

“Trust” in the Digital Era

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Digital transformation has caused continuous changes to the world at an unprecedented speed, leading to a new paradigm separate from the past. Companies, individuals, businesses, and systems are intricately connected together, which necessitates the handling of rapidly increasing data. With this, the verification of quality, authenticity, and eligibility of all factors has grown difficult. In order to resolve this issue, it is important to have ICT simplify the mechanism for achieving “trust” in the digital era, which is distributed and correlated in a complicated manner. This paper presents Fujitsu Laboratories’ approach for how to use advanced technology in the realization and social implementation of “trust” in the digital era, which has taken on more significance than ever before in our increasingly complex world.

1. Introduction

Since the Industrial Revolution, human beings have achieved social and economic development by producing technologies and manufacturing products efficiently and in large quantities. The ICT industry has also offered products and services with high reliability that are unbreakable and always function, to contribute to improved operational efficiency for customers. Today, however, digital technologies have advanced and value creation based on data and knowledge has become a key to success for companies’ businesses. Given this backdrop, new “trust” in the digital era has come to attract attention.

The progress of digital technology has caused companies, individuals, businesses, and systems to become intricately connected, necessitating the handling of rapidly increasing data. This has in turn made it difficult to verify quality, authenticity, and eligibility of all factors. In addition, problems such as issues in large-scale systems, damages caused by cyberattacks, personal information leaks, corporate scandals, and fake news have gradually caused a loss of trust, which has been built up by nations, companies, and systems up until now. The once firm social system structure has been shaken, making it difficult to maintain trust in top-down governance.

Meanwhile, regarding “trust” as it relates to data, the General Data Protection Regulation (GDPR) went into effect in 2018 in Europe in order to deal with personal information leaks. Regarding the utilization of artificial intelligence (AI), a new technology, various countries and companies have begun to announce recommendations for dealing with ethics, morality, and bias issues.

Thus, in order to maintain “trust,” it is necessary to use technology to support factors related to “trust” in the complex social system and to verify them retrospectively.

For “trust” to be accepted in society, not only knowledge of technology but also of economics, the humanities, psychology, sociology, and other areas is required. In addition to “trust” of products and services with which customers come in direct contact, trust of data, systems, and those who handle them gains importance. Fujitsu will tackle with concerted efforts the challenge of what “trust” is and how to acquire it, which is at the root of social acceptability.

This paper presents Fujitsu Laboratories’ approach for how to use advanced technology in the realization and social implementation of “trust” in the digital era, which has taken on more significance than ever before in our increasingly complex world.

2. Definition of trust

This section describes "trust" from the viewpoint of sociology and shows its relationship with policy for technology development.

2.1 Trust in social systems

In one theory by Niklas Luhmann, a German sociologist, the world is complex in a way that is beyond human recognition, and that society is established by reducing its complexity with trust.¹⁾ People are forced to choose something before they understand what the best option is. Therefore, people must inevitably trust something. Trust also means reducing the number of possible situations in the world by eliminating some possibilities in advance without considering them.

Trust also enables the division of labor in society. Those who trust others can entrust most of their work to others. Individuals are supported by the information processing of others and must be able to rely on information processing by others. Individuals have achieved division of labor by leaving everything to acquaintances who know what they do not, and have learned how to live in a complicated social system beyond the upper limit of the individual's information processing ability.

Trust is information extracted in excess of the quantity of information that individuals have, and the basis of trust cannot be established without the acquisition of a certain level of basic information and thorough knowledge.²⁾ If information provided by the other party is found to be doubtful and requires verification in various ways, the time and cost required may allow competitors to excel, causing loss of opportunity. That is, results can be produced overwhelmingly faster if the other party is trusted from the beginning. Trusting each other eliminates the costs of doubt and makes the delivery and sharing of information, communication, and procedures faster and easier. In other words, the realization of trust can be expected to lower barriers to entry into new businesses and accelerate co-creation between companies. In addition, it is also necessary to trace back this reduced social system over the entire process to confirm unshaken trust. We believe that realizing this idea with advanced technology will lead to the building of "trust" in the digital era.

2.2 Distributed trust

The British writer and social innovator Rachel

Botsman describes the forms of trust by showing her interpretation that trust shifts from local trust, such as that which existed in face-to-face local or rural communities, to institutional trust, represented by governments, financial institutions, large corporations and huge platform players like Facebook and Google, to finally distributed trust via technology.³⁾

Distributed trust is a form of trust distributed horizontally among many people through technologies and platforms, rather than the bottom-up one-way trust in institutions or authorities.

X-Road, which is the basis of the advanced e-government system in Estonia, is operated as a system under legislation that includes the Public Information Act, Personal Data Protection Act, and Digital Signature Act. Through this system, citizens can use various services in a one-stop manner. However, the system does not centrally manage the data for administrative services or medical institutions. Instead, it links between databases distributed among various organizations. This distributed system has a mechanism capable of detecting any fraud, which is convincing enough for the citizens to accept and use the e-government system.⁴⁾

In China, the Alibaba Group has constructed Sesame Credit, a system for quantifying and managing individuals' credit scores based on data accumulated through e-commerce. This system permeates society in China to allow an environment to be built where individuals with higher credit ratings can receive preferential services and live with more ease. Some point out that these measures may be linked to the Chinese government's credit information network, possibly leading to the monitoring and management of people by the government.

With complex and diverse data and technology supporting person-to-person communication, we are now in an era in which people may trust others whom they have never seen based on evaluation histories with ratings as in with Uber, Airbnb, and other sharing services.

In this way, end users' perception of "trust" has changed based on digital technology, which has led to the emergence of new services and new innovations.

3. Trust and co-creation in the digital era

This section describes the redefinition of Fujitsu's

slogan "Trust and Co-creation" to adapt to change in the digital era.

Since it presented its slogan of "Reliability and Creativity" in 1976, Fujitsu has pursued reliability by providing customers with high-quality products and services and creativity as a company. In the coming digital era, the role of ICT is expanding not only to include the improvement of operational efficiency and the development and maintenance of customers' information systems but also the creation of innovations to enable customers to expand lines of business and develop new businesses. ICT will also aid in the achievement of Sustainable Development Goals (SDGs).

One major change in the digital era is caused by the intricate connection between companies, individuals, businesses, and systems that are necessary to handle rapidly increasing amounts of data, which in turn diversifies the accompanying risks. In this situation, verification of quality, authenticity, eligibility, and so on of all factors is difficult. This makes the new "trust"—which guarantees these—important. For issues such as compliance, governance, and accountability of companies and rules and regulations and privacy protection of society, "trust" must be achieved that encompasses everything from reliability such as robustness and availability of ICT to traceability of information and inferences made by AI. New digital technologies and services are required to provide "trust" that satisfies these various factors and demands. Social systems

are becoming increasingly complicated due to new mechanisms built because of the need to comply with numerous and complicated rules and change to rules. ICT can support the building of individual "trust" and distributed "trust," making it possible to simplify the mechanisms and provide a trustworthy business environment to customers.⁵⁾

Therefore, Fujitsu redefined "trust" in the digital era not only as reliability but also as a trust that encompasses all factors that are decentralized and complexly related. By safely connecting various types of data, systems, people, companies, businesses, and society in digital business, we will offer a trustworthy business environment to customers and provide ICT systems and services that enable people to verify that "trust." Doing so, we will create innovations and contribute to the development of a sustainable society and economy (Figure 1).

4. Activities for realizing "trust"

This issue presents activities for realizing "trust" in the digital era.

First, it discusses the relationship between trust and technology from the sociological viewpoint in the paper "Role of Trust in Realizing a Digital Society."

Then, the paper "Initiatives for AI Ethics: Formulation of Fujitsu Group AI Commitment" presents the Fujitsu Group AI Commitment announced by Fujitsu in March 2019 as a responsibility of a company engaged in

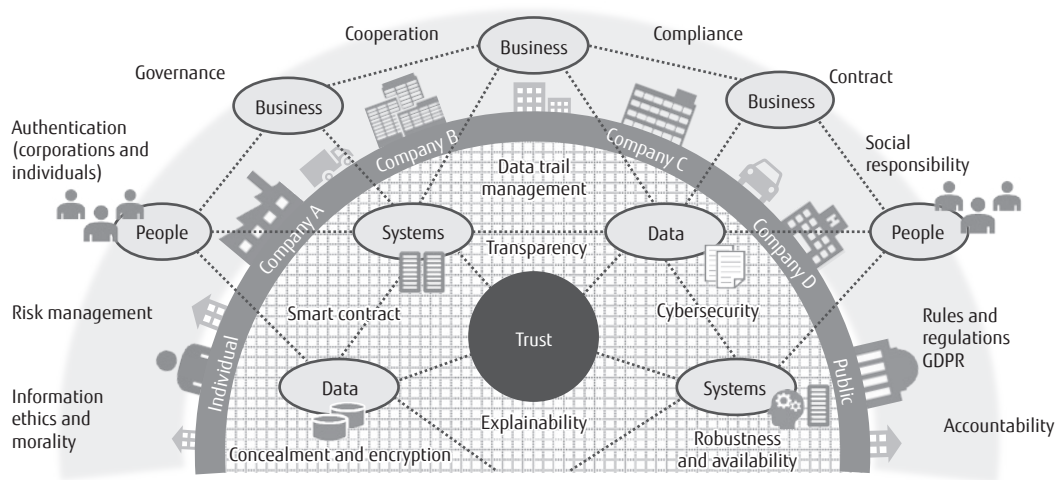


Figure 1 "Trust" in digital era.

research and development as well as business in the field of AI to promote the safe, secure, and reliable use of AI.

Next, four examples of digital technologies to provide customers with "trust" are introduced.

- Privacy risk assessment technology for secure distribution of personal data under decentralized management (see the paper "Technologies for Improving Reliability of Personal Data Distribution Platforms to Realize Data-Driven Society")
- Technology for linking between distributed trust through threat analysis in Hyperledger Fabric, a blockchain execution platform (see the paper "Threat Analysis Method and Smart Contract Verification to Improve Reliability of Blockchain")
- Reliability assurance technology for scoring various risks by using the perspective of social psychology and IT risk assessment in transactions between companies and individuals (see the paper "Scoring Technology to Guarantee the Reliability of People in a Connected World")
- Approach to the industrial application of knowledge graphs explaining the reason and basis for the answers presented by AI (see the paper "Trustworthy and Explainable AI' Achieved Through Knowledge Graphs and Social Implementation")

In addition, three papers describing the latest technologies for continuously verifying ICT and human "trust" together with examples are introduced.

- Wide Learning technology, a new technology for explainable AI capable of prediction and classification using logical knowledge that can be comprehended by people (see the paper "Wide Learning Technology to Provide Trust Through Knowledge Discovery")
- Chain Data Lineage technology enabling the management of historical information such as consent to use, generation and processing of data for realizing a society in which trustworthy data are distributed (see the paper "Improving Reliability of Data Distribution Across Categories of Business and Industries with Chain Data Lineage")
- Biometric authentication technology that realizes highly convenient hands-free payments by identifying an individual and a person's "trust" out of a million users at high speeds (see the paper "Integrated Biometric Authentication Technology

to Support a Cashless Society")

Finally, this issue introduces five cutting-edge technologies that are required to realize "trust" in the future.

- Dataaffinic Computing technology that delivers fast and low-cost processing of data that continue to rapidly increase (see the paper "Dataaffinic Computing: Data-Centric Architecture to Support Digital Trust")
- Virtual network construction technology to connect microservices reliably in a multi-cloud environment (see the paper "Cloud Network Operation Management Technology to Support Trust of Services in Era of SoE")
- Operation technology for highly reliable wireless networks that enables even those wireless network administrators without advanced expertise to construct and operate wireless networks in a stable manner (see the paper "Highly Reliable Operation Technology for Wireless Networks to Achieve Cyber-Physical Systems")
- Inference factor identification technology that provides high-accuracy analysis of graph data representing connections between people and objects and explains the reasons for AI inferences (see the paper "Inference Factor Identification Technology for Explaining Inference Results Made by Deep Tensor")
- Technology for building trustworthy AI solutions and implementing them quickly in society (see the paper "Platform to Accelerate Utilization and R&D of AI Technologies")

5. Conclusion

This paper presented Fujitsu Laboratories' idea of how to use advanced technology for the realization and social implementation of "trust" in the digital era in business and society, which has come to take on more significance than ever before in today's increasingly complex world.

Looking to the future, Fujitsu Laboratories intends to create innovations by using advanced technology to realize "trust" and co-creation in the new digital era and contribute to sustainable development of society and the economy together with customers.

All company and product names mentioned herein are trademarks or registered trademarks of their respective owners.

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