

# NEC Value Chain Innovation – The Future Created by Digital Technology

Digitalization has spread across the globe, transforming people's lives and values so fundamentally that their ramifications have yet to be made manifest. Corporations and industries, meanwhile, find themselves in a world where they must pledge their commitment to addressing various social issues, while adapting to constantly evolving threats and refashioning themselves to cope with the "new normal" prompted by the novel coronavirus (COVID-19) pandemic. In this era of VUCA (volatility, uncertainty, complexity, and ambiguity), it is nearly impossible to foresee the future. Nevertheless, it is crucial to ask how corporations and industries can maintain growth into the future and create an enduring society. At NEC, we believe that the key to securing the future of corporations and industries is the NEC Value Chain Innovation (VCI). Through VCI, NEC aims to create social value by utilizing data on people, goods and processes generated through collaboration with partners across various sectors. This paper introduces the work we have undertaken so far in promoting VCI and discusses our commitment to the five business domains that support the achievement of VCI.

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### **1. Introduction**

The crisis presented by the COVID-19 pandemic has touched virtually every corner of the world.

While the pandemic has inflicted enormous damage on many businesses and industries, it has also exposed new issues. One example is the disruption of global supply chains that led to shortages of goods and materials and threatened to shut down entire supply chains. Another is the dramatic decrease in human mobility that severely impacted businesses in many industries, not least the transportation industry that supports travelling by air, rail and other modes; the tourism and service industries where inbound tourism and a consumer shift from material goods to experience was driving demand; and the retail and restaurant industries that are integral to our daily lives.

Faced with unprecedented losses, businesses and industries are now under pressure to transform and adapt in order to meet the challenges of the new normal, while continuing to address the various social issues to which they were already committed.

### **2. The Changing Business Environment and NEC Value Chain Innovation**

Even before the arrival of the COVID-19 pandemic, the business environment was in a state of flux. Rapid changes in demand and expectations have left businesses struggling to adapt. Climate change is said to have intensified the seriousness of natural disasters, while depletion of natural resources and fluctuations in supply and demand have provoked businesses to give increased attention to the popular concept of social responsibility. Many have announced their commitment to the United Nations' 17 Sustainable Development Goals (SDGs), including efforts to conserve natural resources and reduce food loss and waste to achieve a sustainable society and ensure respect for human rights. Increasingly, investment decisions are being made that take into account environmental, social, and corporate governance (ESG) factors.

Many industries in Japan are also beginning to engage in Society 5.0, a national initiative announced by the Japanese Cabinet that aims to resolve economic and social issues by a system that highly integrates cutting-edge technologies such as IoT, AI, robots, and

big data. The goal of Society 5.0 is to create new value through innovation and enable the provision of goods and services tailored to the needs of individuals. Ultimately, the goal is to achieve a human-centric society where everyone can live a comfortable and fulfilling, high quality of life.

However, while digitalization has supported tremendous growth in efficiency and convenience, it has opened a back door to a sweeping array of new cyber-risks, leading to calls for measures to prevent loss or theft of personal information and to combat cyberterrorism.

The digitalization of society has also changed the way people communicate and has given root to a new sharing economy which has spawned a host of new business models and services built around integrative super-apps that bring together a variety of services that have not only made life more convenient, but have also dramatically changed people's sense of value.

The spread of COVID-19 has brought many of these trends to the forefront and accelerated the societal shifts that these technologies promote. From teleworking and remote conferencing to the aggressive utilization of touchless technologies—such as online customer service and cashless transactions—aimed at minimizing human contact, digital technologies have seen enormous growth. All of this has put tremendous evolutionary pressure on every aspect of the way we work and is radically reshaping the nature of business and industry in the brave new world of the new normal.

### 3. What We Need to Do Now – Embracing the Digital Transformation

Faced with the reality of VUCA, where volatility, uncertainty, complexity, and ambiguity make it difficult to predict the future, we find ourselves confronting not only a variety of daunting social issues, but also a range of rapidly morphing threats including most recently the COVID-19 pandemic. In light of such challenges, we have

to ask ourselves what we need to do to enable corporations and industries to continue sustainable growth and to create society of abundance and a more vibrant future.

NEC believes that the way forward begins with co-creation. No matter how innovative, one company on its own is limited when it comes to finding solutions to social issues. Instead, companies from different fields and industries can join together in co-creation supported by digital technology. In this way, new social values can be created that leverage the data on people and goods generated from co-creation across the boundaries of corporations and industries as well as the data generated in the various processes of such co-creation efforts.

NEC defined this operational concept approach as NEC Value Chain Innovation in 2014 and has been promoting it ever since (**Fig. 1**).

### 4. What Is NEC Value Chain Innovation?

NEC Value Chain Innovation (VCI) is our commitment to utilizing our digital technology to achieve future-oriented innovation without being restricted by conventional concepts and industrial frameworks, while collaborating with our customers to develop solutions tailored to the issues faced by each industry.

Through co-creation with various corporations that transcends the traditional boundaries of industry, while not being confined to a single corporation or industry, we aim at the formation of new ecosystems and business models. To do so, it is necessary to mutually distribute and utilize digital data. Through this commitment, we will create social value with a view to solving the various social issues that corporations and industries face, as well as achieving a more abundant and vibrant future. In other words, we aspire to the creation of social value.

As envisioned by NEC, the VCI has two patterns depending on the stage of digital transformation (DX) of a business or industry. Those patterns change ways to connect and make new connections (**Fig. 2**).

First, to change ways to connect, you can utilize IoT and AI to massively improve the efficiency of production lines that are expanding globally, for example. Another example of changing ways to connect is to transform the process for dealing with breakdowns, in which instead of taking measures only after the equipment at a production factory, utility plant, or retail store has broken down, you can take proactive measures by identifying symptoms of failure and sharing information with the parties concerned, thereby avoiding service or business disruptions.

Second, to make new connections, you can address, for example, the issue of waste and irregularity (stag-

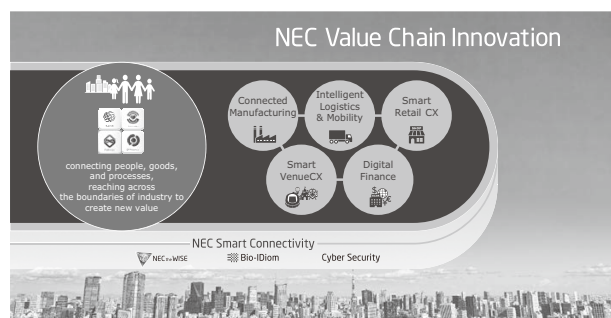


Fig. 1 NEC Value Chain Innovation.

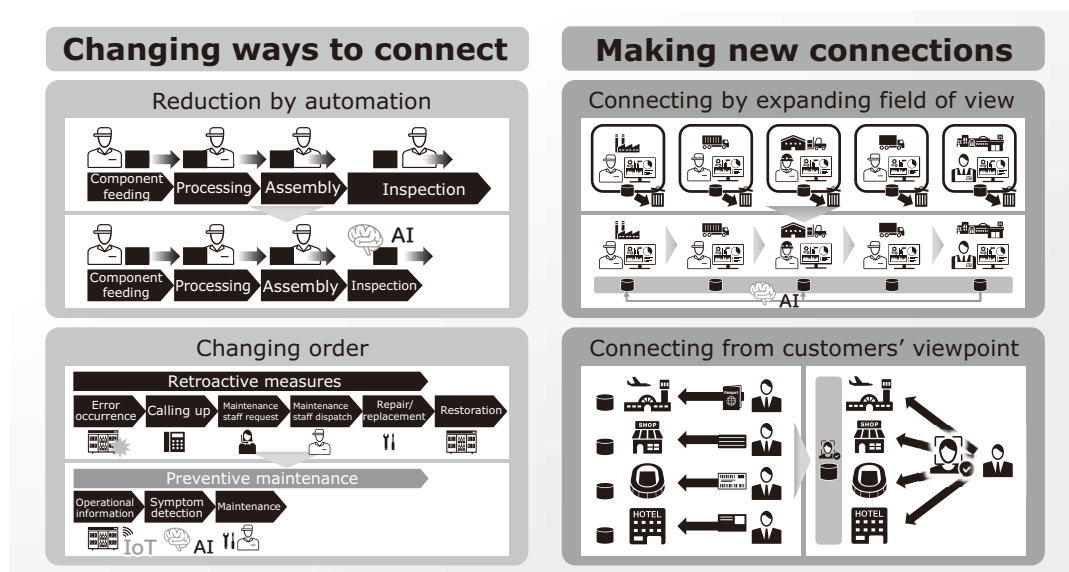


Fig. 2 Creation of value in VCI.

nation) that occurs when there are multiple participants in a supply chain—such as a manufacturer, wholesaler, logistics service providers, and retailer—by expanding the scope of your operational coverage so that optimization can be achieved. Another example of making new connections is to create new value by linking services offered by various operators in ways that better suit the viewpoint of customers.

Section 5 introduces the three primary ways in which NEC is working to achieve the VCI.

## 5. Major VCI Initiatives

One of the ways NEC is working to achieve VCI is through the utilization of its Supply and Demand Optimization Platform for reduction of food loss and waste as set forth in SDG target 12.3 as a global issue.

Worldwide, the amount of food lost or wasted each year adds up to a staggering 1.3 billion tons (metric tons), with Japan accounting for about 6.12 million tons. Food loss and waste due to excessive production, returned goods, surplus inventory, and unsold stock takes place at every step of the value chain—starting with production and moving up through wholesale, logistics, and retailing. Efforts by individual operators to cope with this problem on their own have limited impact. NEC's Supply and Demand Optimization Platform is designed to optimize the entire value chain by utilizing data sharing/distribution and AI (Heterogeneous Mixture Learning). This represents NEC's commitment to VCI by expanding services through engagement in co-creation with numerous cus-

tomers and repeated implementation of validation tests.

Additionally, in November 2019, NEC unveiled NEC I:Delight as a concept to support digital transformation and the new normal of public health concern. Solutions based on using biometric authentication such as face and iris recognition as a universal ID make it possible to offer users a consistent experience by connecting multiple touchpoints and services in various scenarios such as traveling, shopping, and commuting.

Furthermore, NEC is engaged in developing technology for online identity verification, which is becoming increasingly inevitable as digitalization of various services continues—another issue which has become more apparent as a result of the ongoing spread of COVID-19. Specifically, we are developing a Multi-bank Identity Confirmation Platform that utilizes open APIs to provide functions that ensure safe and secure distribution of verified identity information owned by banks, thereby permitting identity confirmation to be done completely online. These efforts are just some examples of the ways in which we are creating new social values by utilizing data through co-creation projects that transcend traditional corporate and industrial boundaries.

## 6. The Five Business Domains That Support VCI

To achieve VCI by leveraging digital technology to implement co-creation and data utilization, it is necessary to build relationships with customers in various types of businesses, to develop a deep understanding of their needs and to work together to achieve solid results. NEC

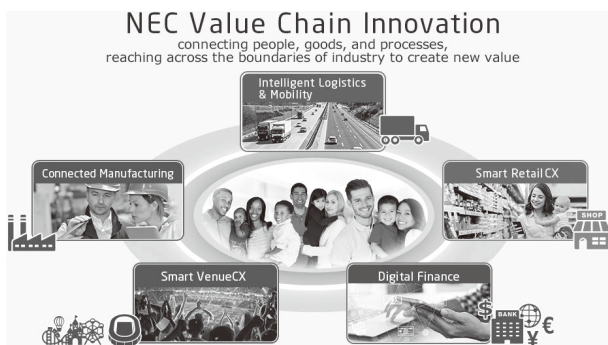


Fig. 3 The five business domains that support NEC Value Chain Innovation.

possesses industry-specific knowledge and business know-how as well as the breadth of expertise and proven results—all gained through our many years of experience in system construction for customers in various industries such as manufacturing, logistics, retail, service, and finance.

Based on our vision of how the business domains that support VCI will help create the future of VCI, we have built and offer a variety of solutions and services. The five business domains of VCI are outlined below (**Fig. 3**).

### 6.1 Connected Manufacturing

The first business domain is Connected Manufacturing, which centers on the manufacturing industry to which we are committed as a manufacturing company ourselves.

Challenges facing the contemporary manufacturing environment such as labor shortages, skills transfer, and mass customization are now being aggravated by the COVID-19 pandemic—which is generating complex new problems including disruption of supply chains and restriction of movement of employees.

NEC's Connected Manufacturing integrates manufacturing sites and supply chains with the power of digital technology and is introducing innovation that transcends the boundaries between industries.

The paper on Connected Manufacturing in this journal introduces two offerings provided by NEC to achieve greater innovation in manufacturing. The first is the smart factory solution that facilitates the smartization of factories and supply chains using IoT, AI, local 5G, and other cutting-edge technologies. The second aims to transform our customers' business models to promote a transition from a seller of goods to a seller of experiences.

As one of our primary initiatives, NEC has been promoting a future manufacturing concept called NEC DX Factory that brings the smart factory into being by utilizing NEC's

digital technologies such as IoT and AI. Furthermore, as communications networks shift to 5G, in order to help achieve smart factories, we use remote operation and control utilizing the local 5G system. This will support innovations in work style that manufacturers must undertake as they adapt to the age of the new normal.

### 6.2 Intelligent Logistics & Mobility

The second business domain—one which provides a framework to support the movement of people and goods—is Intelligent Logistics & Mobility.

As the spread of COVID-19 forces the world to shift to the new normal, the movement of people and goods is about to undergo enormous changes. People are moving around less than they once did, avoiding travel and switching to telework where possible. But just as the movement of people declines, so the movement of goods increases. Instead of going out to purchase goods, many people now shop online and have the goods brought to them. The result has been a huge increase in parcel delivery services. Meanwhile, manufacturing sectors have been experiencing a downturn in shipping due to stagnant freight volumes, which is forcing manufacturers to reassess their supply chains. As all of these changes are occurring, the transportation and warehouse industries are suffering from a chronic labor shortage.

NEC aims to address the above issues by leveraging its digital technologies in the field of Intelligent Logistics & Mobility to connect the real world with cyberspace and merge logistics and mobility. Ultimately, our goal is to support the safe, smooth and reliable movement of people and goods and realize an abundant society in which everyone and every industry has equal access to services and opportunities.

In the paper discussing Intelligent Logistics & Mobility, three solutions offered by NEC are introduced. The first offering related to "transport" focuses on public transport services that facilitate the safe, secure and comfortable movement of people. The solution seamlessly connects all modes of public transport using mobile devices, smart cards, and biometrics. It also leverages mobility-as-a-service (MaaS) to achieve seamless transportation as well as IoT and AI to improve the efficiency of operations and maintenance. The second offering related to "logistics" is designed to innovate supply chains through business-to-business (B2B) collaboration to achieve safe, reliable, efficient logistics operations. The paper also shows how NEC is ensuring a safe working environment at logistics sites by utilizing biometrics and AI while supporting flexible handling of disruption of supply chains and fluctuation of supply and demand by

visualizing flows of goods across businesses and industries. The third offering related to “mobility” provides mobility services that support safe and reliable transport of people and goods by connecting various mobility modalities and utilizing AI-based video analytics.

### 6.3 Smart Retail CX

The third business domain is Smart Retail CX, which centers on retailers that provide consumers with transported products.

In the retail industry, consumer purchase behavior has been increasingly moving online in recent years, as evidenced by the growing popularity of e-commerce sites and cashless payments.

COVID-19 has also had a significant impact on the retail industry. With a growing proportion of consumers who are teleworking and staying at home, online shopping is rapidly becoming more prevalent. With people spending so much time at home, new patterns of consumption are influencing the marketing strategy of the retail industry. At brick-and-mortar stores that have long been plagued by serious labor shortages, along with the need to implement measures to improve efficiency, there is a heightened movement toward cashless and touchless technologies to avoid the risk of infection.

Against this backdrop, NEC’s Smart Retail CX has continuously been promoting the concept of Consumer-Centric Retailing to contribute to the transformation of retailers into the business of choice for customers.

This current issue of the journal includes a paper that explains in detail the concept of Smart Retail CX, highlighting three solutions offered by NEC. The first aims to eliminate “half the workload.” This is primarily directed at the creation of cashierless stores that offer a pleasant and comfortable customer experience (CX), while achieving efficient store operation. The second aims to generate “twice the charm” by embracing the concept of Online Merges with Offline (OMO) to offer shopping experiences focused on only now, only here, and only me. The third solution promotes the progress of “no fraud, no cash” to ensure that shoppers feel safe and secure in their shopping environment. In addition to these three Smart Retail CX solutions, the paper introduces the NEC Digital Store Platform that will form the foundation of a new information system infrastructure for Smart Retail CX.

### 6.4 Smart VenueCX

The shift to an experience economy and rapid increase of inbound visitors to Japan in recent years has increased demand in the service industry such as hotels, theme

parks and live entertainment, but the shortage of labor has amplified the need for measures to reduce burden on frontline operations. Under such circumstances, the COVID-19 pandemic struck a serious blow to businesses in the industry.

With Smart VenueCX, which is the fourth business domain of VCI, NEC is endeavoring to support the transformation of the industry by linking inspiring spaces together through the fusion of emotions and digital to deepen the bonds between people, communities and societies. To realize this vision, NEC is utilizing digital technology in inspiring spaces like stadiums, theme parks, hotels, and integrated resorts to connect people to people and places to people and provide experiences beyond imagination in safe, comfortable environments.

Two examples of Smart VenueCX solutions are discussed in the paper on this topic. One is the Smart Hospitality service designed to elevate customer experience with comfortable, touchless services. The other is the fan marketing solution that is required for venues in the new normal era.

### 6.5 Digital Finance

The environment that surrounds the financial industry is changing at a dizzying pace. New players are now on the rise—mainly in the area of fintech—who offer financial services such as smartphone-based payment and accounting. In Japan, the trend towards open banking is fast progressing as evidenced by the establishment of the Financial Services Intermediary Business. The COVID-19 pandemic, which burst forth in the midst of this trend, is pushing financial service providers to shift to touchless and non-face-to-face operations as is the case in other industries.

The fifth business domain of VCI is Digital Finance. In the paper on Digital Finance in this current issue, three digital finance offerings are introduced. The first focuses on enhancing digital customer engagement based on the digital know-your-customer (KYC) service that enables online identity verification using face recognition technology. The second focuses on business process transformation through automation of operations using AI technologies and partial BPO of operations. The third focuses on risk-management technology (RiskTech) provided through the AI-based Fraud and Risk Detection Service.

## 7. Digital Technologies That Support the VCI

Our commitment to the achievement of VCI is built on a history of pioneering technologies that goes back 121 years.

The digital technologies that support VCI include the following:

- NEC the WISE: a suite of cutting-edge technologies which act harmoniously with humans and expand human capabilities, including Heterogeneous Mixture Learning that improves the prediction of production amounts in manufacturing and sales numbers in retailing; and Autonomous and Adaptive Control that helps achieve optimal staffing at warehouses.
- Bio-Idiom: a multimodal biometric authentication terminal incorporating face and iris technologies that transform the world envisioned by NEC I:De-light into reality.
- Smart Connectivity: supports next-generation network technology that will create new connections. Now underway regarding this technology is utilization validation of the local 5G system which remotely operates and controls smart factories and construction machinery.

In addition, NEC is achieving various solutions and services for VCI by leveraging leading-edge technologies such as cybersecurity and cloud technologies in order to cope with ever-diversifying threats in this age of the new normal, in which telework environments are becoming more and more common.

We are also endeavoring to create new value by incorporating the sources of technologies created in our R&D centers into the co-creation activities with our customers.

## 8. Conclusion

This special issue of NEC Technical Journal introduces our commitment to VCI together with the actual cases and technologies that form the foundation of those cases. We are convinced that our commitment will contribute to the further development of your businesses and aid in your transformation in the age of the new normal. We hope you will enjoy reading this issue.

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The details about this paper can be seen at the following.

### Related URL:

**NEC Value Chain Innovation (Japanese)**  
<https://jpn.nec.com/nvci/index.html>

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– Shaping the Future of Organizations and Industries through Digital Transformation

Remarks for Special Issue on NEC Value Chain Innovation

NEC Value Chain Innovation — The Future Created by Digital Technology

### Papers for Special Issue

#### Utilizing digital technologies across organizational and industrial boundaries

The Supply and Demand Optimization Platform: A Co-Creation Project in Value Chains That Reduces Food Losses  
Multi-Bank Identity Confirmation Platform — A New Way to Verify User Identity Using Digital Technology  
NEC I:Delight — Personalized Adventures Unified by Trust

#### Connected Manufacturing

Connected Manufacturing — Innovating Manufacturing by Integrating On-site Know-how and Digital Technology  
Smart Factory Enabled by Local 5G

#### Intelligent Logistics & Mobility

Intelligent Logistics and Mobility — Intelligent ICT to Optimize the Movement of People and Goods  
Fast Travel: Using Face Recognition to Improve Airport Services with a View towards Wide scale Implementation  
Public Transport Smart Card/Mobile Ticketing Solutions That Support Safe, Reliable Movement of People  
Reforming Railway Operations  
Optimized for the "New Normal," NEC's Intelligent Logistics Supports a Continuous Flow of Goods  
Vehicle Interior/Exterior Monitoring Solution for Safe Transportation of People and Goods

#### Smart Retail CX

NEC's Vision of Retail and Smart Retail CX

A Relaxed and Enjoyable Customer Experience, More Efficient Store Management — The Cashierless Future is Here  
OMO Solutions that Provide a Unique Shopping Experience for Only Now, Only Here and Only Me  
Digital Store Platform, an Information System Platform for Smart Retail CX

#### Smart VenueCX

Smart VenueCX — Linking Inspiring Spaces to Deepen Bonds between People, Communities and Societies  
Elevating Customer Experience with Comfortable, Touchless Services  
NEC's Solutions for Venues in the New Normal Era

#### Digital Finance

Approach to Digital Finance in DX Era

NEC's Online Personal Identification Service Accelerates Innovations Toward New Normal Era

Measures Required for the Banking System in the Digital Era

AI-Based Fraud and Risk Detection Service Ensures Transparency While Improving Operational Efficiency and Performance

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