NEC's Approach to Value Chain Innovation - Safer, More Secure and More Comfortable Living Through Value Chain Innovation -

In order to respond to the various issues in the enterprise domain, NEC believes that value chain innovation - the creation of new value that connects people, goods and processes in the supply chain that links "MAKE" (manufacturing), "CARRY" (logistics) and "SELL" (retail and services) - is an indispensable key. This article will introduce the reader to how NEC defines value chain innovation and what value it can provide.

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1. Introduction
Why is value chain innovation necessary?

1.1 Today's Enterprise Environment

The enterprise domain comprising manufacturing, logistics, retail and service industries is confronting dramatic changes in the business environment ranging from the multi-polarization of the global markets driven by the economic growth of developing countries and increasing global competition to the growing sophistication and diversification of customer needs in maturing markets and the reduction of the labor pool due to the falling birthrate and aging population.

In addition, there are numerous and diverse issues that must be faced including the rising number of tourists and foreign workers, the increase in people with limited access to shopping due to depopulation, global environmental problems, and the consumer safety issues such as food safety.

1.2 The Necessity for Value Chain Innovation

In order to succeed globally in this environment, it is vital to enhance productivity to get the most out of our limited resources, and to upgrade and raise the efficiency of manufacturing, logistics and sales processes. However, in the face of the scale and diversity of the current changes, it is believed that it will be difficult for individual enterprises to respond and solve these challenges by simply reforming and reorganizing their business and processes.

It is necessary to tackle Value Chain Innovation that creates new value by connecting people, goods and processes in the supply chain that links "MAKE" (manufacturing), "CARRY" (logistics) and "SELL" (retail and services), (**Fig. 1**).

For example, the retail industry has seen product development for SPA (Specialty store retailer of private label Apparel) and Private Brands (PB) where product development attuned to market needs transcends the boundaries of manufacturing and retail. Also in step with the widespread usage of the internet and mobile terminals, more and more enterprises are turning to omni-channel retailing that can provide customers with shopping convenience irrespective of time and place.

In the manufacturing sector, Value Chain Innovation is contributing to production planning optimization, inventory replenishment and inventory management through shared understanding of the status of sales and inventory in the supply chain and demand forecasting.

Fig. 1 NEC's approach to Value Chain Innovation in the domain of Enterprise.

By forging links between enterprise and operations, and by functionally responding to changes, NEC is helping to create new value.

2. NEC's Value Chain Innovation

Value Chain Innovation, as envisaged by NEC will help create new social value and a more enriched life by using advanced ICT to link the value chain of manufacturing goods, their transport and the delivery to consumers through retail. Moreover, as ICT advances, the value chain further evolves.

NEC believes that by incorporating ICT advances such as IoT (Internet of Things), Big Data and SDN (Software-Defined Networking) in the value chain, it is possible to build innovation processes that create new value. (1) IoT enables the "collection" of data that embodies actual social behavior; (2) Big Data analysis technologies harness, analyze and then convert vast amounts of complex data into information that can be used to improve operations; (3) the information is used in "operation" to realize a seamless integration of IT and OT; and finally, new discoveries and added value identified through this process are incorporated to realize the innovation of new products, manufactured goods and services with smart high added value (**Fig. 2**).

NEC has extended the value chain of "making", "carrying" and "selling" and added "Living." By exploiting the power of IoT to utilize all kinds of data generated every day in life, NEC is meeting the challenge of creating innovative value for this new link in our value chain (**Fig. 3**).

3. Value Provided by NEC's Value Chain Innovation

This next section introduces some examples that incorporate NEC's Value Chain Innovation (**Fig. 4**).

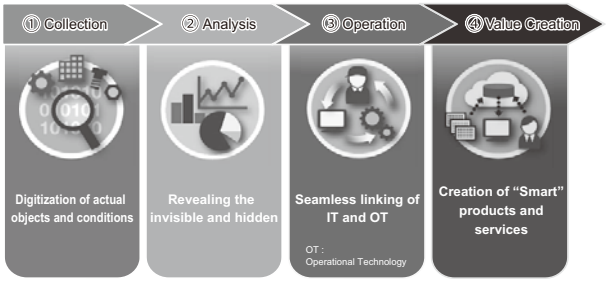

Fig. 2 Innovation Processes for Value Creation.

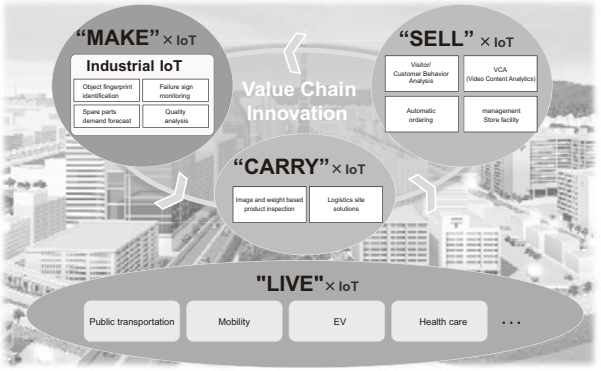

Fig. 3 Creating Innovative Value with IoT.

3.1 The Value of Value Chain Innovation in "MAKE"

Today's manufacturing industry needs innovation and improvements such as inventory reduction, shortening of lead-time, better response to changeovers, and supply chain optimization in step with the globalization. In response to this need, NEC has formulated a concept called "NEC Monozukuri Co-creation Program" that draws from achievements in man-

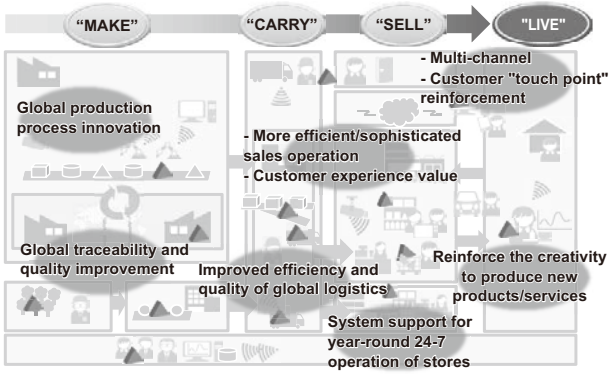

Fig. 4 Value provided by NEC.

ufacturing innovation that NEC has employed in its own manufacturing operations. In addition to the provision of diverse solutions based on this concept, NEC is co-creating manufacturing process innovation on a global basis in cooperation with program members* principally in the manufacturing industry. As of the end of July 2015, program membership totaled 1,675 individuals from 567 companies.

Moreover, NEC's announcement of Industrial IoT in June 2015 has brought IoT to equipment on the factory floor and the seamless linkage of IT and OT (Operational Technology) which in turn will help realize new value including visualization and improved efficiency of manufacturing processes in production centers both in Japan and abroad; it will also enable revolutionary reform of global production processes, traceability and ultimately improved product quality. Furthermore, the incorporation of IoT in products and connectivity support the creation of further added value for products and new business models by enabling visualization of how products are actually used – information that was conventionally invisible and a more detailed grasp of customer preferences and attributes.

3.2 The Value of Value Chain Innovation in "CARRY"

In the field of logistics, the growth of e-commerce transactions has driven demand for individualized delivery in ever shorter time. Moreover, due to the overseas migration of manufacturing centers, the division of labor on a global level is no longer unusual. In order to realize deliveries in a very short time, the application of image recognition technologies in the pre-shipping inspection work is contributing to more efficient inspection. Also by enabling the visualization of the status of products during their transport of goods, Value Chain Innovation in logistics is making the flow of things visible on a global scale, and this in turn leads to improved logistics quality and consequently higher customer satisfaction.

3.3 The Value of Value Chain Innovation in "SELL"

Demographic shifts such as the increase in single-person households, the growing population of elderly and working women are changing the structure of society and impacting lifestyles. It is increasingly necessary for the retail domain of "SELL" to respond to these changes by improving the retail environment and enables the purchase of goods anytime, anywhere.

Based on the extensive experience and know-how acquired from providing IT support for multi-outlet retail businesses such as convenience store chains, both domestically and internationally, NEC can support 24/365 day non-stop outlet operation and provides service for smooth, stable business administration.

In response to the difficulty in forecasting demand due to changing lifestyles, NEC's original Big Data analysis technology is providing highly advanced demand forecasts that can enable automatic ordering. The retail sales floor is also being improved by sensing technology and image analysis information. All these are contributing to more efficient and advanced retail operations.

Furthermore, NEC's various achievements go beyond the traditional brick and mortar premises to retail channels such as e-commerce. In response to O2O (Online to Offline) and the omni-channel trend, NEC is developing solutions and services to offer value that enhances customer touch points.

3.4 Value Chain Innovation That Enriches People's Lives

NEC is working to enrich people's lives by tackling ways to more closely support consumers.

As an example of utilizing next-generation energy, the EV infrastructure of charging stations for electric vehicles is being deployed at commercial facilities across Japan Also the adoption of a standard IC card that can be used for multiple public transportation networks in Japan is making transportation smoother and more convenient. Moreover, this same public transportation IC card solution is being provided globally in cities such as Dacca, Bangladesh. In this and many other ways, NEC ICT is improving the quality of people's lives around the world and contributing to the creation of social value.

Furthermore, the "My Number" system is scheduled go online in January 2016, this system of a unique single identification number assigned to each citizen will not only streamline various types of public administration services, but also is under consideration for use by private sector services. Identity confirmation when purchasing goods and services and linkage between ID and various services is expected to provide added value and enhance convenience for users.

* Regarding the latest number of members, please visit NEC's Monozukuri Co-creation Program website at http://jpn.nec.com/manufacture/monozukuri/ (Japanese only)

NEC has been appointed to design and develop the software for the intermediate servers that support the "My Number" system. While taking part in the construction of this national infrastructure, NEC is also looking ahead to usage of the My Number system by the private sector, and is considering the possibility of creating new services and businesses for our customers based on an in-depth understanding of this national platform.

In this way, NEC is providing platform systems that fuse our distinctive technological assets such as network and sensor technologies, broad SI know-how, and customer assets as well as operation services to not only customers in the enterprise domain but also to government organizations at the national, regional, municipality level as well as other public organizations, financial institutions and telecommunications carriers both in Japan and abroad. Leveraging our achievements and know-how gained in non-enterprise domains, NEC is advancing and realizing Value Chain Innovation for our customers.

4. Supporting Value Chain Innovation with NEC ICT

The ICT necessary for the support of Value Chain Innovation encompasses the network that connects everything, IoT technology for data collection, the Cloud for storage of the collected data, Big Data analysis engine for analysis of those data, and security which enables the safe, secure utilization of all these technologies.

For the network that links everything, NEC uses SDN which boasts both the flexibility to speedily respond to changes in the operating environment that accompany advances in Cloud and Big Data technology, and the efficiency that enables utilization of only the network assets necessary for the task and only when they are needed.

In the field of IoT technology, NEC provides "one stop" solutions based on an IoT platform and digitalization of "things" that leverages NEC's image recognition and "fingerprint of things" product recognition and traceability technology, which is recognized as the most advanced in the world.

Collected data are stored in the Cloud. NEC provides solutions that systematically integrate the "on-premise" model with cloud services such as NEC Cloud IaaS, which delivers high performance and high reliability combined with speed, flexibility and scalability, and Cloud Platform Suite which enables the easy construction of an on-premise private cloud environment.

In the area of Big Data, NEC is aiming at more advanced and optimized operation using our powerful "Invariant Analysis" engine as well as improvement of product/service value through "Heterogenous Mixture Learning" and "Behavior Analysis" technologies; NEC also aims to achieve strengthening of information management, detection of crime/unauthorized access, customer acquisition/maintenance and sales promotion with "Textual Entailment Recognition" and "Facial Image Analysis".

In every phase of development and operation, security is essential for vital infrastructure inclusive of systems, products and services. The standards of their developments and operations are determined with the primary objective of preventing information leaks and data tampering by cyber-attacks. While swiftly implementing countermeasures to meet new cyber-attacks that are occurring on almost a daily basis, the quality of security is preserved.

In addition, by using NEC's biometrics technology recognized for its highest level of accuracy in the world for fingerprint, face, and fingerprint + finger vein identification, even more robust security can be provided.

As described in the preceding section, NEC is leveraging its world-class ICT to support the realization of Value Chain Innovation.

5. Solutions on a Global Scale

For our customers who pursue business around the globe, NEC provides a selection of solutions called NEC Global Enterprise Solutions. Drawing on our extensive record of solution achievements and our strengths, we create optimized value chains for our customers operating in countries and regions around the world and provide robust support for their ongoing innovation.

NEC Global Enterprise Solutions have 4 defining characteristics. First, we deliver solutions that leverage our expertise gained through collaborations with convenience store chains, automobile manufacturers, and other major Japanese companies operating on the global stage. Second, we provide "Step-by-step Solutions" that are tailored to meet the unique business expansion and growth goals of each customer in different countries and regions. Third, NEC provides one-stop ICT-LCM (Life Cycle Management) solutions, including ERP (Enterprise Resource Planning) consulting that is recognized as top class in Asia, and multiple-store expansion support. Fourth, NEC provides original state-of-the-art solutions based on the most advanced technology in the world such as our face recognition technology.

Boasting these unique characteristics, NEC Global Enterprise Solutions are provided to customers pursuing business on a global scale in the enterprise domain with a focus on the "manufacturing," "logistics," "retail," "hospitality" and "automotive" sectors.

In order to offer NEC Global Enterprise Solutions on a global scale, NEC has launched Regional Retail Business Support Centers (RBSC) (**Fig. 5**).

NEC's vision is to standardize the experience and know-how accumulated and refined over the many years of providing IT support to customers in Japan and abroad, and offer that

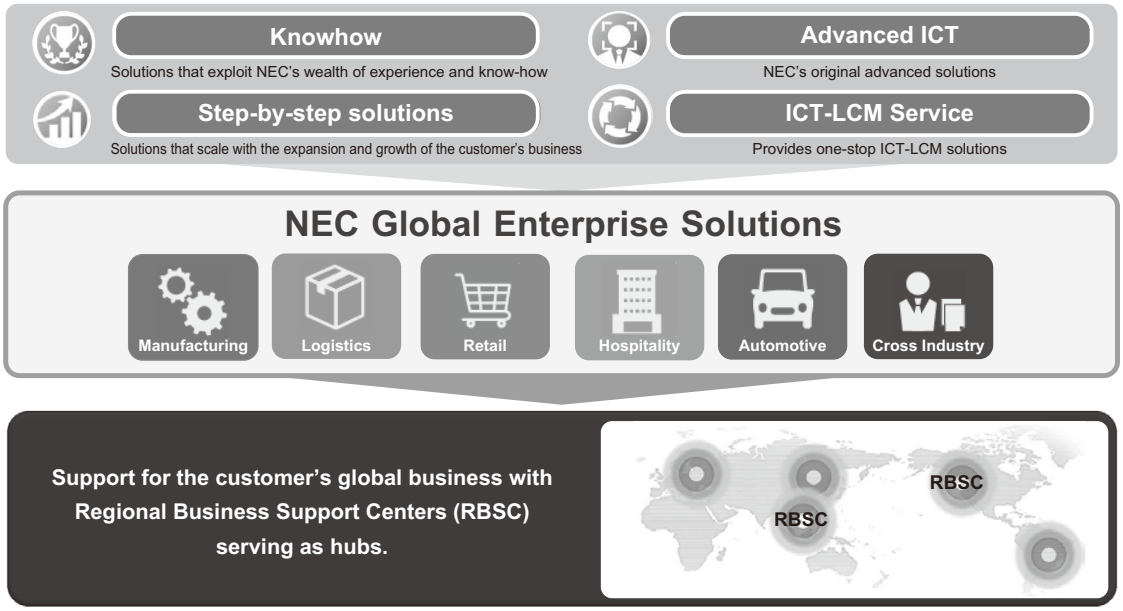

Fig. 5 NEC's Global Support.

standardized experience to overseas customers. Leveraging NEC's own hardware and software, and providing "one stop" service from system planning, deployment and operation to maintenance services, NEC will fully exploit its greatest strength - its know-how, and support the expansion of our customers' global business.

6. Conclusion

In the "MAKE," "CARRY" and "SELL" operations, NEC aims at enriching life through Value Chain Innovation that provides new value by linking people, things and processes. This special issue introduces the reader to concrete examples of how NEC is tackling this objective in each stage of the value chain, the solutions that deliver innovation, various case studies, and our ICT supporting NEC's Value Chain Innovation.

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- Value Chain Innovation Linking "MAKE," "CARRY" and "SELL" -

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