Ever-evolving Things

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Abstract

Big data analytics will fuel innovation. Even after products are shipped, they will become ever-evolving things through functionality and performance enhancements. This in turn will boost value for customers and promote business model transformation.

Keywords: smart machines, artificial intelligence, cybersecurity

1. From goods to services

With the development of globalization and the expansion of digitization, more products are becoming commodified. In the meantime, the transition from an industrial to an intellectual society has changed the sources of value from tangible things and assets to the use of intangible information, design, and functions. The same product may have different value depending on the user's sense of value, situation, and usage. In some cases, products have emerged from price-cutting wars with added value, ending up with an increased price point. The law of *one* price, which indicates that value is attributed to products, is being shifted to *multiple* prices, which means value is derived from products by using them.

In the manufacturing industry, *servitization* that provides products as a solution is becoming more common. This accompanies the paradigm shift from the idea that value exists in products themselves to the idea that value is generated by using products. For example, customers who wish to shop efficiently and those who wish to enjoy their shopping experience look for different kinds of value such as the atmosphere of the store and the service of the sales staff. Redefinition of the value offered to customers is also happening in the financial, medical, and social welfare fields.

2. Analysis of big data

The development of information technology (IT) has enabled all kinds of information produced by people and things to be accumulated. Real-time analysis of varied and large amounts of information generated in real time helps visualize the conditions of customers, markets, society, and the environment. Signs of change and correlations that have been elusive can now be linked to improvements in customer satisfaction, development of new products, diagnosis of illnesses, and development of medicines. While privacy and other issues must be considered, the results of big data analysis may prevent problems based on the correlations of behavior patterns and environmental conditions with success and failure, illness and accident, and criminal action.

Analytical algorithms are the key to deriving value from big data. For example, analysis of customer attributes may generate different results depending on the data and analytical algorithms used. In the consumer finance industry, traditional financial information has included revenues, debt balances, and credit histories. In addition to these, an approach is emerging that determines the credit risks of individuals based on their overall information, including financial behaviors that were traditionally overlooked and information seemingly unrelated to financial behaviors such as the way they sign documents, their major in college, and their postings on social media. While demographic groups with no credit histories can now receive loans, which leads to the correction of some disparities, loans to applicants with high default risks have decreased, allowing some lenders to reduce losses from defaults by more than 20%.

3. Ever-evolving things

Because automobiles, machines, consumer

electronics, and other things are connected to the Internet, processes common in the world of IT are expected to be used widely in the physical world. For example, when software updates of computers and digital devices are applied to a wider range of things, users may be able to enjoy the advantages of added features and improved performance without trading in their things. While in the past, goods were replaced whenever a new product with enhanced features appeared, it may become common to update only the software while continuing to use the same device (hardware). If that happens, design concepts will change so that software will provide all kinds of features. Modularization, which enables only the components of a device to be replaced depending on the software features, and agile development methods, which are common in software development, might be introduced.

Cars that can be converted to self-driving vehicles by installing software, and robots whose functions expand by adding applications have already been introduced. Robots that learn tasks and those equipped with artificial intelligence (AI) with self-learning abilities also exist. It used to be that the different tangibility of goods and services produced other differences. For example, there was a time difference between the production and consumption of goods, while those of services were simultaneous. The value of goods was determined at the completion of production and deducted through consumption, while that of services was co-created by producers and consumers. Things whose value increases as they are used have made it meaningless to make a distinction between goods and services. This could create an impact on industrial classification and how depreciation is treated in accounting.

4. Emergence of smart machines

Recent years have seen the emergence of self-driving cars, drones, robots, and other machines equipped with AI (collectively called smart machines) that have self-learning functions and move autonomously. The spread of smart machines is expected to change the roles and functions of both people and machines in society. For example, more factories and other facilities may become unmanned, with robots monitoring machines. Self-driving cars and drones will be handling logistics, and virtual assistants will be serving customers at banks and stores. Robots can already communicate with other robots to share what each has learned on its own. In the future, it is believed that smart machines will also be sharing perceptions such as those concerning collision avoidance, acting in collaboration with one another. While society is human-centered, smart machines are expected to assume a central role in the social infrastructure and social control, giving rise to restructured social systems and processes.

5. Human–AI collaboration

Although AI now has the capability to beat top-class professionals in Japanese chess (*shogi*) and *go* through self-learning, this type of AI is specialized in specific skills. There is still no AI that possesses the overall high intelligence of humans. In light of the increasing dependence on decisions made by AI in the future, it may make sense to provide AI with a basic education that lets it make correct decisions similar to human children, allowing for versatility and high intelligence. Unfortunately, AI could also be taught impropriety by malicious developers, enabling it to make incorrect decisions or misjudge between right and wrong. With its increased use, AI will be expected to make decisions outside its expertise such as those related to ethical problems. In short, it will be essential for AI to acquire common sense.

Some non-profit organizations have already launched educational institutions that focus on AI. In the future, the education of AI may become critical. Meanwhile, if a smart machine (AI) causes an accident due to its self-learned ability, an issue will occur as to the extent of liability that may fall on the owner, user, manufacturer, or software developer. Some have

started to consider giving smart machines the legal status of a person, subjecting it to liability.

One study reported that the employment of 40% to 50% of a nation's labor force could be replaced by AI and robots [1]. In school education and worker training, it may be necessary to have humans learn a high level of cooperativeness and creativity, which are difficult to substitute with AI. However, the employment opportunities replaced by AI could exceed those newly created for humans. For this reason, it may be necessary to first examine the social system, including the social security concept, the possibility of shorter workdays to increase the number of employees, and the implementation of basic incomes.

6. Strengthening of cybersecurity

It is believed that real-time situational judgment and continuous communication among smart machines will help avoid accidents in the future. This could make the quality and reliability of communication functions even more critical. For example, if exploitation of security vulnerabilities causes a large-scale blackout or traffic jam, the entire society might become dysfunctional. Hacked smart machines might even start assaulting humans.

One way to avoid hacking is to refrain from having them be constantly connected to the Internet. However, this would make it impossible to take full advantage of existing information. Although strengthening countermeasures against cyberattacks is necessary to ensure security, it will also be necessary to build fail-safe systems to minimize the impact of potential failures and to prevent unexpected actions of a smart machine.

Reference

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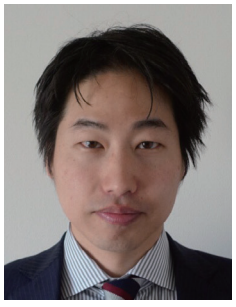

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