also used but they have a technology and virtual world bias respectively. Current research into digital currencies can be separated into three threads. The main focus of the media, practitioners and research (Sapuric and Kokkinaki, 2014; Hayes 2015) has been on the value of one such digital currency Bitcoin, considering this an important indicator of these currencies success. A second research thread is developing the underlying technology (Gjermundrod and Dionysiou, 2014; Verbücheln, 2015). A third thread, which this research is part of, attempts to explore and better understand the inherent functionality and value of this technology (Giaglis and Kypriotaki, 2014; Zarifis et al. 2014) considering the functionality and value as the deciding factors in their adoption in some shape or form (Internal Revenue Service, 2014). While the current price of Bitcoin depends on the actions of certain organizations and individuals the inherent characteristics are not and may therefore be a better medium and long term predictor of adoption.

This research attempts to better understand consumer trust in transactions using digital currencies so that our understanding of one of the inherent characteristics of this technology is developed. The consumer's perspective and level of trust in a technology is an important factor in the level of its adoption particularly when there is some financial risk. This paper develops previous research (Zarifis et al. 2014) which was more exploratory using qualitative methods by applying a quantitative data collection and analysis. The quantitative data collection was guided by the previous findings (Zarifis et al. 2014).

2 Digital Currency Enabled Transactions

There are a number of digital currencies in addition to Bitcoin including Litecoin, Ripple, Anything Point, Facebook Credits, Amazon Coin and Linden dollars. This research chose Bitcoin to explore but the findings should be relevant to other digital currencies also. Bitcoin, like Litecoin and Ripple, is both a currency and a transaction system (Nakamoto, 2009). Furthermore these three currencies are not limited to a specific environment (Akins et al. 2013) in the way Linden dollars can only be used in Second Life. For the consumer to use Bitcoin they need to have an internet connection, a user version of the Bitcoin software known as Bitcoin wallet and another user such as a retailer willing to carry out a transaction. The transaction is either at a minimal fee or no cost. The significantly lower cost in comparison to transactions implemented by traditional banks is one of the main factors that is attractive to consumers.

When the consumer considers collaborating online trust is an important factor. Trust becomes an even more decisive factor when making a transaction online (Jarvenpaa et al. 1998; O'Brien, 2000; Bhattacherjee 2002). Trust is considered to have two components trusting beliefs and trusting behavior (McKnight et al. 1998; Pearce, 2007). In addition to this psychological dimension of trust there is also a more sociological dimension that includes institution based trust. Institution based trust refers to the trust in the institutions involved in the transaction such as a regulator, a government or a bank card provider (McKnight et al. 1998).

Trust in digital currency enabled transactions includes the issues related to trust in online transactions. Therefore the research in the area of online trust should be applicable. In addition to being an online transaction however it has some different characteristics and a partly different context due to the use of

digital currencies and therefore warrants particular attention. Previous research (Zarifis et al. 2014) attempted to explore trust in this area and adapt an existing model to this different context.

3   Digital Currency Trust Model

The model proposed and explored in the first qualitative stage of this research (Zarifis et al. 2014) is a development of a widely adopted trust model (McKnight et al. 2002) and shows constructs of trust and their relationships. The model combines constructs applicable to trust in all online transactions such as the general web experience (McKnight et al. 2002) with constructs specific to digital currencies such as the digital currency payment system (Zarifis et al. 2014).
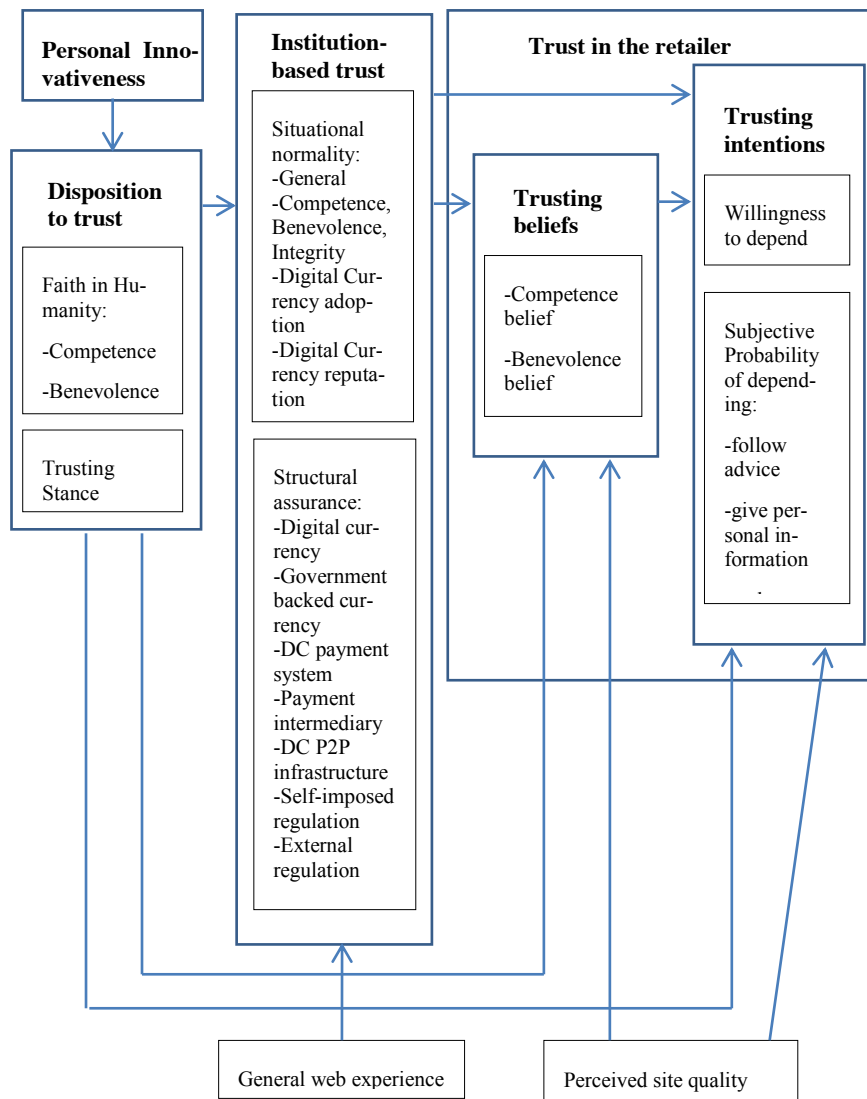

Figure 1. Digital currency enabled transactions trust model (Zarifis et al. 2014), an extension of the web trust model (McKnight et al. 2002).

The overarching constructs of the model personal innovativeness, disposition to trust, institution based trust, trusting beliefs, trusting intentions, general web experience and perceived site quality remain the same. These overarching constructs along with the original model have been validated extensively and are therefore a strong basis to develop and extend into the different context. These constructs had been first used in other disciplines before being applied to offline business to consumer commerce. They were then extended to the online context in a similar way to which they are being extended here to a partially different context.

Previous exploratory research (Zarifis et al. 2014) suggested that the constructs of personal innovativeness, disposition to trust, trusting beliefs, trusting intentions, general web experience and perceived site quality remained unchanged and valid for digital currency enabled transactions. These constructs are related to the psychology of the consumer and the online context so it is reasonable for them not to change as they are similar in the different context of digital currencies.

The differences identified to be explored further were in the area of institution based trust both in situational normality and structural assurance. The sociological dimension of institutional trust is posited to be significantly different to online transactions without digital currencies. Institutional trust is defined as the environment and institutions that shape and influence it (McKnight et al. 1998). For digital currency enabled transactions the environment is the internet. While the role of institutional trust has been researched extensively it is of particular interest for digital currencies because institutions that shape them are very different to the government organizations and private companies that shape other online payments such as by bank card.

Situational normality refers to the environment being perceived to conform to what is expected and to be conducive to a positive outcome. It has six sub-constructs. The first, general structural normality, refers to the prevalent conditions on the internet in relation to security and the degree to which expectations will be met. The degree to which the consumer considers the related institutions as competent, benevolent and acting with integrity reinforces situational normality. The degree of digital currency adoption can influence the consumer. This is related to the diffusion of innovation as consumers with different characteristics adopt an innovation depending on the degree and stage of the adoption of that innovation in general (Rogers, 1962). The last sub-construct, digital currency reputation from the consumer's perspective, can be influenced by a numbers of factors including reports in the media and word of mouth. The trajectory of a digital currency value in relation to other currencies, security breaches, successes or failures of organizations active in this area and developments in the regulatory framework can impact the reputation.

Structural assurance refers to the related regulations, laws and guarantees. Given the relatively immature area digital currencies exist in, these are both influential and changeable. From the consumers perspective there are similarities between the issues influencing situational normality and structural assurance but the former is more fluid and abstract while the latter is more rigid. This construct has seven sub-constructs. The first sub-construct focuses on the currency characteristics, not the technology. As digital currencies are an alternative to government backed currencies the structural assurance in both influences the level of trust in the former. The second sub-construct, the digital currency payment system, can be explored separately as it faces different challenges and competitors. The payment intermediary can fulfil the function of the payment but also act as a reputable independent third party reinforcing the consumers trust in a successful transaction. Digital currency peer-to-peer infrastructure can also be considered separately as it is the platform of the technology and fundamentally different to alternative currencies and payment systems. Self-imposed regulation is a factor as it is a way to mitigate the negative influence of the incomplete, immature and changeable current level of regulation.

The last sub-construct external regulation to the degree which it exists in different countries can influence the consumer.

4   Method

While the research this paper develops (Zarifis et al. 2014) was exploratory and led to proposing some extensions to a model of trust to cater for this context this paper attempts to validate that proposed model. The data was collected by questionnaires. The participants had made online purchases but had not necessarily used Bitcoin. It was considered that a sample from current Bitcoin users which would share characteristics of technology savvy early adopters would be less representative of consumers in general. The limitation here is the varying exposure to this immature technology that the participants would have. This is a point in the method where gauging the consumers' perspective was preferred over a more typical human computer interaction focused experimental approach. The questionnaire adapted scales from similar research on trust (McKnight et al. 2002; Wrightsman, 1991; Dobing et al. 1993) and the participant responses were recorded on a 7-point Likert scale. Participants were recruited online and were mostly from Europe and North America. The participants were volunteers and no payment was given.

The analysis was in three stages covering convergent, discriminant and nomological validity. These three parameters would give us construct validity (Bagozzi et al. 1991). The methods used were Principal Component Analysis, Confirmatory Factor Analysis and lastly Second-Order Models. Principle Component Analysis would show us whether the constructs were discriminant. As these construct had been explored in the qualitative phase in earlier research (Zarifis et al. 2014) there were strong indications of the validity of the model's constructs but as the previous sample was small the generalizability of the findings could not be claimed. Confirmatory Factor Analysis was implemented with Structural Equation Modeling to evaluate the convergent and discriminant validity of the sub-constructs. Lastly Second-Order Models were used to evaluate the relationships across constructs with LISREL 9.1.

5   Results

From 562 questionnaires received 528 were considered valid. The quantitative analysis of these questionnaires showed a degree of validity of the constructs that exceeded the minimum acceptable level. The hypothesized paths were significant. Additional links and adaptations of the model were explored but not found to be sufficiently supported. For the constructs that are relevant to all online transactions beyond supporting their validity in this context this research further supported their validity in online transactions by consumers in general. These previously validated constructs were personal innovativeness, disposition to trust, the sub-constructs of institutional trust that came from the general online trust model (McKnight et al. 2002), trusting beliefs, the general web experience and perceived site quality.

For the sub-constructs of institutional trust that are specific to the context of digital currencies this further supports the findings of the qualitative research which developed them (Zarifis et al. 2014) and suggests they are valid and generalizable. Digital currency adoption and digital currency reputation were particularly significant. Both of these are part of situational normality that appeared to have a stronger influence than structural assurance. This may be due to the early stage in the adoption of this technology and may subside when this technology matures and the uncertainty around certain issues is reduced. An alternative explanation of these results is that the sub-construct of situational normality is currently and will remain more significant for digital currencies due to the nature of the function they provide and the issues currencies and transactions involve.

Construct	Sub-construct	Alpha
Personal innovativeness		0.81
Faith in humanity	Competence	0.79
	Benevolence	0.86
	Integrity	0.83
Trusting stance		
Institution-based trust	Situational normality	
	-General,	0.70
	-Competence, Benevolence, Integrity	0.78
	-DC adoption	0.86
	-DC reputation	0.85
	Structural assurance	
	-Digital currency	0.84
	-Government backed currency	0.85
	-Payment intermediary	0.81
	-DC P2P infrastructure	0.83
	-Self-imposed regulation	0.78
	-External regulation	0.81
Trust in the retailer	Trusting beliefs	
	-Competence belief	0.85
	-Benevolence belief	0.84
	-Integrity belief	0.83
	Trusting intentions	
	-Willingness to depend	0.81
	-probability to follow advice	0.84
	-probability to give personal information	0.83
	-probability to make a purchase	0.84
General web experience		0.82
Perceived site quality		0.86

Table 1. Construct and sub-construct reliability

6 Conclusion

Digital currencies appear to offer advantages such as convenient, immediate, low cost transactions and have attracted the interest from retailers and consumers (Giaglis and Kypriotaki, 2014). These currencies however face the challenge posed by trust that is particularly decisive in all online purchases and transactions (Jarvenpaa et al. 1998; Bhattacherjee, 2002; Zarifis and Kokkinaki, 2015). The main contribution of this research was to assess the validity of the digital currency trust model proposed (Zarifis et al. 2014). This is part of a thread of research into the potential value and limitations of digital cur-

rencies to the consumer (Giaglis and Kypriotaki, 2014). The data collected and analysed supported firstly the validity of the model and secondly that trust has related but distinct parts that should be given individual attention.

The consumer trust in digital currency mediated transactions model can benefit organizations utilizing digital currencies in a number of ways: Firstly those developing the technology that supports the currency itself but also organizations that want to use it can take the findings into consideration to reinforce trust. For example the disagreements over the future of Bitcoin (Hearn, 2015) reduce institutional trust significantly and should be avoided. Secondly organizations engaged in business to consumer e-commerce can adapt their models, marketing and outlets to build consumer trust more effectively. For example a retailer can compensate for the reduced institutional trust by increasing trust with further assurances and guarantees (Karimov and Brengman, 2014). Thirdly organizations engaged in business to consumer commerce faced with a range of payment systems and channels (Lazaris and Vrechopoulos, 2015; Zarifis and Kokkinaki, 2015) can make better informed choices about where digital currencies can fit into their multichannel strategy. The role of the payment intermediary who may offer the digital currency functionality also influences trust. The value of some steps that have already taken place are supported by the model such as some Bitcoin organizations volunteering themselves to be regulated so that institutional trust is enhanced (Gruber, 2013). Lastly the trust in digital currency enabled transactions model can provide clarity, a platform and structure for further research and discussion.

Further research is needed to confirm the findings with different samples, methodologies and digital currencies other than Bitcoin. Furthermore the constructs and sub-constructs may change in their significance and relevance over time. This is due to the volatile nature of this immature technology and its relationship with competing online payment systems which are also evolving.

References

Akins, B.W., Chapman, J.L. and Gordon, J.M. (2013). "A Whole New World: Income Tax Considerations of the Bitcoin Economy", Pittsburgh Tax Review, URL: http://ssrn.com/abstract=2394738 (visited on 25/07/2015).

Bagozzi, R.P., Yi, Y. and Phillips L.W. (1991). "Assessing construct validity in organizational research". Admin. Sci. Quart. vol. 36, pp. 421.

Bhattacherjee, A. (2002). "Individual trust in online firms: Scale development and initial test", Journal of Management Information Systems, vol. 19, iss. 1, pp. 211-241.

Dobing, B. (1993). "Building trust in user-analyst relationships". Unpublished Doctoral Dissertation, Information and Decision Sciences Department, University of Minnesota, Minneapolis.

Giaglis M.G. and Kypriotaki K.N. (2014). "Towards an Agenda for Information Systems Research on Digital Currencies and Bitcoin", Business Information Systems, vol. 183, pp 3-13.

Gjermundrod, H. and Dionysiou, I. (2014). "Recirculating Lost Coins in Cryptocurrency Systems", Business Information Systems, vol. 183, pp 255-268.

Gruber, S.M. (2013). "Trust, Identity, and Disclosure: Are Bitcoin Exchanges the Next Virtual Havens for Money Laundering and Tax Evasion?", 32 Quinnipiac L. Rev., pp.135, URL: http://ssrn.com/abstract=2312110 (visited on 25/07/2015).

Hayes, A. (2015). "Cryptocurrency value formation: an empirical analysis leading to a cost of production model for valuing bitcoin", Ninth Annual Mediterranean Conference on Information System (MCIS), Samos, pending.

Hearn, M. (2015). "Why is bitcoin forking? A tale of different visions", Medium: Faith and Future, URL: https://medium.com/faith -and-future/why-is-bitcoin-forking-d647312d22c1 (visited on 25/07/2015).

Hett, W. (2008). "Digital Currencies and the Financing of Terrorism", Richmond Journal of Law & Technology, vol. 15, iss. 2, URL: http://law.richmond.edu/jolt/vl5i2/article4.pdf (visited on 25/07/2015).

Internal Revenue Service: Notice 2014-21, (2014), URL: http://www.irs.gov/pub/irs-drop/n-14-21.pdf?utm_source=3.31.2014+Tax+Alert&utm_campaign=3.31.14+Tax+Alert&utm_medium=email (visited on 25/07/2015).

Jarvenpaa, S., Knoll, K.D. and Leidner, D. (1998). "Is anybody out there? Antecedents of trust in global virtual teams". Journal of Management Information Systems, pp. 29-64.

Karimov, F.P. and Brengman, M. (2014). "An examination of trust assurances adopted by top internet retailers: unveiling some critical determinants", Electronic Commerce Research, vol. 13, pp. 459-496.

Lazaris, C. and Vrechopoulos, A.P. (2015). "The Interplay of Omniretailing & Store Atmosphere on Consumers' Purchase Intention towards the Physical Retail Store", 12th European, Mediterranean & Middle Eastern Conference on Information Systems (EMCIS), Athens, Greece.

McKnight, D.H., Cummings, L.L. and Chervany. N.L. (1998). "Initial trust in new organizational relationships", Academy of Management Review, pp. 473-490.

McKnight, D.H., Chaudhury V. and Kacmar C. (2002). "Developing and Validating Trust Measures for e-Commerce: An Integrative Typology", Information Systems Research, pp. 334-359.

Nakamoto, S. (2009). "Bitcoin: A peer-to-peer electronic cash system", URL: http://bitcoin.org/bitcoin.pdf (visited on 25/07/2015).

O'Brien, T. L. (2000). "Aided by Internet, identity theft soars", The New York Times, April 3.

Pearce, W.B. (2007). "Trust in interpersonal relationships". Speech monographs, pp.832-835.

Rogers, E. M. (1962). Diffusion of innovations. New York: Free Press.

Sapuric, S. and Kokkinaki, A. (2014). "Bitcoin Is Volatile! Isn't that Right?". Business Information Systems, vol. 183, pp 255-268.

Verbücheln, S. (2015). "How perfect offline wallets can still leak bitcoin private keys", Ninth Annual Mediterranean Conference on Information System (MCIS), Samos, pending.

Wrightsman, L.S., (1991). "Interpersonal trust and attitudes toward human nature", In: Robinson, J.P., Shaver, P.R., Wrightsman, L.S. (Eds.), Measures of Personality and Social Psychological Attitudes: Vol. 1: Measures of Social Psychological Attitudes, Academic Press, San Diego, CA, pp. 373–412.

Zarifis, A., Cheng, X., Efthymiou L. and Dimitriou, S. (2014). "Consumer Trust in Digital Currency Enabled Transactions", Business Information Systems, vol. 183, pp.241-254.

Zarifis A. and Kokkinaki A. (2015). "The Relative Advantage of Collaborative Virtual Environments and Two-Dimensional Websites in Multichannel Retail", Business Information Systems, vol. 208, pp.233-244.