

# Trust in Digital Environments: From the Sharing Economy to Decentralized Autonomous Organizations

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## Abstract

*Within the 50th Hawaiian International Conference on System Sciences (HICSS), we organize for the first time a minitrack on Trust, Identity, and Trusted Systems in Digital Environments. Trust is a pervasive concern not just with new technologies but also with established technologies as they become more complex and interdependent. Through papers and a panel, the track will discuss and debate when and to what degree trust matters, in what form(s), and with which consequences, primarily in the context of the sharing economy and blockchain technology.*

## 1. Introduction

Within the 50th Hawaiian International Conference on System Sciences (HICSS), we organize for the first time a minitrack on Trust, Identity, and Trusted Systems in Digital Environments. Questions abound as trust is a pervasive concern not just with new technologies but also with established technologies as they become more complex and interdependent. For example, how do new advancements in both hardware and software technologies change the way we view interpersonal trust, trust in collectives, institutional trust, trust in technology, and trust in processes, and how do these different forms of trust interact? Furthermore, what are the implications for trust as technologies take on capabilities with both social and moral agency?

Technology responds to our actions and talks back to us and is associated with provisional and consequential actions. As systems become more human like, they might exacerbate rather than compensate weaknesses common in trust assessments among humans. Some technologies are argued to even replace the trust we now have in institutions as trust shifts from humans and central organizations to algorithmic-processes, networks of computers, and decentralized anonymous organizations that have no geographic boundaries. What are the risks and vulnerabilities with

these emerging algorithmic capabilities and highly distributed peer-to-peer systems?

While there are endless issues to discuss when it comes to trust, this track will attempt to shed some light on the larger issues such as *when and to what degree trust matters, in what form(s), and with which consequences*. In particular, three papers and a panel will address trust in contexts related to the sharing economy and blockchain technology.

## 2. A brief look at trust in digital environments

Trust is one of the most complex concepts and has been researched extensively across disciplines. Trust can be seen as a measure of confidence or belief that the other party will refrain from opportunistic behavior and behave in an expected manner (Williamson 1993) thereby fulfilling the trusting party's expectations without exploiting its vulnerabilities (Pavlou & Gefen 2002). Therefore, trust enables situations that one can neither completely predict nor control (Luhmann 1979).

With the rise of digital environments, individuals are now able to interact and engage in online social exchanges regardless of distance and any previous relationships. For example, digitalization has enabled virtual teams and organizations, crowdsourcing, e-commerce, and more recently the sharing economy. However, these online exchanges are generally characterized by a high degree of transaction complexity and uncertainties, giving rise to the need for trust as an enabler (Friedman et al. 2000; Jarvenpaa et al. 1999; Ratnasingham 1998).

A considerable amount of research has been conducted on trust in e-commerce transactions, in many ways a forerunner to the sharing economy. The lack of trust in web providers has been found to be one of the main reasons for individuals not to conduct online transactions (Hoffman et al., 1999) while perceived risk negatively influences individuals' intention to purchase (Jarvenpaa et al., 1999). For one-time transactions, the existence of trust between parties

has been found to be particularly important (Gefen & Straub 2004) with antecedents to trust being the individual's disposition to trust, i.e., a general propensity to trust other parties that can influence an individual's initial belief (Jarvenpaa et al. 1999; McKnight and Chervany 1996), and familiarity with the website (Gefen 2000).

The research on e-commerce has further revealed that the concept of trust is multi-dimensional. For example, auction sites such as eBay and third party aggregators such as Amazon marketplace have led researchers to distinguish between trust in the individual sellers and buyers and trust in the third party platforms and intermediaries. One of the more interesting findings of this research is that "consumer behavior in an online marketplace is largely determined by their trust in the well-established, trustworthy intermediary, not by their trust in the individual sellers doing business in the marketplace" (Hong & Cho 2011), i.e., trust in the platforms and intermediaries is more important for users than trust in the individual sellers on these platforms. Researchers suggest that this is because the intermediaries govern the entire transaction process through a set of rules and structures – communication between buyers and sellers, financial transactions (Hong & Cho 2011, Pavlou and Gefen 2002).

This trust in the intermediary platform is a form of institutional trust, which may be the most important mode of trust in business environments that lack familiarity (Pavlou & Gefen, 2002). Institutional trust can be built through structural assurances, which can provide guarantees or safety nets, e.g., escrow services, credit card guarantees, legal recourses, regulations (Pavlou & Gefen 2002, Shapiro 1987).

Turning to the sharing economy, researchers argue that building and sustaining trust in online sharing economy transactions is more complex than in traditional forms of e-commerce due to a number of factors (Hawlitschek et al. 2016; Möhlmann 2016). Among them are the fact that a large number of transactions tend to be one-off transactions among private individuals who are merely coordinated through an intermediary platform, thereby increasing the number of parties involved in all transactions (Hawlitschek et al. 2016, Möhlmann 2016). Second, even though the matching occurs online, the transaction tends to occur offline in physical environments, often leading to a social component that cannot be governed by the platform since the transaction parties interact directly, e.g., the renting of a room (Möhlmann 2016). Third, in many cases the object being transacted differs, i.e., merely accessed, used, and returned and not purchased – a shift from owning to accessing shared goods, leading to the

transaction being associated more with services than goods (Bardhi and Eckhardt 2012, Möhlmann 2016) and to potentially more interactions between the parties.

Due to these complexities, trust has even been labeled the sharing economy's "currency" (Botsman 2012), and Hawlitschek et al. (2016) have outlined a conceptual model that differentiates between three substantial variants of trust: trust towards peers (interpersonal), trust towards the platform (institutional trust), and trust towards the product.

Many platform providers in the sharing economy today have developed extensive systems designed to build interpersonal trust, institutional trust, and product trust. For example, both suppliers and users are able to review and rate one another and their products, e.g., Airbnb renters and owners, while some platforms enable suppliers and users to gain different status levels, e.g., Airbnb superhost status, as well as to verify themselves through either uploading personal IDs or connecting their identities to social network accounts such as Facebook or LinkedIn. Structural assurances in the forms of escrow services, guarantees, and insurance are also quite prevalent as well as various measures to ensure privacy protection, transaction security, and transaction integrity, which have proven valuable in building trust online (Wu et al., 2010). These structural assurances can serve to strengthen interpersonal trust due to trust transference, i.e., when a supplier does not provide any structural assurances but is associated with a platform that builds trust through structural assurances, then trust in the platform is transferred to the supplier (Stewart 2003).

Despite these extensive measures, limitations to trustbuilding, such as information reliability, have been found in digital environments. For example, users may artificially inflate the trustworthiness of others when writing reviews or giving ratings because they may be friends or because they may be not willing to write negative comments in fear of retribution due to the public nature of the platform (Lauterbach et al., 2009).

In response to many of the problems above related to ensuring trust in e-commerce, Bitcoin and its underlying technology, the blockchain, were developed. The original idea was to create "A purely peer-to-peer version of electronic cash [that] would allow online payments to be sent directly from one party to another without going through a financial institution."<sup>1</sup> In essence, the idea is that blockchain technology would enable the digitalization of trust through the replacement of trusted intermediaries and central authorities with algorithmically-based trust

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<sup>1</sup>Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, vol. 1, 2008

among a decentralized, distributed network of peers. Extrapolating on the removal of third parties, one use for blockchain technology that is being explored is that of decentralized autonomous organizations in which smart contracts programmed onto the blockchain will enable the emergence of self-organizing, emergent organizations without any formal governance other than the blockchain-enabled software code itself.

As such, trust would then take the form of process-based trust. Indeed, some propose that since the blockchain technology enables the digitalization of trust, it may even “drive a productivity revolution across the globe on par with what Henry Ford did with the automobile”.<sup>2</sup>

### **3. From trust in the sharing economy to blockchain-enabled decentralized autonomous organizations: Three papers and a panel**

In the first two papers of this track, we explore some of the issues raised above related to the sharing economy. While there is no consensus on the definition of the sharing economy, the growth of multi-sided platform-based companies such as Uber and Airbnb that enable the more efficient use of otherwise idle assets through peer-to-peer sharing has been exponential in recent years. Indeed PwC estimates that revenues from the five largest sectors of the sharing economy will grow from USD 15 bln in 2013 to USD 335 bln in 2025, thereby an area clearly demanding attention from researchers. With only 7000 employees and drivers in around 520 cities, Uber has reached a market capitalization of more than USD 60 billion since its founding in 2009. Furthermore, Airbnb was founded in 2008 and has already reached a market capitalization of USD 21 bln with only 3000 employees compared with Marriott, the hotel chain that was founded in 1928 and today has 200,000 employees and a market capitalization of USD 17 bln.

In the first paper, “The Implications of Trust in the Sharing Economy - An Empirical Analysis of Uber”, the author Christoph Mittendorf explores to what degree trust in Uber the company vs trust in the drivers of Uber influences customers’ intentions. More specifically, the author develops a research model drawing on research by Gefen (2000) and finds through an analysis of survey data of 221 Uber customers using structural equation modeling that ‘Trust in Uber’ influences the customers’ intentions, whereas the influence of ‘Trust in drivers’ does not.

In the second paper, “Private vs. Business Customers in the Sharing Economy - The Implications of Trust, Perceived Risk, and Social Motives on Airbnb”, the authors Christoph Mittendorf and Uwe Ostermann develop and pretest an initial model of how social motives, trust, and perceived risk of private and business customers alter the Airbnb rental provider’s intention to accept a booking request.

Having explored the sharing economy, the track turns to quite a novel area in the third paper, “Developing a Mechanism to Study Code Trustworthiness” by Charles Walter, Rose Gamble, Gene Alarcon, Sarah Jessup, and Chris Calhoun. As multi-sided platform-based organizations continue to penetrate industries, an increasing number of organizations are drawing on third party software programmers to develop code. This paper explores how third party Java software programmers and their code are deemed trustworthy by those adopting the code.

Moving from the three papers within the first session, the track’s second session focuses on the digitalization of trust through blockchain technology. Bitcoin and its underlying blockchain technology were developed by one or more individuals under the pseudonym of Satoshi Nakamoto and first released as a white paper in 2008. In January 2009 the software code was then released in an open source project on SourceForge, and since then a community of thousands of volunteers across the globe has further developed and maintained the software. In the fall of 2016 Bitcoin had a market capitalization of around USD 11 billion and more than 200,000 daily transactions.<sup>3</sup> Cryptocurrencies and blockchain technologies have attracted more than USD 1 billion in venture capital investments in recent years, and while they hold the potential to “revolutionize” any number of industries, the finance industry has been particularly keen on exploring this potential.

In addition to the open source blockchain technology Bitcoin, there are hundreds of other blockchain technologies with various levels of openness in governance and access. For example, a consortium of more than 50 financial institutions led by R3CEV is working on developing Corda, a permission-based, closed-source distributed ledger technology based on the blockchain concept.

Another leading effort is that of Ethereum and its accompanying cryptocurrency, Ether, which is based on the blockchain concept but not the Bitcoin code. It was first published in a white paper by a Russian-born programmer in 2013 and crowdfunded in 2014. A

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<sup>2</sup> Paul Brody, Americas Strategy Leader, Technology Sector, Ernst & Young

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<sup>3</sup> Coinmarketcap.com, July 2016.

**Table 1. A simple model of the essential differences among consensus platforms**

		Who do I trust to maintain a truthful record?			
		A central authority	A group of known actors	A group of actors, some known	Nobody
What is the universe of "things" I need people to agree on?	Ownership of on-platform assets	Central Bank, Commercial Bank	Corda (R3CEV)	Ripple (XRP)	Bitcoin
	Ownership of off-platform assets	Custodian Bank	Hyperledger	Ripple (Gateways)	Colored Coins, Counterparty
	Obligations and rights arising from an agreement	Clearing House	Eris	Ripple (Codius)	Ethereum

group of core developers as part of the centrally-controlled Ethereum Foundation oversee the software's open source development, and today it has a market capitalization of just over USD 1 billion. Ethereum enables smart contracts, or pieces of code stored on a blockchain that read and write data in the blockchain's database when programmed blockchain transactions trigger the event.<sup>4</sup> Smart contracts enable and enforce a contract among parties without the need for a third party intermediary, and potential uses include the trading of financial instruments, real estate, and intellectual property, encouraging multinationals such as Microsoft, JP Morgan and Thomson Reuters to develop this technology.

One additional proposed use of Ethereum is decentralized autonomous organizations, in which an organization's rules and decisionmaking apparatus are coded, thereby creating a structure with decentralized control since the need for documents and people to govern the organization are eliminated.<sup>5</sup>

To explore the digitalization of trust through blockchain and distributed ledger technologies, expert scholars in the field Matti Rossi, Carsten Sorensen, and Liisa Välikangas will debate and discuss a number of trust-related issues with the Track Co-chairs Sirkka Jarvenpaa and Robin Teigland moderating the discussion. Topics will include areas such as the differences among consensus platform and the relationship between trust and governance and access (table 1<sup>6</sup>). Additionally, the panel will touch on how blockchain technologies, such as Ethereum, may enable "smart contracts" as well as DAO, one of the first experiments in decentralized autonomous organizations that was hacked and led to a subsequent

forking of the Ethereum code, bringing into question one of the core concepts of blockchain technology, immutability.

#### 4. Future avenues for research

The number of research issues related to trust in digital environments is endless. Below we list some areas that we hope may provide inspiration for scholars interested in investigating this fascinating area.

- Understanding issues of trust and reputation in the context of sharing economy organizations, e.g., in the platform provider, among the users of the platform, in the organization behind the platform, in financial transactions conducted through the platform.
- Understanding the relationship between trust in an organization and an organization's handling of its users' data, e.g., privacy/integrity, security, use of the cloud.
- Understanding the relationship between trust in an organization and trust in the organization's technology-based offerings.
- Understanding how regulation and policy at the national and international levels influence issues of trust and technology penetration, e.g., in the financial industry and the sharing economy, and vice versa.
- Understanding the role of trust between users and emerging technologies, e.g., personal robots, smart toys, wearables, 3D printing, self-driving vehicles, drones.
- Understanding the role of trust in the development of algorithms, e.g., functions, openness of coding, data collection.
- Understanding the activities and narratives that start

<sup>4</sup> <http://www.coindesk.com/three-smart-contract-misconceptions/>

<sup>5</sup> <http://www.coindesk.com/understanding-dao-hack-journalists/>

<sup>6</sup> <https://gandal.me/2014/12/19/a-simple-model-to-make-sense-of-the-proliferation-of-distributed-ledger-smart-contract-and-cryptocurrency-projects/>, accessed 2 November 2016

- up organizations in emerging high-technology industries use to build trust and legitimacy in the industry, e.g., users/consumers, incumbents, regulators.
- Understanding the relationship between trust and business models in startups within emerging industries as well as in the commercialization of new technologies by established firms.
- Understanding the relationship between trust and the development and dynamics of self-regulated, decentralized, peer-to-peer networks.
- Understanding the relationships among trust, technology affordances, and institutional logics.
- Understanding the relationship between national culture and institutions and trust in technology and digital environments that know no geographic boundaries.
- Understanding the relationship between trust and control in digital environments.
- Understanding how trust is built, maintained, and repaired when the context is continuously changing.

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