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Business Field

05 Understanding the IT Business and Ethics

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Korea Productivity Center

Publisher TOPCIT Division
+82-2-398-7649 www.topcit.or.kr helpdesk@topcit.or.kr

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I. The Concept of IT Business

Recent Trends and Major Issues

In the past, the perception of IT among the business community was that IT could play an auxiliary role in business processes, but that nothing more could be expected from it. However, as digital technologies have become ever more deeply embedded in users' lifestyles, IT is being actively integrated into corporate business processes. It is from this perspective that people must understand not only the concept of (IT?) business but also the IT ecosystem and IT value chain related to IT business.

Learning Objectives

1. To be able to explain the concept of IT business and its characteristics.
2. To be able to explain the IT business ecosystem.
3. To be able to explain the business value chain after understanding the IT resources allocated to businesses and the activities (roles/functions?) of such IT resources.

Keywords

Concept of IT business, IT business ecosystem, IT business value chain

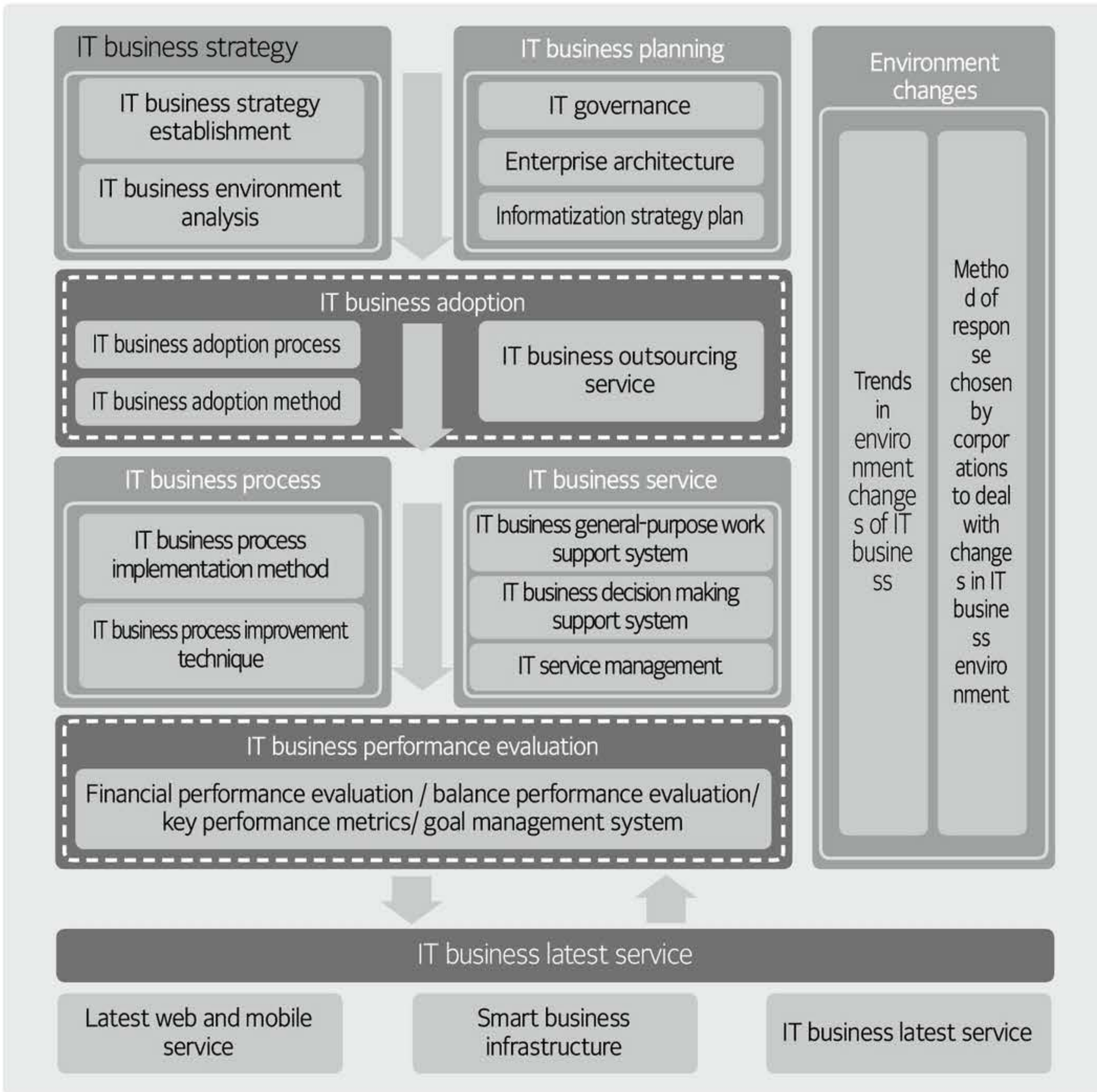
✚ Preview for practical business

Alibaba, a Chinese e-commerce company, was listed on the New York Stock Exchange on the morning of September 19, 2014. What's amazing about Alibaba is that on the day of its listing, its stock price rose by 38 percent to $231.4 billion (241.6 trillion won) in market value, and Jack Ma, Alibaba's largest shareholder, quickly became China's richest man, with $25 billion (26 trillion won) in assets.
In 1999, Jack Ma, along with seventeen friends, founded Alibaba, an online shopping mall that sells Chinese SME products to companies around the world from his apartment. Alibaba's rapid growth began in 2000 with a $20 million investment from Softbank's Masayoshi Son. Following in the footsteps of Alibaba a B2B service, the company launched "Taobao," an online shopping mall for individuals (C2C), "tmall.com" an online department store for wealthy customers, and "Alipay," an electronic payment service. Today, Alibaba Group has become the world's leading online shopping mall and fintech corporation. Alibaba is also one of the finest models of success in the IT business. So what is the key success factor (CSF) that has enabled the company to out-maneuver eBay, the global company that previously occupied the dominant position in the Chinese market?

First, there are no transaction fees at Alibaba's online shopping mall. Profits are generated from advertising and search services. Second, the company deployed an innovative logistics system that can deliver goods to any address in the vast Chinese territory in just 1~2 days, and, using the 'Alipay' service, it turned China's unreliable e-commerce into a trading channel trusted by the trading parties. Third, it worked aggressively to meet customer requirements. It supported the practice of 'chat-purchase' when shopping through the Internet, whereby customers can negotiate the price of a product by chatting before making a purchase decision. Fourth, CEO Ma Yun's vision and strategy inspired his employees to dedicate themselves to the company and drove them to work with all they have got.

As we saw earlier, Alibaba provides the three elements of competitiveness that all companies must have: price, quality, and customer-friendly services. And, most importantly, the organization is very well led by the CEO thanks to his vision and strategy. Alibaba is a perfect example of why strategy is so important in the IT business.

01 The Concept of IT Business: A Summary



[Fig.1] IT Business Lifecycle and Interrelationship Diagram

An IT business is pursued as a series of steps after developing a strategy and establishing a plan for adopting an IT business. The IT business process begins right after the adoption of the IT business. The ultimate output of this process is an IT business service that will generate earnings for the company. This cycle then "recycles" itself perpetually as IT becomes integrated into the company's business. Thereafter, the direction of the IT business can be corrected or improved by evaluating its performance on a continuous basis.

The management environment surrounding a company responds with sensitivity to changes in politics, economy, society, culture, and technology. Further, the management environment evolves continuously to become fully optimized for the objective of maximizing corporate value. As a core element for optimizing the management of a company, IT's integration with the service (which utilizes the latest technologies) sets the direction in which the IT business will evolve.

To efficiently plan and implement an IT business and realize the benefits of its implementation, the concept of IT business must first be clearly established. Therefore, this chapter begins by explaining the concept of IT business and how it has evolved. Next, we will introduce an IT ecosystem made up of contents (C), platform (P), network (N), device (D), and security (S) industries that compete and collaborate with each other in the IT business environment (an environment which is affected by the new IT technology hype curve) and the IT value chain produced by the ecosystem.

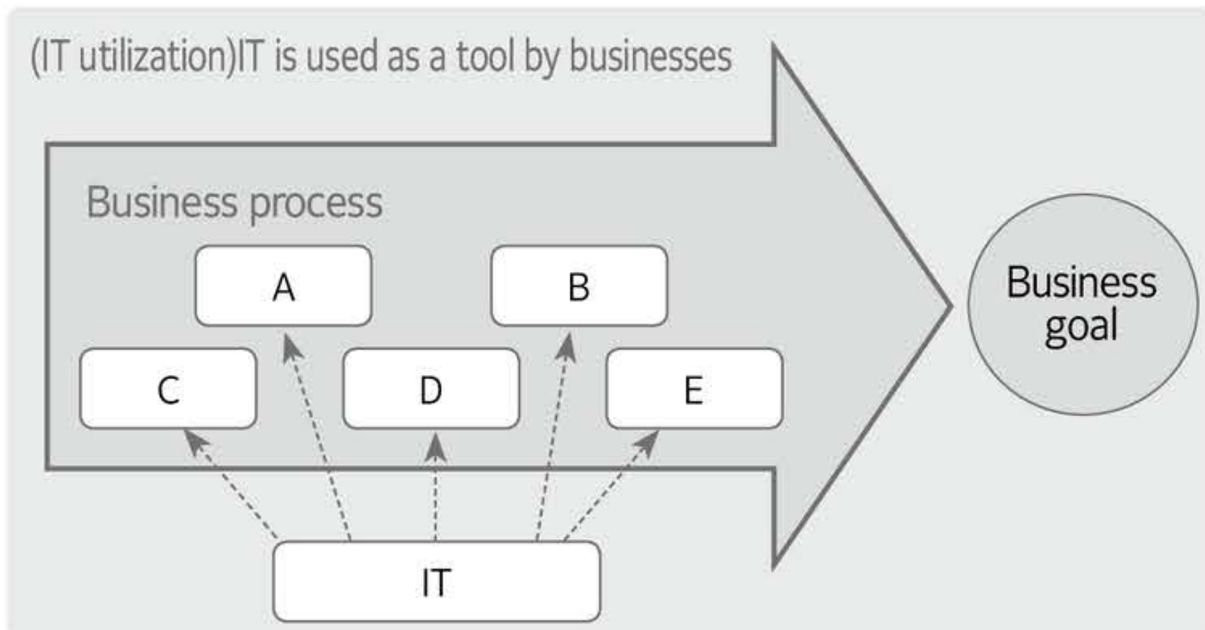
A) Definition of IT business

IT business refers to all activities that are strategically carried out by integrating IT into a broad range of processes to realize the business objectives of a company.

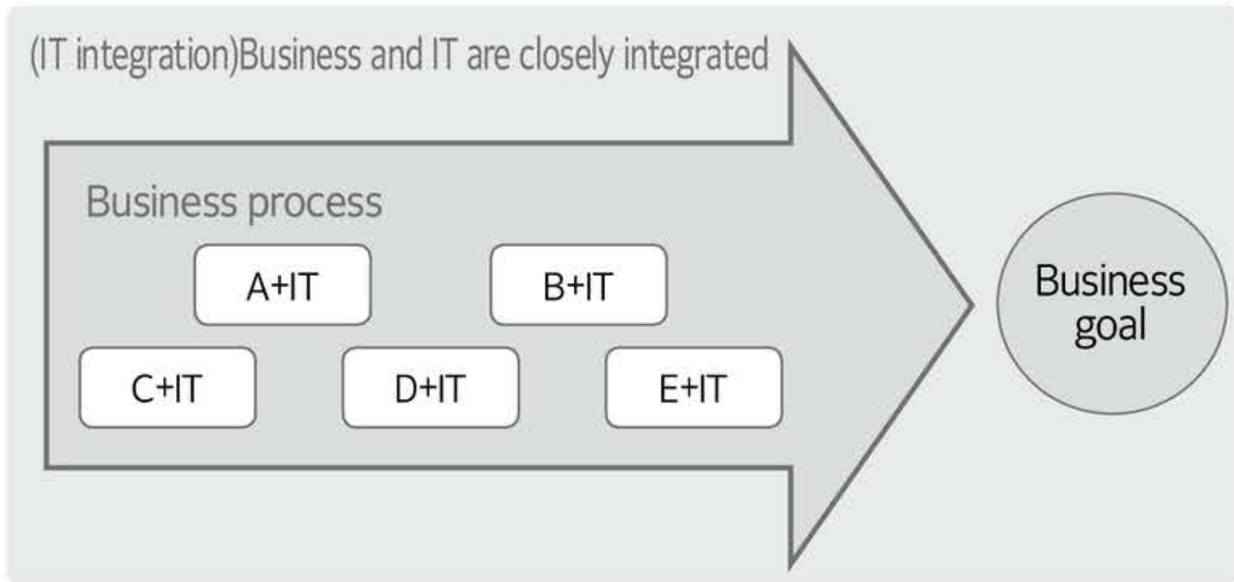
In the twentieth century, computers were installed mainly in computing rooms and used only sparingly in the ordinary working environment of most businesses. However, since the 1990s, with the development of computers and the mass adoption of web technology, the use of computers has gradually been extended to the ordinary working environment.

This popularization of computer technology accelerated rapidly in the twenty-first century with the infiltration of IT into every corner of the national industries. From this point on, the lifestyle of the great majority of people began to transition to one centered on digital technologies, and IT began to play a key role in the business processes of almost all industries. In other words, companies were not utilizing computers only partially in the workplace; rather, IT began to play a key role in companies' decision-making process from an enterprise-wide perspective.

Around 2005, the concept of 'IT business' first began to be discussed and recognized in earnest by people working in the field, mainly in industries that sell products where IT is critical. After 2010, as a growing number of companies integrated IT into their business processes, the concept of IT business evolved into a structure in which IT is tightly merged with business processes in order to give companies a competitive advantage. In particular, decision-makers in the world of business began to recognize the importance of fully incorporating IT into their businesses in order to acquire high-quality data in a rapidly changing business environment. [Fig. 2] explains how the concept of IT business has evolved over the years.



(a) IT utilization

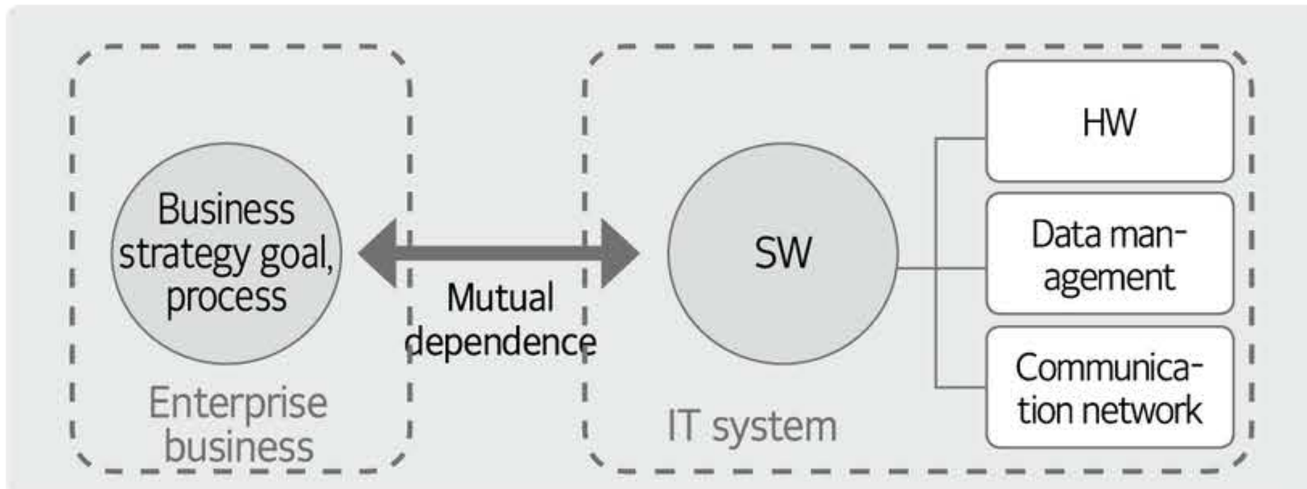


(b) IT integration

[Fig.2] The evolving concept of IT business

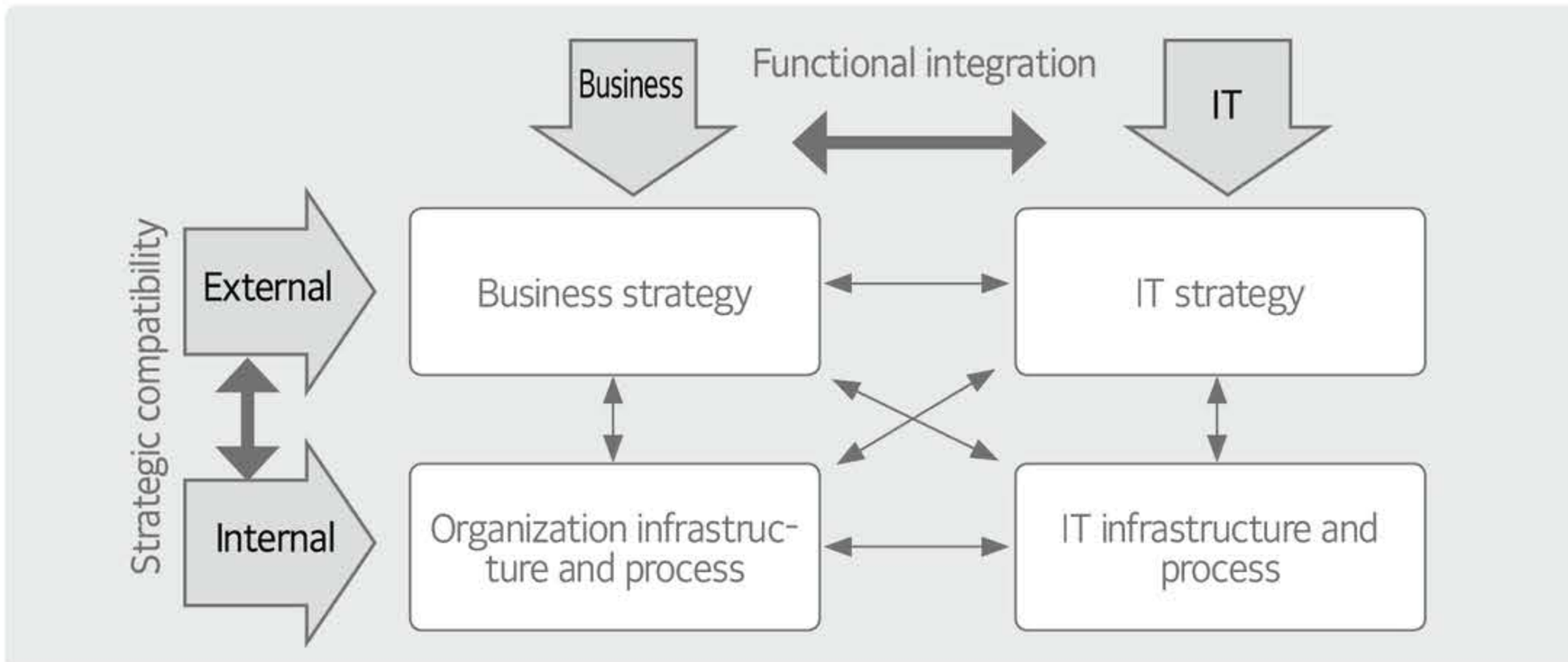
B) The alignment of business and IT

In terms of IT business, IT is more than just a tool or a support function: It is becoming established as a concept whose interdependence with business strategy objectives and processes is maximized. This maximization of interdependence not only strengthens the competitiveness of a company's business model but also plays a major role in creating new business value. [Figure 3] shows the interdependence between a coprorate business and the IT system of a corporation.



[Fig.3] The interdependence between a corporate business and the IT system.

In IT business, the alignment of business and IT can be understood as IT application programs, IT infrastructure, and an IT organization that supports and realizes a company'sbusiness strategy and business processes.The strategic alignment model of business and IT can be represented as a 2-dimensional diagram, as shown in [Fig. 4]. In this figure, the"strategic fit" dimension is subdivided into external focus (business environment) and internal focus (management structure), while the"functional integration" dimension is subdivided into business and IT.



[Fig.4] The strategic links between business and IT

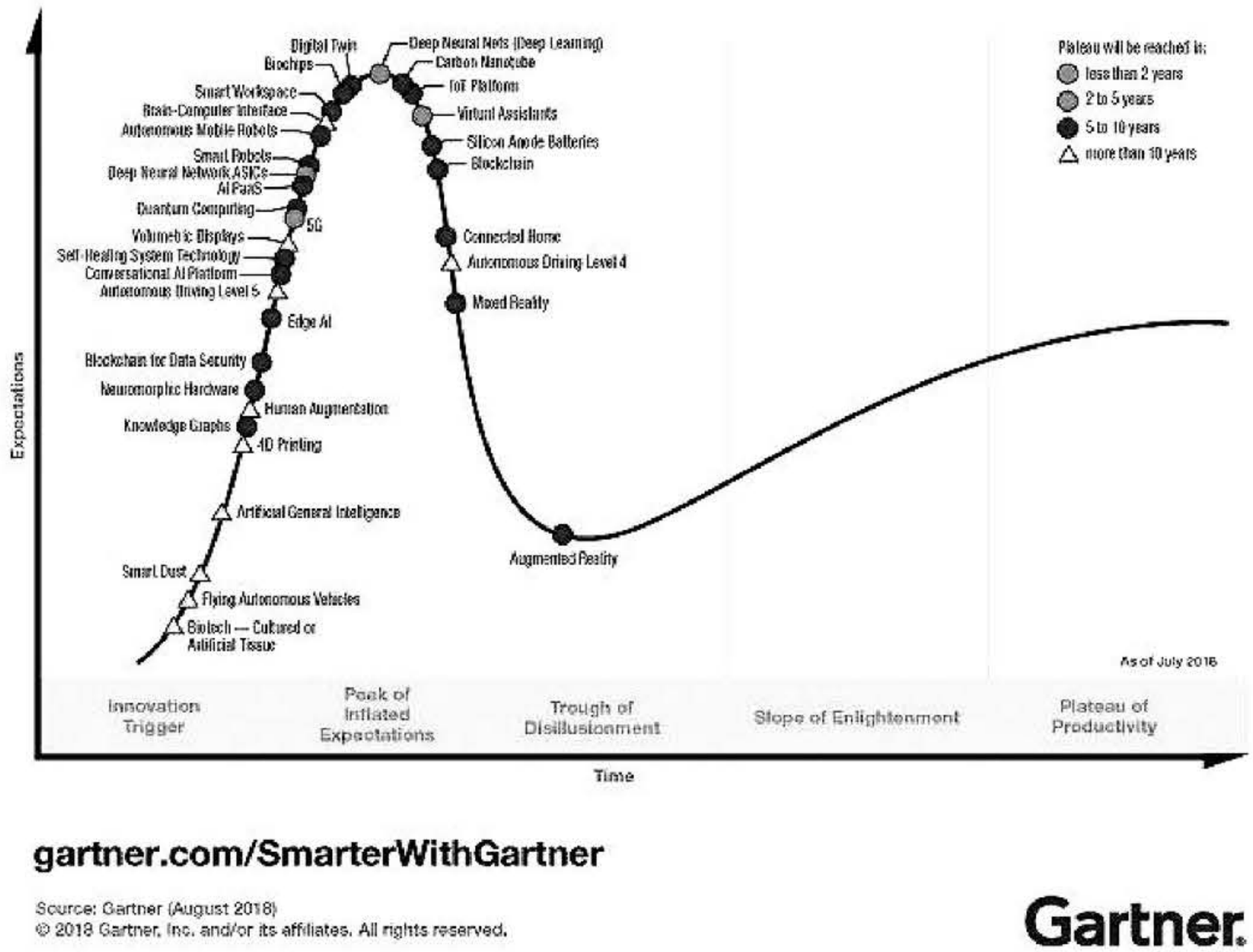
To achieve strategic alignment, this model defines four areas that complement each other: business strategy, IT strategy, organizational infrastructure and processes, IT infrastructure, and processes. Each area has its own scope, capabilities, governance, infrastructure, processes, and technology.

02 IT Business Ecosystem

A) IT business and the hype cycle

Now let's take a look at the changes in the IT technology environment that have brought about various IT business innovations in recent times. A diagram that shows changes in the expected level of industrial economic value and the impact of new technologies in the IT sector over time is what the hype cycle from Gartner (released every year) is all about.

In the hype cycle, the so-called "innovation trigger" is the time when new technologies are first introduced and people expect great things from them. After that point, the level of expectation gradually increases before the new technology starts to become more exaggerated than what it can actually deliver, leading to a period when the bubble reaches its maximum size (the peak of inflated expectations). The Trough of Disillusionment is the period when the bubble bursts, after which the hype cycle enters a period of revival (the Slope of Enlightenment) in which the expectations for the technology start to climb steadily once again. In the last period of the hype cycle, the technology transitions to the Plateau of Productivity, the period when it generates steady values.



[Fig.5] 2018Gartner Hype Cycle

The hype cycle allows us to understand not only those technologies which have recently become important issues, but also what kind of world will unfold in the future due to the nature of such technologies. Understanding the evolution of technology as presented in the hype cycle and incorporating it into an IT business can be of tremendous help to a company's growth.

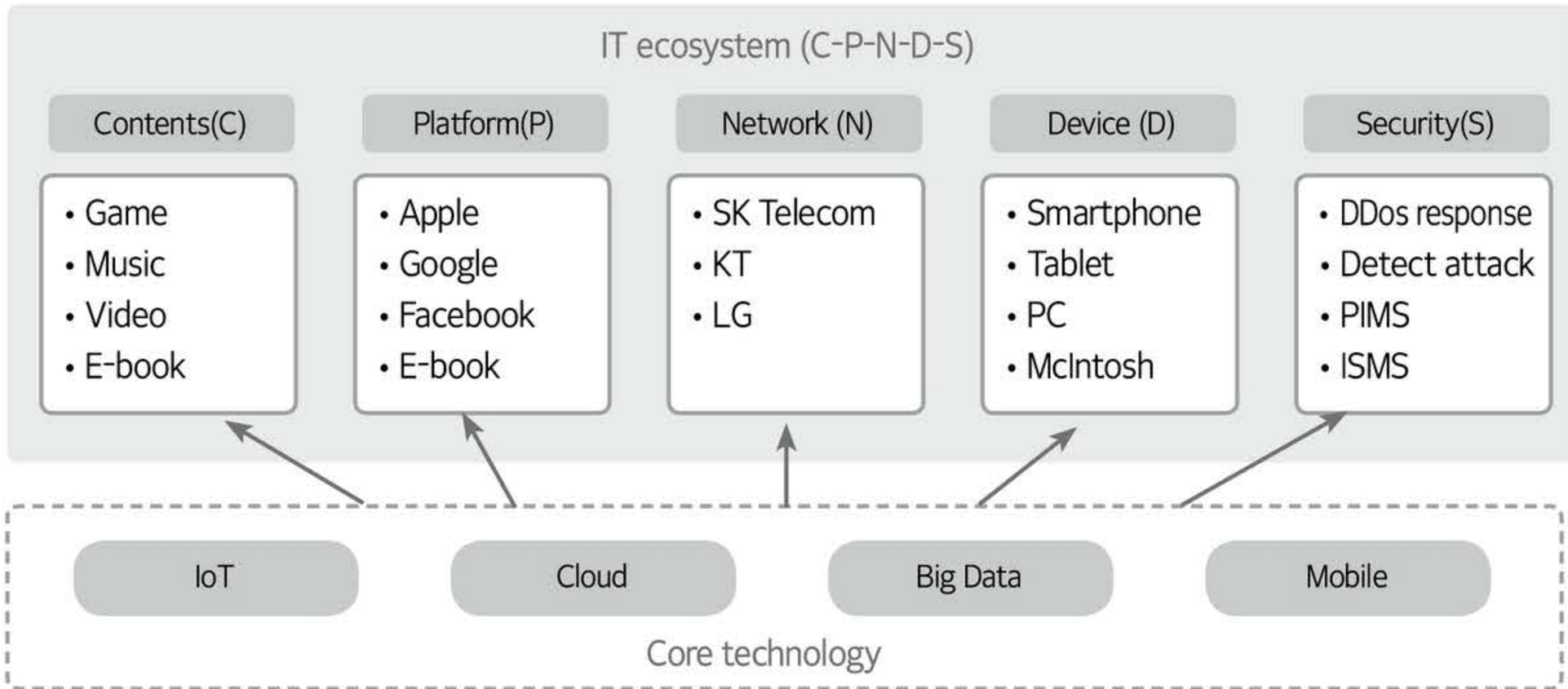
B) IT ecosystem

As IT technology continues to advance and improve, it is creating a huge ecosystem where different technologies both interact with and compete against each other. [Fig. 6] represents this IT ecosystem.

After the Information Revolution of the 1980s brought on by the development of personal computer and telecom networks, we witnessed-from around the year 2000 onwards - the birth of the Smart Revolution in which mobile devices began to be converged with smartphone-based wireless Internet, phone, and computing services. The Smart Revolution not only accelerated the convergence of the IT industry but also affected other industries, acting as a catalyst for the overall "smartification" of entire industries.

Overall smartification has resulted in IT technology being adopted by such diverse sectors as education, automobiles, defense, construction, shipbuilding, and medicine. Advances in sensor and network technologies are driving the

transformation of M2M (Machine to Machine) into the IoT (Internet of Things) and extending it to the realm of the Internet of Everything (IoE).IT technology is connecting humans to humans, humans to objects, and objects to objects, and leading our society towards a hyper-connected society where humans, objects, spaces, data, and services are all connected together.



[Fig.6] CPNDS ecosystem and ICBM core technology of the IT industry

A hyper-connected society wields a huge influence on the IT ecosystem, which is built on contents, platforms, networks, devices, and security. As the center of the IT ecosystem moves from hardware devices to platforms and contents, software is becoming increasingly important, and smart mobile-based IT convergence is expanding into traditional major industries, finance, and healthcare.

Meanwhile, destructive innovations like 3D printing and unmanned vehicles with the capacity to destroy existing markets are leading the IT ecosystem and improving competitiveness based on open innovation, and demand customized business models are proliferating. The core technology that is currently making the hyper-connected society possible is ICBM technology, which consists of the Internet of Things (IoT), Cloud Computing, Big Data, and mobile.

[Table 1] explains the changes taking place in the IT technology environment and the form of IT competition in terms of the following five major trends from the perspective of IT paradigm change: the change from HW to SW platforms, the change from IT convergence to smart convergence, the ICBM-based hyper-connected society, the rapid changes in the IT technology environment and the IT business transformation of competition.

<Table1>IT paradigm change

Category	Description
Change from HW to SW platform	• The IT ecosystem moves from devices (HW) to platform contents (SW). • SW and platforms are the key to value creation - the engine of growth for national industries.

Category	Description
The change from IT convergence to smart convergence	• Smart mobile-based IT convergence is expanding to traditional major industries, finance, and medical services. • Fintech has emerged as the new blue ocean in IT convergence.
The ICBM based hyper-connected society	• ICBM-based hyper-connected society and increased opportunities for economic growth-Internet of Things(I), Cloud(C), Big Data(B), Mobile(M).
Rapid changes in the IT technology environment	• Real sensation environment technology of virtual reality that combines the real world with the virtual world. • Destructive innovation that destroys existing markets, e.g. 3D printing, unmanned vehicles.
IT business transformation of competition	• Growth is being driven by small and medium-sized creative IT venture companies. • Competitiveness is built through open innovation and the spread of the demand-customized business model.

C) Components of an IT business ecosystem

The table below describes the characteristics of the 5 components (contents, platform, network, device, and security) that constitute an IT ecosystem.

<Table2> Components of an IT business ecosystem

Components	Main characteristics
Contents (C)	Advances in mobile technology lead to increased consumption of mobile contents. • A mobile environment centered on a smartphone with computing power allows users to use diverse contents free from the restrictions of time and space. • In the new mobile environment, users can not only enjoy music and video but also use e-books and other materials with ease. An ecosystem comprising a new form of content distribution in which mobile users are the chief customer segment is gradually gaining acceptance.
Platform (P)	IIT service platforms are evolving from individual services with a single operator to a common platform in which multiple providers participate together. • The closed platform is being superseded by the open platform. • The trend is changing from building one's own platform and providing one's own service to providing services using a common platform shared by a select few. • Apple, Google, and Kakao have developed their service framework based on the concept of a platform in whichmany operators can participate.
Network (N)	The smart revolution began with tablet PCs, smart TVs, and smartphones, but is it now raising the standard of network traffic bothqualitatively and quantitatively. • Next-generation smart services such as smart homes and smart cars can generate many different forms of large volume traffic. • The diverse types of IoT devices and sensors used in thehyper-connected society are also generating massive amounts of data traffic.
Device (D)	The market launching of wearable devices has resulted in fiercer competition as well as collaboration among device makers. • Watch-type products such as Samsung's Galaxy Gear and goggle-type products such as the Google Glass are becoming commercially successful products. • The number of smartphones and tablet PCs that can be connected to smart devices is increasing.

Security (S)	The sophistication and smartification of IT cyber threats is leading to an increase in damages and threats due tothe increased use of IT by key national infrastructures. • There is a growing threat of cyber targeted attacks such as cyber terrorism, which aims to neutralize information and communication networks and computer systems, and hacktivism,in which hackers attack computer systems for political and social purposes. • The response to new malicious hacking attacks is changing from a response based on security technology for post-attack investigations to one based on security technology for early prevention and real-time resolution.

03 IT Resources and Management Activities for IT Business

A) The concept of IT resources

The concept of "IT resources" encompasses the people, processes, software and hardware used to run anIT business. IT resources include IT support systems and IT management systems, of which the former are systems that support or manage IT businesses, such as ERP (Enterprise Resource Management), SCM (Supply Chain Management)and PLM(Product Lifecycle Management), while the latter IT typically include information technology service management (ITSM).

IT resources evolve continuously while maintaining a direct relationship with the IT business in question. They are changing in a direction that maximizes the results of an IT business with changing technologies and the changing times.

The system for managing IT resources is called an IT resource management system: Essentially, it manages and controls the solutions, products, and processes required to support IT businesses. The IT resource management system manages resources (from planning and development through application, operation and management to disposal) using the IT resource lifecycle as a template. It manages the specification list of IT resources as well as the gains in business performance achieved by utilizing IT resources.

B) The role of IT resources

One can identify the many benefits to be derived from the use of IT resources for an IT business, but they can be summarized into three main viewpoints.

[Fig. 7] The role of IT resources

① Improved production efficiency

Many companies are using their IT resources to improve their overall production efficiency. For example, most domestic hypermarkets in South Korea monitor customer purchasing patterns in realtime, and manage their

inventory levels continuously based on information gleaned from the customers' purchasing data. The inventory data are sent to a process that analyzes real-time customer purchasing patterns. This pursuit of production efficiency can maximize sales and contribute significantly to the building of competitive advantages.
Wal-Mart is a case in point. The company recorded sales of more than $28 per unit area of the store (which is more than double that of other retailers (sales of $12 per unit area on average) through the use of its RetailLink system, which allows suppliers to access Wal-Mart's data warehouse directly.

② Creation of new business values

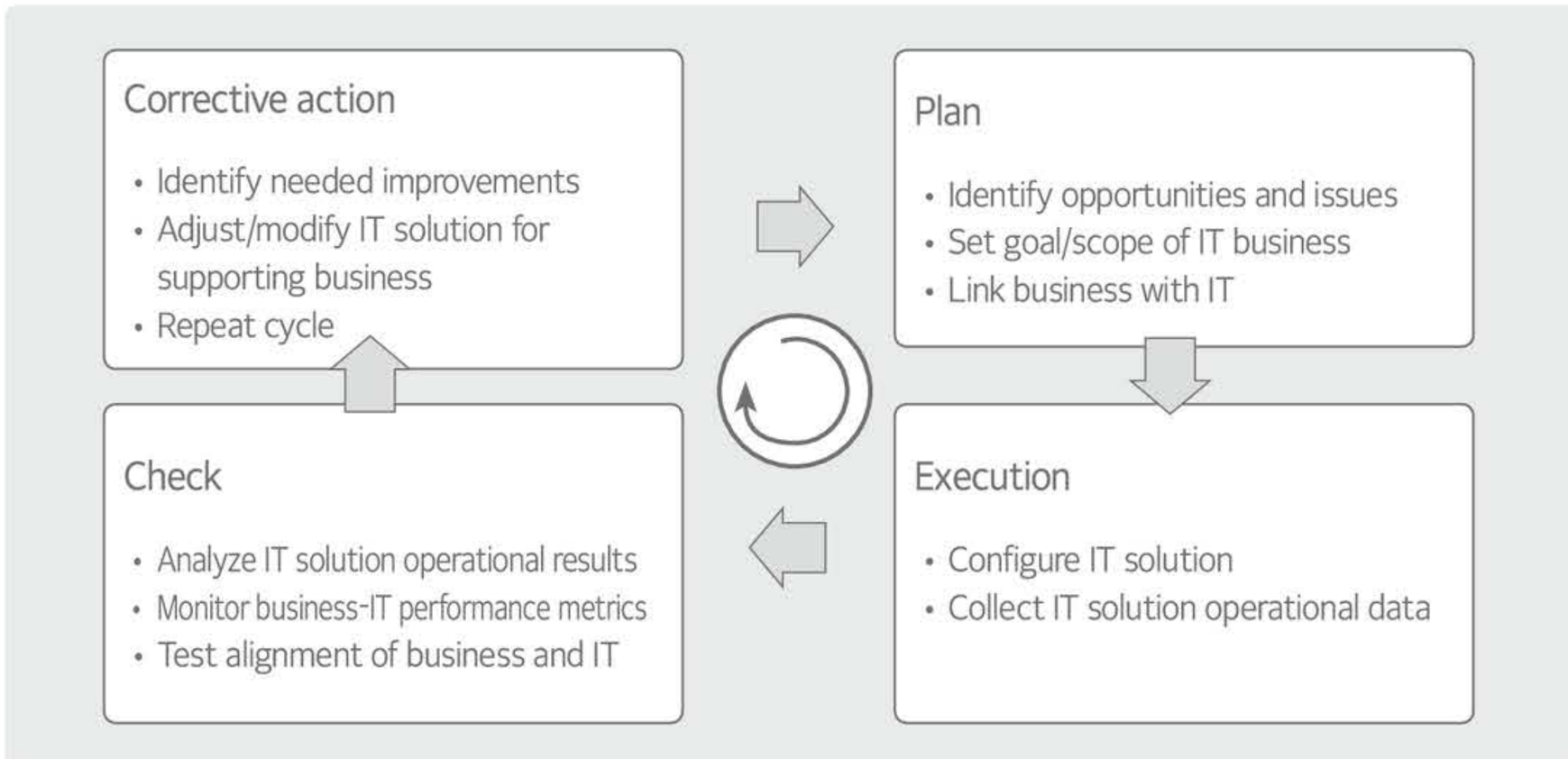
Since the dawn of the twenty-first century, we have been seeing ever more examples of new business values being created through the application of IT resources. Apple completely changed the offline music distribution structure with its iTunes music store. The new online music distribution structure has created a new business value, and this is considered by many to have been the greatest driver of Apple's growth as a company.
E-commerce is also another example of a new business value created by IT resources. The virtual online market that emerged through IT is changing the traditional concept of commerce, spawning new concepts of commerce such as open markets and social commerce.

③ Expansion of global business

Many companies today are seeking new markets and global businesses to develop for the sake of their survival and prosperity. The global cooperative working environment enabled by IT resources has presented possibilities for exploring new markets to companies that otherwise would have kept their focus on local markets only. The global cooperative working environment has challenged traditional ideas about the costs, labor, and time needed for developing global businesses.
For example, the establishment of videoconferencing systems has improved decision-making speed and efficiency in the rapidly changing business environment, while the ability to exchange information through Intranet systems without the constraints of time and space has given huge competitive advantages to global businesses.

C) Management activities and structure for IT business

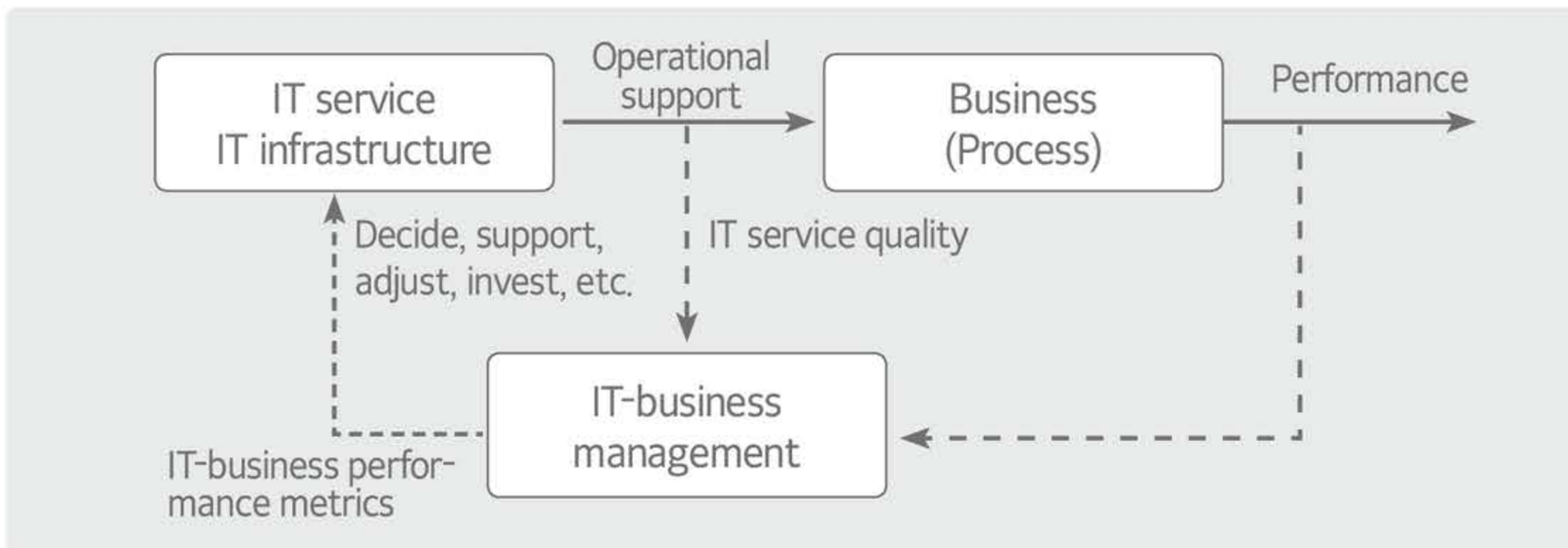
The IT business's cyclical management activities follow the traditional PDCA management cycle of planning, execution, checking, and corrective action. The Planning (P) phase identifies opportunities and issues, sets the goals and scope for IT business, and establishes an IT business plan for linking business with IT.
In the Do (D) phase, the IT business is designed and implemented and the business operations data are collected. In theC (Check) phase, the results of IT business operations are analyzed, the business and IT performance indicators are monitored, and business & IT correlation verification is carried out.
In the Action (A) phase, the improvements needed are identified and IT adjustments/modifications are made to support the IT business,after which the Planning (P) phase begins all over again, completing and continuing the cycle of repeat and renewal ad infinitum.



[Fig.8] The cyclical management of IT business

The cyclical management structure of IT business is shown in [Fig. 8]. The IT service and IT infra provide operational support aimed at enablinga business (process) toachieve results in its IT business.

In IT business management, new IT business performance indicators are derived from the service quality of the IT operational support service (IT QoS) and the business performance results of the organization. These indicators are then sent to the IT division. The IT business management provides support for the making and adjusting of decisions, and investments, to the IT service and IT infra,thus ensuring that the target levels for the performance indicators can be met.



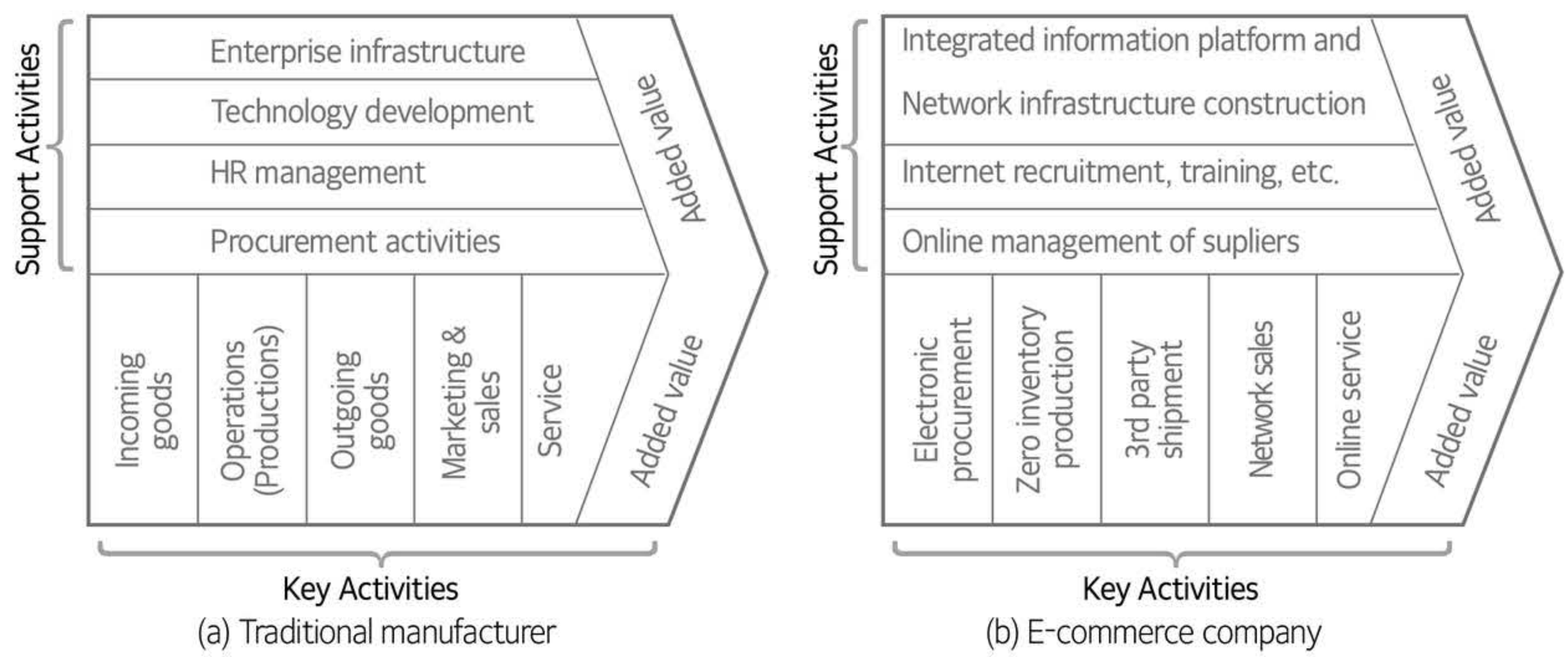
[Fig.9] The management and control structure of an IT business

04 The IT Business Value Chain

A) Overview of the value chain

The value chain model defines the ultimate direction of an enterprise organization in terms of the concept of value. The model presents a structure designed to help an enterprise organization realize its value. The value chain model has come to be recognized as a critical management theory for analyzing the business activities of an enterprise. Furthermore, the value chain model not only provides a very useful framework for analyzing and understanding a company's competitive advantage from its activities, but also introduces the concepts of key activities and support activities that have become important reference points for enterprises' organizational structures.

The concept of a business value chain can be approached from two different angles: a traditional manufacturing company and an e-commerce company. From the angle of a traditional manufacturing company, a business value chain explains how key activities (warehousing, operation [production], shipment, marketing and sales, customer service) and support activities (corporate infrastructure, HR management, technology development, purchasing activities) should be organized and implemented if the company is to reach both its financial and its non-financial objectives. The value chain of an e-commerce company can be used as a tool for increasing business efficiency and effectiveness by electronically handling business processes. In this case, the key activities are procurement, zero-inventory production, third-party logistics, network sales, and online services. The support activities include the deployment of an integrated information platform and network infrastructure, Internet recruitment, and the management of online suppliers.



[Fig. 10] Business value chain

Before the mid-2000s, IT-related activities or departments were seen as a category of back-office support activities, completely distinct from the main activities of a company. However, since the 2000s, when IT companies began to emerge and existing companies accelerated the integration of IT, the perception of the role IT could play and the role of IT-related departments in the value chain model began to change. In particular, since 2010, the perception of value chain models from the IT business perspective has changed dramatically, and this change can be seen from two main

perspectives.

B) Company-wide integration of the value chain model and IT

IT is being applied throughout all the key activities and support activities that constitute the elements of a company's value chain model. This signifies that the role of IT is no longer limited to back-office functions, but that IT is being integrated and utilized as a key factor in every aspect of a company's key activities.
For example, let's look at the typical example of a hypermarket. Without IT, would it be possible to pursue the five key activities of the value chain model normally or do it in a way that would be competitive? In an environment where managers working for a hypermarket can check inventory and product information in realtime, place products on shelves in ways that reflect customer shopping behaviors and local characteristics, and collect customers' purchasing histories in realtime, the answer to this question would be a resounding 'NO'. In other words, today, when the operations of all key activities defined by the value chain model are based on IT, the above question suggests a new perception about the convergence of the value chain model and IT. Leaving aside the example of hypermarkets, the situation is pretty much the same in other industries referred to as "smokestack industries".

C) Value chain model and IT specialized companies

When a company's business model is e-business or Internet business, it is hard to explain its key activities and support activities separately from IT. For example, Amazon.com is a leading example of a company that performs both its key activities and its supporting activities using IT. Likewise, Interpark in Korea is considered a similar case. In other words, companies that began their operations as IT-based entities cannot be understood if the key activities and support activities defined in their value chain models are considered separately. In such situations, the traditional value chain model has to be approached from a new perspective.

D) Expansion of the value chain model

The two perspectives explained above are related to the two angles mentioned when explaining the IT business. Just as when one tries to understand the IT business, one must view it in terms of two different trends, that's to say one in which IT is integrated into the business processes across the whole company, and another in which IT is used as the main business, the value chain model can also be understood in two different ways. Therefore, since most companies today are pursuing their IT business in the hope of gaining a competitive edge from IT, our understanding of the traditional value chain model must also be expanded from the business perspective.

Such an expanded understanding of IT is raising several issues in academia and in the field. Traditional job processes that have long been taken for granted are driving structural changes in companies following the company-wide integration of IT. Examples include the elimination of unnecessary processes in the decision-making process through the adoption of an intranet information system, and the transformation of a company into a more horizontal organization in which quality information is supplied to all employees - information that otherwise would have been held by a privileged few. That is, the perception is spreading that the utilization of IT is not limited to just being integrated into the value chain model activities, but that it is a (new) concept of value chain model that could have a decisive impact on the structure of an entire organization and its competitive advantages.

II. IT Business Strategy

Recent Trends and Major Issues

The development of a company's IT business strategy is the process of finding the most effective way of achieving its mission and objectives under the constraints of the internal and external environments to which it is subject. Setting the right strategy is particularly critical for this new concept of IT business, which involves the integration of IT and business processes. As the domain of IT business continues to expand, and the business process becomes ever more closely integrated with IT, interest is growing in how to establish IT business strategies and find the right way to analyze the environment before setting one's strategies. This section introduces the current model and the future model, which are essential elements in developing IT business strategies, as well as the strategies for implementing them, and also presents different methods of analyzing the IT business environment (including SWOT analysis).

Learning Objectives

1. To be able to explain the IT business strategy.
2. To be able to explain the business environment analysis model for formulating IT business strategies.

Keywords

IT business strategy formulation, IT business environment analysis

✚ Preview for practical business

In the mid-1990s, Dell Computers of the U.S. conducted a SWOT analysis with a view to establishing an effective business strategy that would make them highly competitive in the value chain of the computer industry. Dell discovered that its strengths lay in selling directly to customers and in designing its own computers and components in order to lower its manufacturing costs. It also recognized that its principal weakness was its lack of relationships with local computer dealerships. At that time, Dell Computers was faced with threats from rivals such as Compaq and IBM, both of which enjoyed much stronger brand recognition and an outstanding reputation for quality. The company took note of the fact that customers already had a deep knowledge of computers and knew exactly what they wanted in a computer without having to talk to a sales representative. The company sensed an opportunity. It also saw the Internet as a potential marketing tool. The results of Dell's SWOT analysis are described below.

Strengt(S)	• Ability to sell directly to consumers. • Ability to keep prices lower than competitors.
Weakness(W)	• No relationships with local computer dealerships.
Opportunity(O)	• Consumer demand for one-stop shopping. • Consumers know exactly what they want in a product. • Internet could become a powerful marketing tool.
Threat (T)	• Competitors enjoy superior brand power to Dell. • Competitors enjoy very close relationships with local computer dealerships.

After completing the SWOT analysis, DELL incorporated elements of the SWOT findings into its IT business strategy. The company began assembling and selling customer-tailored computers after receiving customer orders over the phone,which ultimately resulted in the entire process taking place on the Internet. Dell formulated a strategy that played to its strengths while eliminating its dependence on a local computer network, which was its weakest link. The threats of better brand recognition and quality posed by Compaq and IBM were effectively neutralized by Dell's ability to build high-quality computers tailored to each customer's individual needs and then assemble and ship them immediately to the customers.

01 Summary of Lessons Learned

The IT business strategy phase is divided into two parts: establishment of the IT business strategy and analysis of the IT business environment. In the first part, the general concept of establishing a strategy is explained, along with the elements that make up a strategy and the process involved in establishing a strategy.
In the second part, methods of analyzing the external and internal environments are conducted followed by an analysis the consolidated environment that considers the external and internal environments together.
For the analysis of the external environment, the PEST technique is employed to analyze the macro-external environment from the political, economic social and technical perspectives. An explanation is given of the 5-Force industry structure analysis technique (i.e. analysis of the competitive advantage provided by IT business through 5 factors including the supplier and buyer's negotiating power, level of competition, etc.), which is used to analyze the micro-external environment. This is followed by an explanation of the4P and 3C techniques used in marketing and competitive market analysis.
For the analysis of the internal environment, the McKinsey 7S Method is introduced. This technique uses 7 factors starting with the letter S (shared values, strategy, system, etc.) to analyze the internal environment. In the consolidated environment analysis, the SWOT analysis technique is explained as a method of simultaneously analyzing the external market environment and internal factors. SWOT analysis is explained in conjunction with the BCG matrix, which is a technique for selecting a business development strategy by looking at the growth potential and market share of an IT business.

02 Establishment of an IT Business Strategy

As the IT business environment is changing and evolving continuously, the targets of an IT business strategy must also be updated continuously if a company is to meet the objectives of its IT business. In addition, the goal of the IT business strategy is to fine-tune the organization and its business to the environment, thereby increasing the likelihood of the organization's survival as well as increasing its chances of achieving its business targets.

A) The concept of strategy establishment

"Strategy establishment" is the process of defining strategies for fulfilling an organization's mission. Corporate strategies must incorporate explanations and analyses of the current status of a given company and suggest direction(s) for change. The formulated strategies should be directly aligned with the strategies of each unit-level organization. The output of strategic planning is a document that describes the top-level strategy and the environments or aims of the organization that could have an impact on the strategy. A strategic plan not only provides the basis for carrying out the specific action steps of the plan, but also provides the overall direction for the enterprise architecture (EA), process improvement, risk management, and portfolio management, and other types of company-wide activities.
The subordinate goals and procedures for realizing a company's implementation strategies can be defined si as to reflect issues that are pertinent to each level of the organization's hierarchy. For instance, if the business manager

establishes mid-level strategies and goals based on the corporate strategy, the production staff can then use the mid-level strategies to set their own goal sat their level.

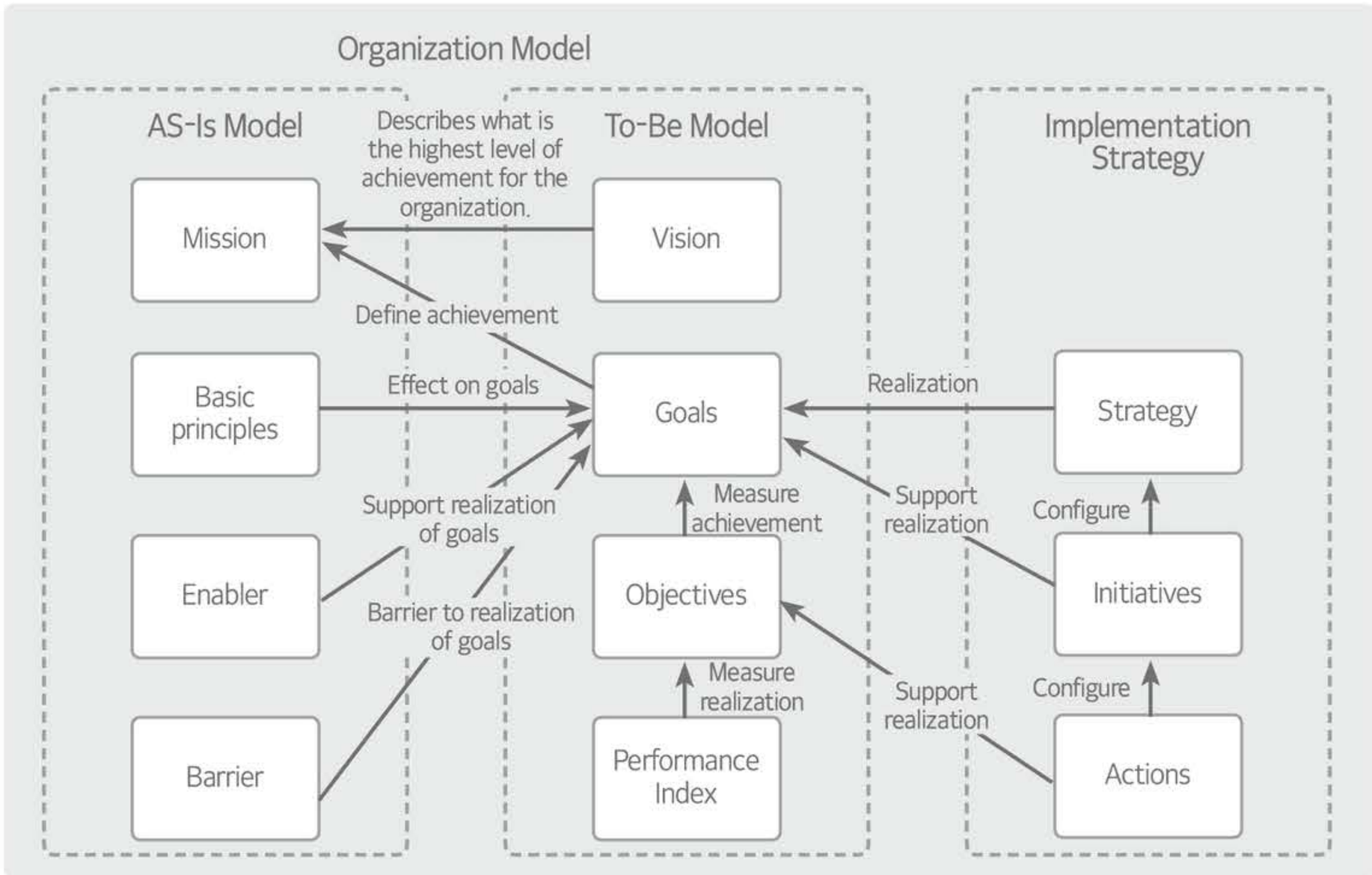
B) The elements of a strategy plan

There are many different approaches to choose from when developing a strategy. At a typical strategy development stage, the current conditions of the subject company are evaluated, future goals are set, and implementation strategies for realizing the company's target model are formulated.

<Table3>Elements of a strategy plan

Elements	Description
Basic information	A company's mission, objectives/goals, and performance results (quantitative).
Current status model	The current internal/external environment of the company; the explanation of a company's mission in terms of its business principles and values.
Future goal model	The vision and goals that the company seeks to fulfill in the future.
Implementation strategy	The road to achieving a company's objectives, goals, and missions.

In a typical strategy development process, the current (As-Is) model of a company is evaluated and a picture of the future (To-Be) model is presented, after which a set of strategies for transforming the company from one model to the other model is developed. The interdependence among the different elements of strategy development is shown below.



[Fig.11] The interdependence among the different elements of strategy development

• Mission
A company's mission is typically either its objective or its main business. A mission describes what an entity does for its own benefit and is not bound by time.

• Vision
A company's vision is the ideal future that it aspires to. A vision can only be obtained by the successful execution of the mission. A company's vision is both a source of inspiration and an extension of its capabilities.

• Goals
Goals must be measurable, high-level, and support an entity in its efforts to achieve its mission.

• Objectives
Specific, quantifiable and low-level targets which signal that the objectives have been reached.

• Principles
Principles state the constraints that a company must consider when selecting the method of achieving its targets. The basic ideology of a company represents its core values, and is used in shaping its strategy.

• Enablers
Enablers are the external environments and corporate strengths that can boost a company's ability to achieve its goals and objectives.

• Barriers
Barriers are the external environments and corporate weaknesses that impede an entity's ability to achieve its goals and objectives.

• Strategy
Strategy is the approach a company takes to realize its mission, objectives, and goals. Strategy must support a company's vision, but it is affected by enablers, barriers, and the basic ideology.

• Strategic plan
A strategic plan is a document created through strategic plan setting activities. A strategic plan explains the strategy of a company and the factors that affect the strategy.

• Initiatives
Initiatives are a set of activities carried out to implement a strategy.

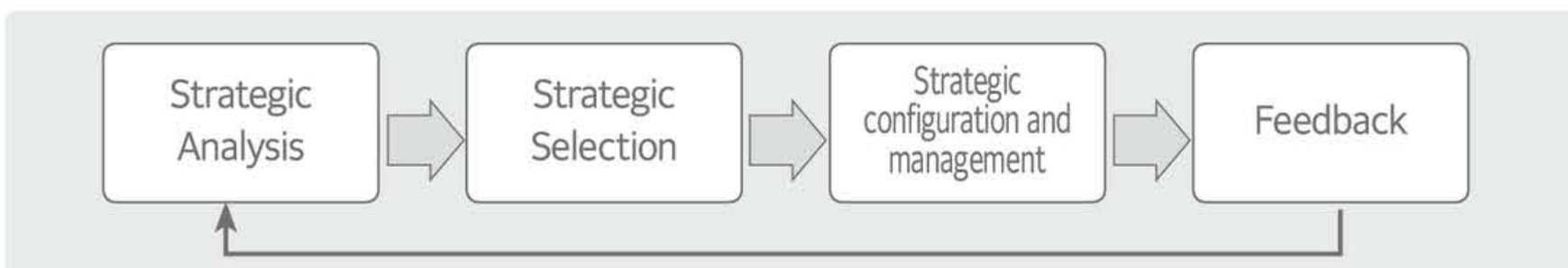
• Actions
Actions are specific procedures for achieving goals and objectives. Generally speaking, people are assigned to manage activities, and activities are subject to certain timetable constraints.

• Performance Index

The performance index describes the performance target value for each goal.

C) Strategy setting process

The strategy-setting process consists of strategy analysis, strategy selection, strategy implementation and management, and feedback. First, in the strategy analysis phase, basic information regarding the company is investigated, and the As-Is model is studied. In the strategy selection phase, the future (To-Be) model and the strategy for realizing the To-Be model are established. In the strategy implementation and management phase, the strategy is adopted and put into effect. When necessary, adjustments can be made to a strategic plan during this phase.



[Fig.12] Strategy setting process

① Strategy analysis

The purpose of the strategy analysis is to collect the information required to make the business decisions of the company. The internal environment can be improved because it can be controlled by the company, whereas the external environment is generally difficult to control and requires an adaptive strategy.

• External environment analysis

This is an analysis of the environment surrounding a company and other external conditions.

- (Macro-environment) This is the political, economic, social and technological environment surrounding a company. The boundaries of its influence can be expanded across several industries.
- (Micro-environment) As the industrial environment to which a company belongs, the micro-environment is where the company faces competition when acquiring resources and selling its products/services, and is what we often call a general competitive environment.

• Internal environment analysis

The analysis of a company's internal environment focuses on internal elements and processes, resources, organizations, etc., and also focuses on the internal changes taking place within a company.

• Consolidated environment analysis

- A comprehensive analysis of the external and internal environmental factors of a company is carried out, and integrated internal/external analysis results can be obtained.
- SWOT analysis is an important tool of consolidated environment analysis. A SWOT analysis examines the strengths (S) and weaknesses (W) of a company's internal environment and the opportunities (O) and threats (T) present in its external environment.

② Strategy selection

In the strategy selection phase, the best possible direction for the future of the company is selected based on the information collected in the strategy analysis phase. If the information obtained during the strategy analysis phase is incomplete or defective, it becomes impossible to determine whether the strategy chosen by an organization is the right one. Therefore, strategy selection must begin with a thorough review of the results and inferences of the preceding strategy analysis phase.

If this process is completed seamlessly, it will produce an optional list of alternatives to a set of strategic directions that a company can adopt. It is common for each of these alternatives to have different resource requirements with unique solutions to key issues.
Each alternative is evaluated according to a reasonably established evaluation standard, and, ultimately, the most appropriate alternative is chosen as the strategic direction.

③ Strategy implementation and management

In the strategy implementation and management phase, the chosen strategic alternative is adopted and put into effect. During this phase, several managerial issues could emerge, such as the viability of a company's resources for executing a strategy, the readiness of a company's culture and structure, the change management for realizing a strategy, the path of strategy realization and the development method decision, the strategy implementation readiness of the steering group within the company, and the level of influence over internal/external stakeholders, etc. The progress of the strategy is monitored continuously, and the status of the strategy is delivered from the implementation phase to the analysis phase via a feedback path. The progress of the strategy may influence the internal or external environment of the company.
In addition, the internal or external environment may change due to the occurrence of unexpected events after completion of the strategy analysis. Therefore, a review of the strategy analysis should be conducted to ensure that the chosen strategic direction is still valid.

03 IT Business Environment Analysis

A) External environment analysis

① PEST analysis

PEST analysis, technique for analyzing the external macro-environment, is used as a tool for analyzing the impact of political, economic, social, and technological opportunity and threat factors. In PEST analysis, brainstorming is carried out to determine the characteristics of the country or region that is the target market for a company's products and business services. The table below shows examples of items examined in PEST analysis.

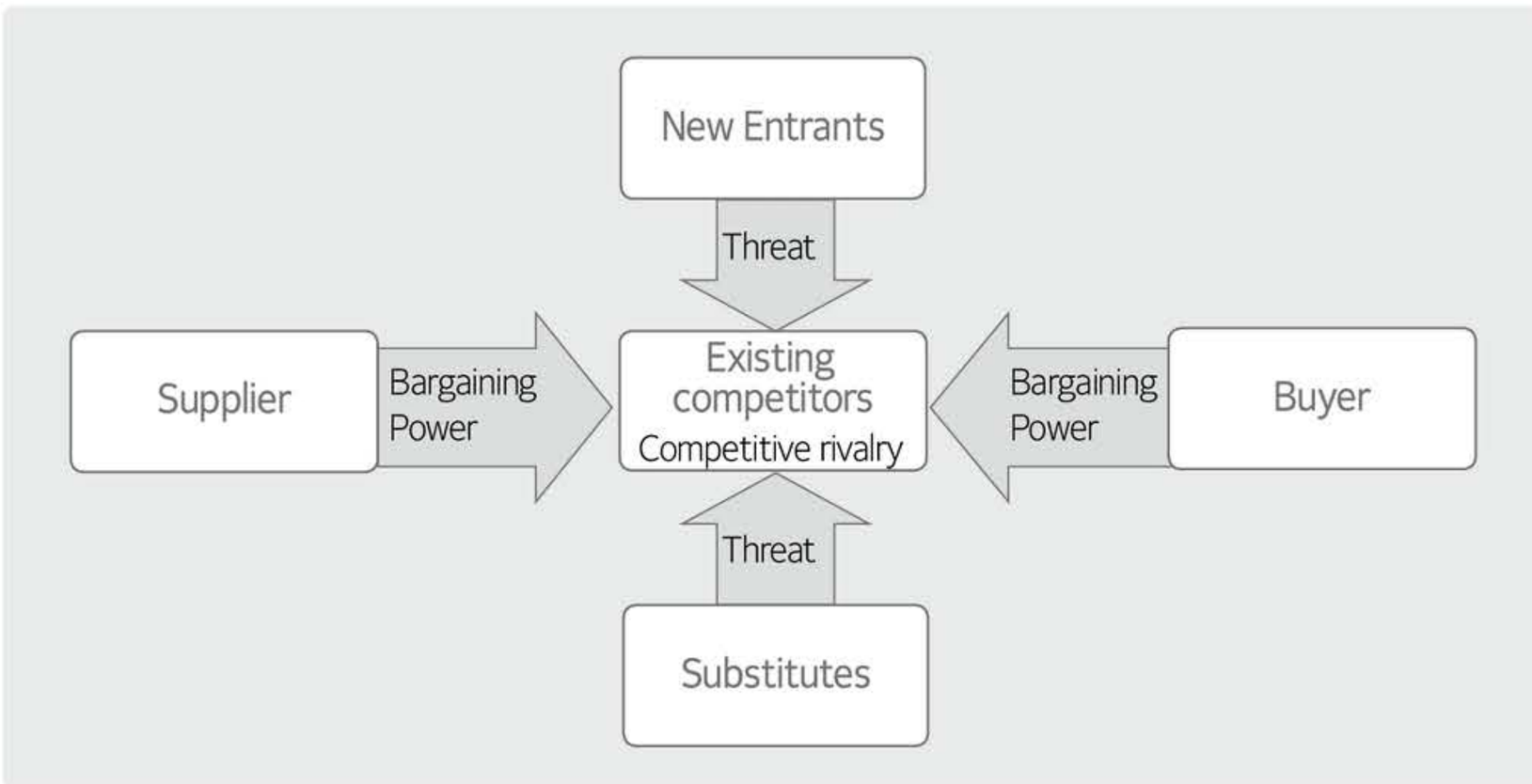
<Table 4> PEST analysis and examples of items examined

Category	Items examined
Politics (P)	Form of government and degree of stability, social and employment legislation, trends in regulation and deregulation, tax policy, trade and tariffs, likely changes in the political environment, environmental and consumer protection laws, etc.
Economy (E)	Current and future economic growth, unemployment and labor supply, inflation and interest rates, labor costs, the impact of globalization, disposable income and income distribution levels, changes in the economic environment, etc.
Society, Culture (S)	Population growth rate and age, education, health of the population, social mobility and mindset, freedom of the job market and attitude toward jobs, employment patterns of the population, social taboos, etc.
Technology environment(T)	Impact of new technologies, impact of the Internet, reduced communication costs and remote work, research and development activities, technology transfer effects, etc.

When legal and environmental factors are included in addition to the four elements of PEST discussed above, PEST is called PESTLE or PESTEL.

② Porter's Five Force Analysis

Porter's Five Forces Framework, a micro-external environmental analysis technique is used to analyze the structure of the industry to which a company belongs. It is used mainly in establishing a strategy for securing a competitive edge for a company's products or business services. In this framework, we will analyze the structure of the industry from five perspectives:



[Fig.13] Michael Porter's 5 Force Analysis

• Competitive rivalry

Market dominance through product differentiation, fixed costs injected into the market and industry growth rate, surplus equipment and replacement costs, etc.

• Bargaining power of suppliers
Supplier's market share, volume supplied, technological superiority, importance of supplied product, etc.

• Bargaining power of buyers
Price sensitivity of the purchaser, amount purchased for a given level of purchasing power, importance of a purchaser, etc.

• Threat of new entrants
Entry barriers, product differentiation, financial resources of new entrants, level of market penetration derived from market share, level of recognition, etc.

• Threat of substitutes
Changes in consumer needs, price competitiveness of substitutes, effects of substitutes, impact of replacement, etc.

The Five Forces Framework proposed by Michael Porter is a type of industry structure analysis model. In a 1979 HBR paper, he asserted that the five factors shape the structure of an industry, and that companies can actively respond to threats by closely studying the five factors.

③ 3C and 4P Analysis Method

The 3C/4P framework, a micro-external environmental method of analysis, issued to analyze the market of the industry to which a company belongs. It is widely used for marketing products and business services and for analyzing the competitive market environment.

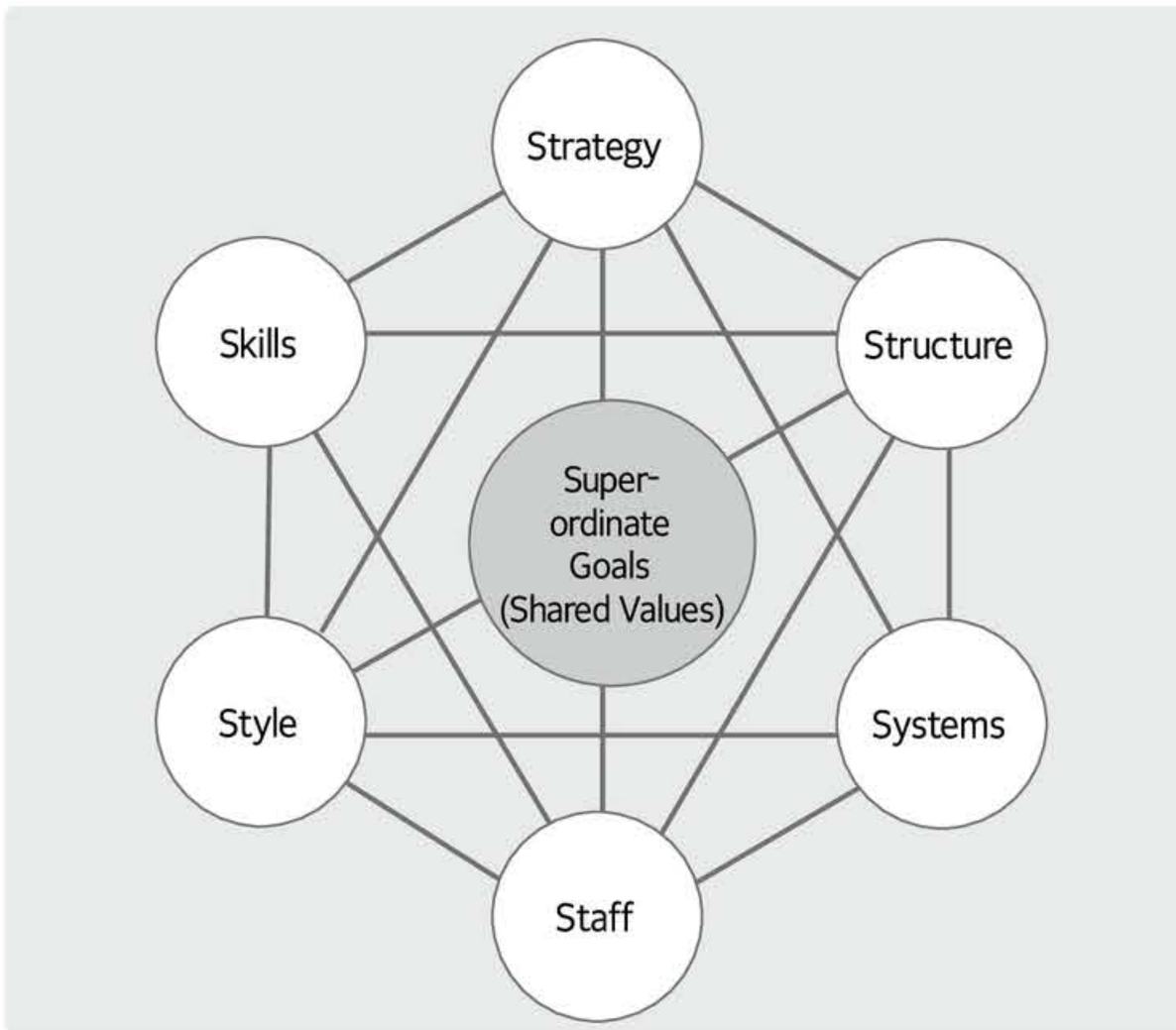
• 3C -Customer, Company, Competition
• 4P -Product, Price, Place, Promotion

The 3C's consist of three pillars: customer analysis, company analysis, and competitor analysis. In customer analysis, the market size and market growth rate are estimated by identifying the customer target, product positioning, and customer demand hierarchy.
In company analysis, the internal/external environment surrounding the company, as well as its strengths and weaknesses, are examined (in conjunction with the SWOT analysis technique) and used in setting the company's goals and developing its strategies.
In competitor analysis, current competitors and potential competitors are identified by using market analysis and the competitors' financial data and business portfolios.
The 4P's consist of product, price, place (place of sale), and promotion.
In product analysis, the design, brand, characteristics, brand power, performance, and quality of the product concerned are analyzed.
In price analysis, the product price, discount condition, and demand as a function of price levels are analyzed, and the price is compared to the prices of the competitors, and the price flexibility is examined.
In place analysis, the region of product sales, distribution, logistics, and inventory levels are analyzed.
In promotion analysis,the advertising, promotion, marketing, and customer communication strategies are analyzed.

B) Internal Environment Analysis

① 7S Analysis Method

The 7S model used to analyze a company's internal environment is an internal environmental analysis technique created by the McKinsey consulting firm. This is a method of diagnosing a company by identifying its core competency components. It defines the core competency components of a company in terms of 7 items that start with the letter S.



[Fig.14] 7S Analysis Method

• Shared Values

The ideals and mission shared by members of an organization or a company must be analyzed. Find the values emphasized within the company and ascertain whether the values are universally shared among the members.

• Strategy

Analyze the company's strategy on its goals and vision, assess the budget, organization, and human resources needed for realizing the company's strategy.

• System

Analyze the process or system (technique) for managing people and making important decisions. Regulations and policies are all included in the scope of a system.

• Structure

Analyze the form of the organization and the workforce structure for executing the company's strategy. Go one step further and also examine the division of responsibilities between departments and the system of coordination

between departments.

• Staff
Analyze the capabilities, qualities and expertise levels of the staff, including the strengths and weaknesses of each staff member and the environment in which they can demonstrate their capabilities.

• Style
Analyze the style of management and operation of the company. Analyze the leadership exhibited at the company when pursuing its business strategy and the organizational culture.

• Skills
Analyze the company's skills in terms of organizational operations and management. Analyze the employee skills needed to run the company and the core competencies of the organization whereby employees can prove their skills.

7S is a tool that is used to consider and analyze both the hardware and software elements of a company. Because individual elements can dynamically affect each other, the shortcomings of one element can directly or indirectly impact another element. Therefore, in order to achieve its business goals, a company must manage its 7S comprehensively.

C) Consolidated Internal and External Environment Analysis

① SWOT Analysis

Generally speaking, SWOT analysis has primarily been used to establish strategies related to a company's marketing activities, although Universities also rely on SWOT analysis to teach marketing to students. Today, however, SWOT analysis is used in a variety of ways beyond the realm of marketing activities, and is used by companies as an important analytical framework, especially when setting a company's overall strategy.
SWOT analysis is a framework for analyzing opportunities and threat factors in an external market environment that could affect a company's core products and services, together with its internal strengths and weaknesses. The results of the two analyses are then matrixed. Many companies today use this framed matrix as a method for environmental research because it provides an important basis for deriving insights into their strategic directions.

Strategic Direction		S (Strength)	W (Weakness)
		• Factor 1 • Factor 2 • Factor 3	• Factor 1 • Factor 2 • Factor 3
O (Opportunity)	• Factor 1 • Factor 2 • Factor 3	SO strategy	WO strategy
T (Threat)	• Factor 1 • Factor 2 • Factor 3	ST strategy	WT strategy

[Fig.15] SWOT analysis framework

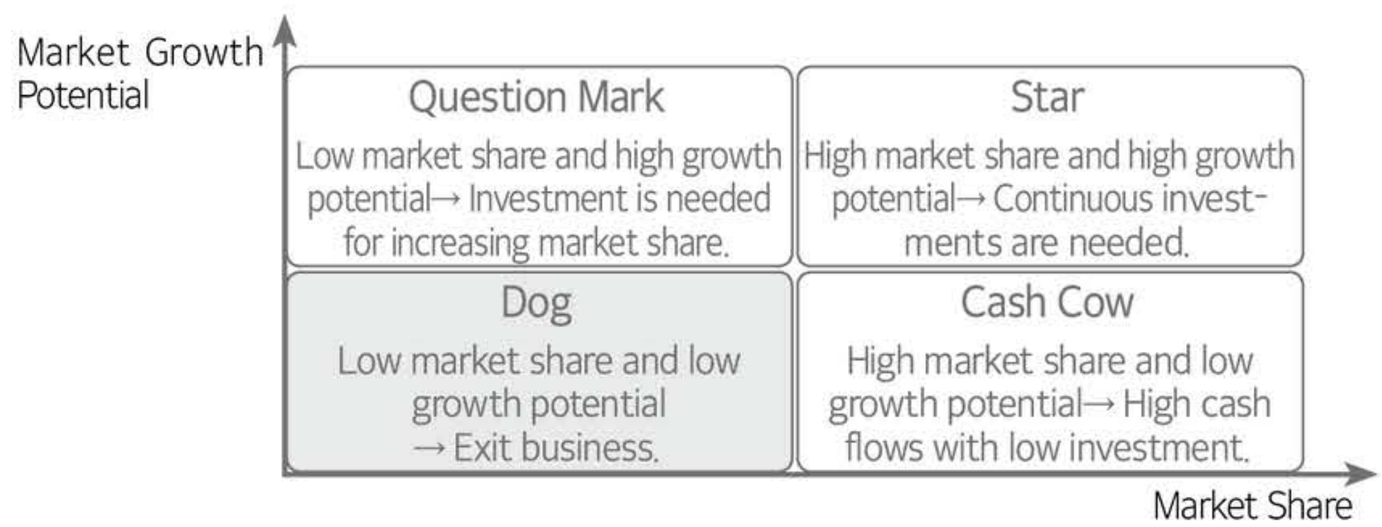
Generally, SWOT analysis has primarily been used to establish strategies related to a company's marketing activities, although Universities also rely on SWOT analysis to teach marketing to students. Today, however, SWOT analysis is used in a variety of ways beyond the realm of marketing activities, and is used by companies as an important analytical framework, especially from the perspective of establishing a company's overall strategy.
The reason why SWOT analysis is receiving renewed attention in today's corporate IT business environment is because the role of business intelligence has become very important in establishing strategic directions through this matrix. Even at the dawn of the twenty-first century, SWOT analysis was used to derive a matrix strategy based on the arguments of abstract insights rather than on the incontrovertible basis of concrete data.
Therefore, to assert that the real value of SWOT analysis had been overrated is nothing less thanto speak the plain truth. Since the person conducting the analysis uses abstract arguments based on his or her insights to create a matrix, SWOT analysis rarely provides any practical implications. As such, it was viewed as a method of theoretical analysis to be performed as a matter a routine. Of course, even without data, SWOT analysis offers a different way of looking at and analyzing a company, and in that sense it provides another advantage. However, from the perspective of a company aiming to plan and execute strategies that could affect its survival as a business, there is simply too much of a gap between what is expected of this analysis tool and what it can actually deliver. Therefore, SWOT analysis cannot become an integral part of the execution strategy of a company's business process.

But as IT business becomes fully integrated into the operations of a company, the growing use of business intelligence is reawakening people to the value of SWOT analysis. In other words, as the development of a matrix strategy through SWOT analysis becomes increasingly enhanced by high-quality information that can back up the analysis results, people have begun to obtain objective and future-predictive SWOT analysis results.

This way of formulating strategy using business intelligence-based SWOT analysis is not only bringing huge benefits to the major areas of marketing activity but is also having a substantial effect on the overall processes of companies. As a side note, when we examine cases of SWOT analysis performed by companies, an unimaginable amount of data is being analyzed and made available to companies prior to the derivation of their ideal matrix combinations. Especially quantified numerical data are analyzed from many different angles and presented to decision makers. Because the quality of such objective data is guaranteed, the quality of company strategies developed using SWOT analysis has been improving steadily.

② BCG Matrix

Conceived as a technique of market analysis by the Boston Consulting Group (BCG), the BCG Matrix (market growth rate-market share matrix) is used by companies as a tool for evaluating their portfolio of products and business services during their marketing and sales planning activities. This tool evaluates products and business services with a two-dimensional matrix consisting of market growth (external environment) as the vertical index and market share (internal environment) as the horizontal index. Products are assessed and put into one of four quadrants: dog, question mark (?), star (*), and cash cow, as shown in the following figure.



[Fig.16] Composition of aBCG Matrix

The BCG matrix is used to evaluate a company's portfolio of products and business services, and also to evaluate a single company or a single department within a company.

III. Understanding IT Business Planning

▶▶▶ Recent trends and key issues

IT business planning starts with an understanding of the company's vision, goals, strategies and tasks, and the first step is to build enterprise architecture (EA). In addition, companies also turn to information strategy planning (ISP) when deploying information systems for their IT division.

It is through IT governance, which stands at the center of this trend, that companies establish their system of managing their IT businesses.

Companies that adopt EA are also deploying an enterprise architecture management system (EAMS) for managing the continuous upgrading of the EA, and are working hard to close the gap between strategy and IT business.

In recent years, the public sector has begun to require a detailed list of specifications (i.e. a list detailed enough to calculate functional scores) by including it in the request for a proposal (RFP) when awarding a contract. ISP is often carried out for each type of job to enable companies to produce this detailed specification list.

▶▶▶ Learning Objectives

1. To be able to explain IT governance.
2. To be able to explain Enterprise architecture.
3. To be able to explain Information strategy planning (ISP)

▶▶▶ Keywords

IT governance, enterprise architecture (EA), information strategy planning(ISP)

✚ Preview for practical business

Company 'A' is a company whose main focus is its financial business. As the company's capabilities grew, so did its size, leading each department and team to begin installing its own small systems here and there. This in turn led to overlapping developments and other difficulties associated with development. Compared to the allocated budget, the level of informatization attained was disappointingly low.

Thus, company 'A' decided to adopt an EA after recognizing the need to establish a plan-based informatization strategy aimed at preventing or eliminating development efforts that could overlap or be carried out indiscriminately. It conducted inspections of and reengineered its current business processes, and established mid-to-long-term plans for the job responsibilities each of its stakeholders, as well as its applications, data, and technologies.

Furthermore, the company established information strategy planning in order to develop informatization strategies at the division level. When establishing the ISP, the company devised a plan that used the current information of the EA to prevent any overlapping of development activities and indiscriminate development. The adoption of ISP made it possible for the company to derive the detailed requirements of each individual system and to set up a system for the efficient calculation and verification of the business scope, schedules, and budgets.

01 Summary of Lessons Learned

IT business must begin with the establishment of a strategy before moving on to planning. The two main activities performed during the IT business planning stage are the enterprise architecture (EA) and information strategic planning (ISP). This is one of the ways of planning from the macro perspective and serves to prevent indiscriminate and overlapping development activities when a company is pursuing an IT business.

IT governance provides control over the implementation of the EA and ISP and secures the linkage of the IT business strategy with IT values. It also provides risk management, resource management, and performance measurement systems.

The section on IT governance describes the concepts and frameworks of IT governance and introduces the areas of focus of IT governance. The EA section describes the concepts and components of the EA and introduces the EA framework. The ISP section introduces the concept of ISP and explains the ISP deployment procedure as well as the main outputs of ISP deployment.

These plans - generated during the IT business planning stage - are first created for the deployment of IT business and then for the operation of IT business processes and services, eventually leading to their utilization in evaluations of IT business performance.

02 IT Governance

A) Concept of IT governance

The aim of IT governance is to implant a system for controlling and managing a company's IT to the same degree as corporate governance. In other words, IT governance can contribute to realizing business targets by aligning IT resources with a company's goals and strategies. By defining the roles and responsibilities within an organization, IT governance creates a control and management structure for handling the performance results and risks of IT. The table below gives some concrete descriptions of IT.

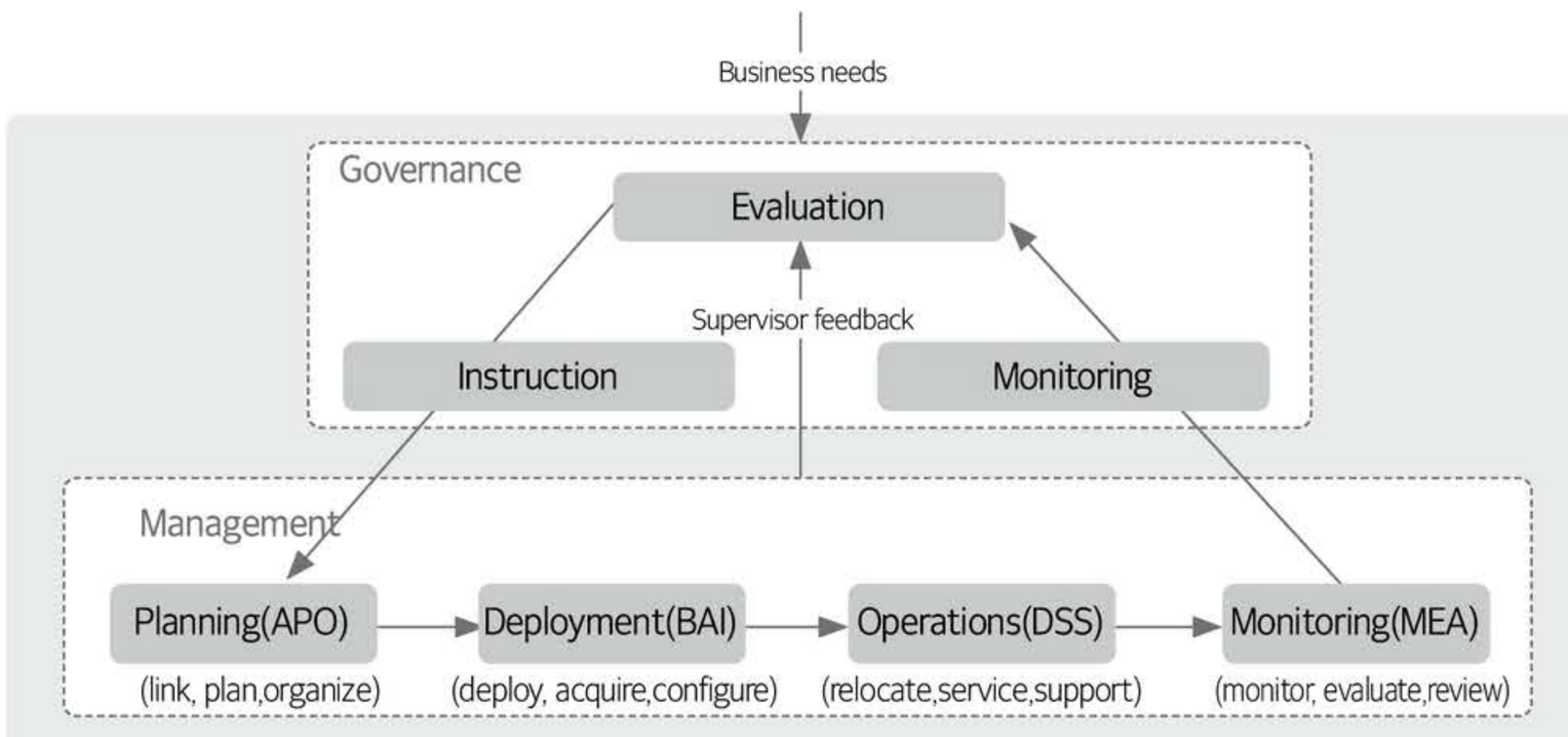
<Table5>Definitions of IT governance

Category	Definition
Definition by IT Governance Institute	As part of the corporate governance undertaken by the top management and BOD of a given company, IT governance encompasses the right leadership, organizational structure and processes that could enable that company to maintain and expand its business strategies and objectives through IT.
Definition by Gartner	IT governance is the activity of establishing a decision-making authority and responsibilities so that IT canbe used in the proper way.
Definition by Entrue Consulting Partners	IT governance is a system that controls and manages IT-related resources and processes so that they are aligned with an organization's strategies and goals.

B) Framework of IT governance

Due to the alignment of IT with the business goals of a company, in IT governance, the value of IT contributes to the attainment of good business performance and results. Through the management of risks and core IT resources for the efficient operation of IT, the roles and responsibilities related to IT resources are clearly defined. IT governance is structured to ensure reliability and transparency.

The following figure shows the governance framework reference model of COBIT 5 (Control Objects for Information and Related Technology 5). This framework is widely known as the "IT governance framework". In the reference model, the governance and management processes of a company are kept separate.



[Fig.17] COBIT 5, a reference model for IT governance

① Governance area

The governance area consists of 5 processes (evaluation (E), directive (D), monitoring (M), etc.), each of which comes with its own work procedures.

- EDM 1. Establish the measurement standard with the governance framework.
- EDM 2. Provide profits.
- EDM 3. Minimize risks.
- EDM 4. Optimize risks.
- EDM 5. Ensure the transparency of stakeholders.

② Management area

The management are consists of 4 process phases: planning (APO), deployment (BAI), operation (DSS), monitoring (MEA)

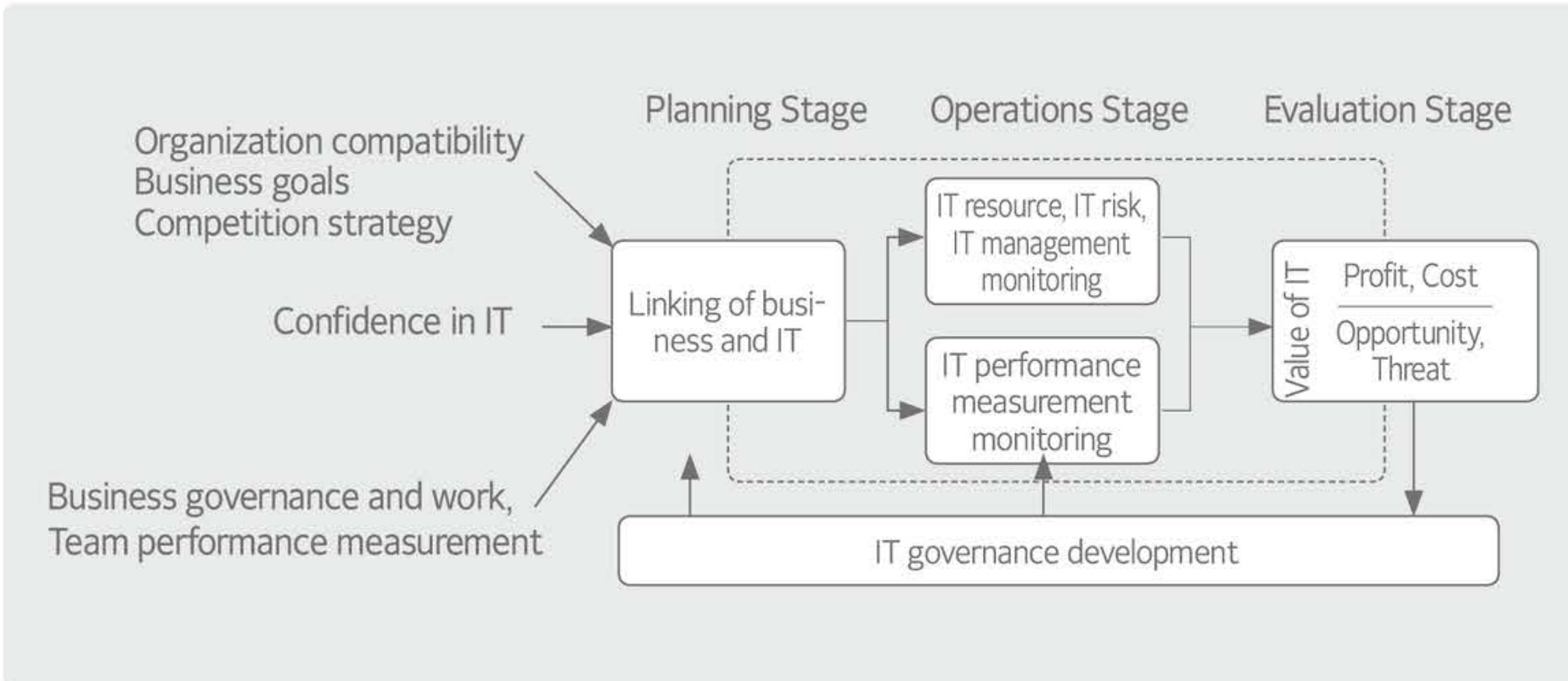
- Planning (APO) phase: linking, planning
- Deployment (BAI) phase: deploying, acquiring, configuring
- Operation (DSS)phase: transferring, service, support
- Monitoring (MEA)phase: monitoring, evaluations, review

The IT governance framework is linked to the international standard ISO/IEC 38500, which simultaneously provides

the principles and frameworks required to evaluate, direct, and monitor the utilization of IT by companies.

C) IT governance process

The IT governance process is composed of the planning stage, operations stage, evaluation stage, and feedback stage.



[Fig.18] IT governance process

① Planning stage

The planning stage involves linking business with IT, setting the goals of IT, establishing the structures, activities and mechanisms regarding the rules on organizing IT related activities, using resources, managing risks, the governance structure, and measuring performance.

② Operations stage

The monitoring of IT resources, IT risks and IT management involves all the structures, activities and related mechanisms for helping companies to monitor their IT resources, IT risks and IT management. The monitoring of IT performance measurement involves the structures, activities and related mechanisms for helping companies to set target levels (for their performances related to IT resources, IT risks and IT management) and measure their attainment of such targets.

③ Evaluation stage

IT value is evaluated through the earnings and costs of the future business opportunities delivered to the company. IT value includes strategic, economic, and risk management, as well as technical, social and quality benefits. To arrive at the IT value, the costs of business risk and other potential risk costs are subtracted from business opportunities.

④ Feedback stage

Based on the results of the evaluation of the feedback information and the need to prioritize this information, during this stage a company takes corrective measures aimed at improving its IT governance activities. Included in such

corrective measures are the structures, activities and procedures for improving the IT governance process and the related jobs.

D) Key focus areas of IT governance

IT governance has five key areas of focus, all of which are linked to the strategies of a company. IT governance looks at how a company's strategies are used in conjunction with IT value, and also includes the management of risk factors and the management of resources, as well as a performance evaluation system on activities.

<Table 6>Focus areas of IT governance

Focus area	Characteristics	Method of alignment
Strategic Alignment	IT governance is aligned with a company's strategy and aims to propose the best direction when it comes to making decisions.	EA
IT Value Delivery	The realization of IT business goals is supported by optimizing the integration of individual business processes with IT.	Backbone system IT Compliance
Risk Management	Risk factors are managed to ensure continuity of the IT business.	DRS, BCP
Resource Management	IT resources are organized and managed so as to respond promptly to IT business requirements.	ITAM
Performance Measurement	An IT-centered performance evaluation system for activities generated by IT business.	BSC IT ROI

03 Concept of EA

A) Overview of EA (Enterprise Architecture)

① Definition of EA

EA stands for "enterprise architecture". It is a blueprint that explains the IT business of an enterprise in a way that is easy for the stakeholders to understand, so that the enterprise can achieve its strategic goals and the goals of its information resource management.

"Enterprise architecture is a blueprint that defines the current state of the relationship between information technology and an enterprise(as well as the activities carried out by the enterprise) and the state that the enterprise must strive for in the future."-United States Office of Management and Budget (OMB)

② Need for EA

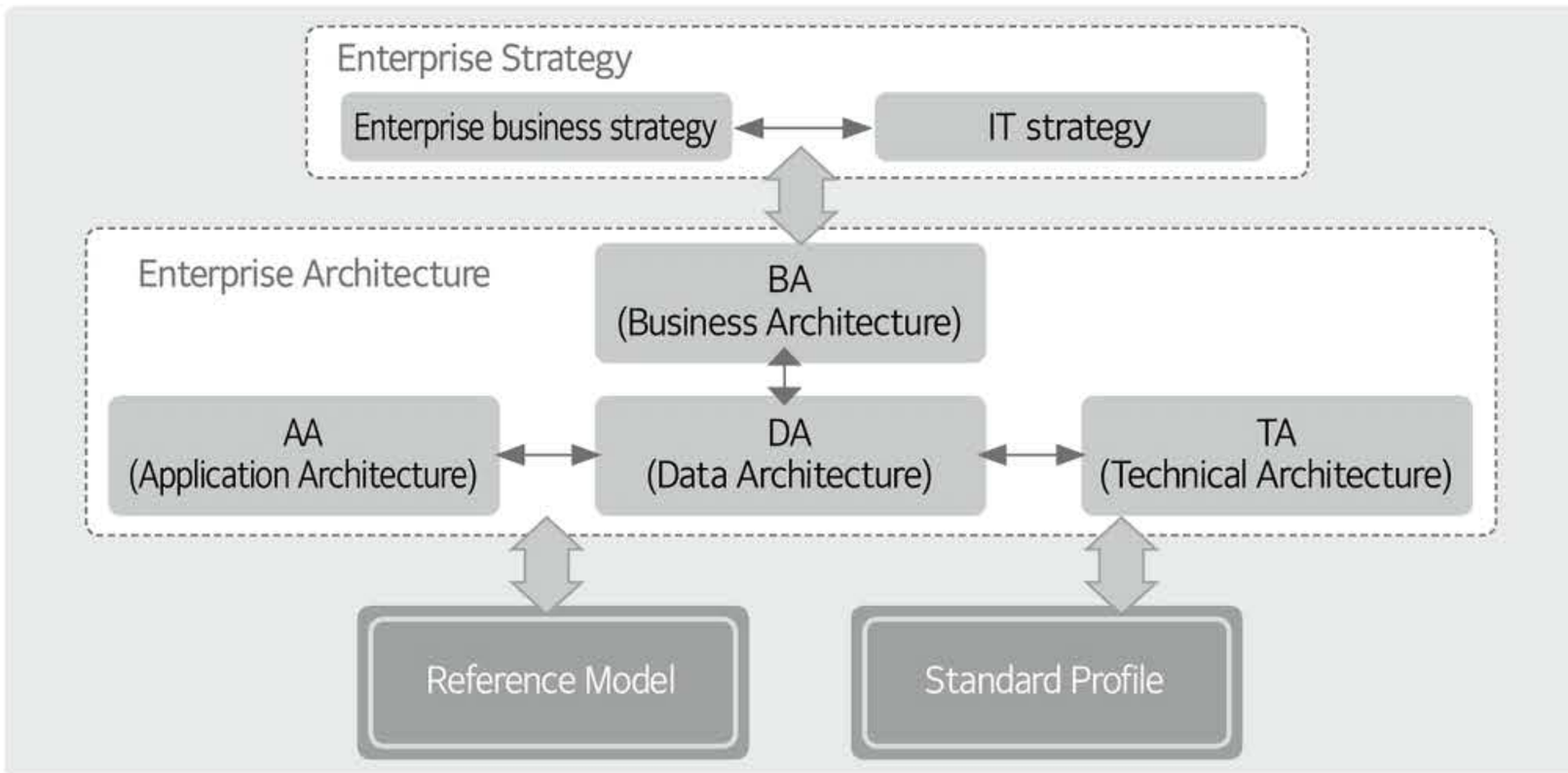
Currently, enterprises are enthusiastically introducing information systems to cope with the rapidly changing business environments, but if information systems are deployed without proper planning at the macro level, enterprises will be confronted with a redundant system and an inability to collaborate. Such enterprises will fall into the so-called "IT Productivity Paradox"1 which can be described as the continuous adoption of information systems without seeing any benefits in the form of increased corporate profits.

There may be several causes of this paradox, but in most cases it is attributable to the lack of a system for clearly explaining a company's business and IT operations to its stakeholders from an overall perspective. For these reasons, enterprises need an EA, as it can provide a bird's eye view of the enterprise's business while simultaneously creating close working relationships between different information resources.

B) Conceptual diagram of an EA and its components

① Conceptual diagram of an EA

The deployment of an EA starts with the enterprise business strategy. The enterprise business strategy is converged with the IT strategy, and the EA is the fruit of this convergence.



[Fig. 19] The concept diagram of EA

② The components of an EA

An EA is delegated or inherits the IT governance control system. To be more precise, the establishment of an EA itself is both an act of IT governance and an instrument of IT governance control.

In addition to IT governance, the key components of an EA are business architecture (BA), applied architecture (AA), data architecture (DA), and technology architecture (TA). The standard profile (SP) is a sub-structure of the technology architecture and can be understood as the detailed specifications of a list of technologies.

<Table 7> Components of an EA

Components	Characteristics	Related reference model
IT Governance	- A method of managing the process organization so that IT becomes aligned with the business goals of an enterprise.	COBIT COSO
Business Architecture	- Activities for designing and building interdependency among people, processes and information are carried out based on the findings of the business strategy analysis and the business environment analysis.	Performance Reference Model (PRM)

Application Architecture	- Stage of extracting information needed on the job, and of identifying and defining the activities for processing and managing such information. - Create standards that define the functions needed for developing an application, and the characteristics and the environment of the application task.	Service Component Reference Model (SRM)
Data Architecture	- Finds which documents are needed for the activities defined in the business model. - Design data model by understanding the interrelationships between all information, data, and data structures.	Data Reference Model (DRM)
Technology Architecture	- Defines the criteria for selecting the infrastructure that supports the business and data application and other technologies.- - Technology architecture also defines the technical support services for the above.	Technology Reference Model (TRM)
Standard Profile	- Defines the detailed technology list for the technology architecture (TA). - Example) JAVA architecture version: JDK 2.0	

There is a reference model for each individual architecture, namely the performance reference model (PRM), service component reference model, data reference model, and technology reference model, respectively. The reference model provides early reference cases in an identical business sector or similar industries that a company could use as a guide when it seeks to deploy an EA. There is also a government EA reference model for government-wide EA, which is used as a reference when EAs are deployed at the departmental level.

As a side note, the government-wide EA includes security architecture in addition to the four abovementioned architectures.

C) The EA framework

The Zachman Framework, TOGAF (The Open Group Architecture), and FEAF (Federal Enterprise Architecture Framework) are some of the leading EA frameworks in use today. The Zachmann Framework is the one used most often when establishing an EA. TOGAF, created by The Open Group, is an open framework that focuses on interoperability between companies. FEAF is also a framework developed in 1998 by the U.S. CIO Council with the help of the Jacquesman Framework and Spewak.

<Table8>Types of EA framework

EA framework	Description
Zachmann Framework	• This is the framework used most often when establishing an EA. It is defined as a matrix using view and perspective. • 5perspectives: Planner, Owner, Designer, Builder, Subcontractor. • 6 ways of describing each perspective: Data, Function, Network, People, Time, Motivation.
TOGAF	• This framework consists of an architecture development method (ADM) cycle, a technology reference model(TRM), and an SIP (standards information point), which is a DB containing summarized standards information. It is structured to resolve problems at the component unit level by employing an approach that uses the concept of building blocks..

FEAF	• This framework consists of eight components and a 4-step progressive structure, and manages all of the model contents of the Zachmann framework. • FEAF defines five reference models (BRM, PRM, DRM, SRM, TRM), which are interrelated and based on the Zachmann Framework. FEAF forms the basis of Japan's EA framework. • The framework includes a unique approach for each segment, and an implementation plan and process through AS-IS and TO-BE gap analysis.

04 Concept of ISP

A) Overview of ISP (Information Strategic Planning)

The literal meaning of the acronym ISP is "Information Strategy Plan". Generally, the term "ISP establishment" is used more frequently as an overarching concept.
ISP can present a vision for the information system and information management structure that can support an enterprise or organization when it is developing its mid-to-long term vision and goals and business plan. In other words, it can be understood as a plan that provides a rough sketch of the direction of information system deployment to aid the enterprise in realizing its long-term objectives.

B) ISP deployment procedure

In order to deploy an ISP, the external/internal environment of the company and the information environment must be analyzed first of all. When analyzing the environment of a company, tools like SWOT, 5-Force,7S and 4C are commonly used. In addition, when analyzing the information environment, the technology requirements corresponding to the purpose and background of a project must be reviewed in detail by studying the technology trends and analyzing the application of new technologies.
The next step consists in analyzing the current operation of the company. The most important item that must be checked in this analysis is the business process. A careful study of the business process in its current state will reveal various factors at work in a company or an organization.
In addition, analyzing the information systems scattered throughout the company and drawing out the requirements of stakeholders and the improvement agenda are also important tasks to be undertaken at this stage. Also, through the benchmarking of earlier cases in the same or similar industries, missing or distorted information can be corrected to some extent.

<Table 9>Basic composition of ISP[1]

Tasks		Details
Step	Activity	
Environment Analysis	Management environment analysis	Identify opportunities and threats through analysis of the internal/external work environment. Determine the CSF and OIR (Official Information Required).
	Information technology environment analysis	Study trends in information technology to analyze the direction in which information technology is developing, analyze the feasibility of applying new information technology, and identify the requirements for informatization.
	Work analysis	Analyze the organization's role and work structure and, based on the findings, identify the current problems with the organization and work structure and areas in need of improvement.
	Information system analysis	Analyze the current information system and the state of information resource management/ operation to identify problems and improvements needed in the information system.
	Benchmarking	Conduct benchmarking from the viewpoint of work and information systems.
	Gap analysis	Identify the business process requirements from early cases and the information infrastructure requirements. Study the gap between the requirements found and those of the company and determine the direction of improvements and corrections to be made.
Future model design	Future business process design	Establish a plan for improving the business process, e.g. an ideal future model of the business process and new business processes.
	Establishment of information strategy	Establish the vision, goals and execution strategy (for each phase) for informatization. Establish rules on the deployment of the information system, the technology requirements pertaining to the information system, and information management strategies.
	Information system structure design	Establish an ideal application service/information technology-based structure for the strategic deployment of the information system.
	Establishment of information management system	Organize the information resource management system in such a way that it can be made to efficiently operate the established information system.
	Establishment of business process improvement plan	Establish the business process based on a future model of the business process.
	Establishment of information system deployment plan	Establish the execution strategy for deploying a strategic model, implementation system and schedule, calculation of investment budget required for informatization, and evaluate the benefits of investment.
Detailed scale of information system	Development service fee	Detailed calculations, e.g. the development costs of each development item.
	Equipment purchase cost	Details of the technical specifications, quantity, and amount of each item (e.g. SW purchase, HW purchase).
	Maintenance and repair during operations	Cost of post-deployment operations, maintenance, and disposal.
	Calculation of function score	Calculation of function scores needed for deployment.
Feasibility analysis	Feasibility analysis	Economic feasibility analysis (B/C, NPV, etc.).
	Alternative analysis	Analysis of alternatives (at least 2) in the case of changes in business volume/cost, business development approach.

1 Common guide on information strategic planning (ISP), National Information Society Agency, 2018.

The results of the analysis of the enterprise environment and the current state of the enterprise constitute an important resource when determining directions for improvement, developing improved job procedures, and creating an informatization plan in the last stage of ISP establishment.

C) Key output of ISP deployment

The ISP deployment process comprises a set of activities that must be performed at each stage, and the results of these activities become the output of the deployment.
An example of a list of typical outputs that could be used in ISP is shown below:

<Table 10> Output of each ISP stage (example)

Stage	Output	Overview
Analysis of business management environment	Report on the analysis of the business management environment	Set the strategic direction of the company, analyze the environment.
Analysis of enterprise status	Report on the analysis of the current process	Analyze the business process, problems and improvement areas of unit organizations.
	Report on IT analysis	Analyze the problems in the information system and the areas in need of improvement.
Establishment of an informatization strategy plan	Informatization goal model specification form	Develop a new information model based on the findings of the analysis.
	Master plan for building the "To-Be" work system	Complete the ISP. Define and prioritize the project.

Although the actual implementation of ISP produces far more diverse and complex outputs, the most valuable output has to be a blueprint for a process for a future model and a set of activities for attaining a company's goals. This content must feature sufficiently in the output.
When comparing ISP to the EA described earlier, it can be said that ISP deals with plans that fall within the scope of EA but which are more microscopic than the EA. An examination of the scope of ISP as described in the table below indicates that its scope, when compared to the EA, is more focused on the informatization strategy.

<Table 11> Comparison of ISP and EA concepts

Category	ISP	EA
Objectives	• Link the management strategy with the informatization strategy, and introduce new information technologies.	• Blueprint for seamless integration of business and information resources.
Scope	• The informatization strategy can be applied at the company-wide level, service or department.	• Architectures for a company's technology (ITA), business (BA), application (AA), data (DA), etc.
Main activities	• Analysis of the business management environment (organization, related agencies and customer characteristics, etc.). • Analysis of the latest trends on information technology. • Analysis of tasks (internal activities of the organization and current process). • Analysis of the information system structure. • Establishment of the information strategy and information management system. • Design of the future task handling process and information system. • Establishment of a To-Be roadmap.	• Establishment of ITA direction and guidelines. • Establishment of a reference model (BRM, SRM, DRM, TRM/SP, PRM). • Analysis of the AS-IS architecture (BA, AA, DA, TA, SA). • Establishment of the TO-BE architecture (BA, AA, DA, TA, SA). • Establishment of an implementation plan. • Establishment of an ITA management system.
Key outputs	• Report on the analysis of the business management environment; report on the analysis of information technology trends. • Report on the analysis of the job/information system, IT vision and strategy. • Implementation agenda and roadmap.	• The vision of the company-wide architecture, rules, architecture matrix. • The current and target architecture • (BA,AA, DA, TA, SA). • The plan for the implementation of the target architecture.

In other words, the EA is deployed under a company's target architecture and incorporates the latest information technology so that it can align the direction of its IT with its management strategy. Therefore, the EA must be managed in a way that allows a company to respond quickly to changes in the business management environment, and must be flexible, so that the company's agenda can be implanted quickly through continuous updating, and in a way that ensures that the roadmap is shared with the rest of the organization.

IV. Understanding the Adoption of IT Business

▶▶▶ Recent Trends and Major Issues

When a company is contemplating the deployment of an IT business, the decision to develop it in-house or outsource its development has always been a difficult decision to make from a corporate perspective.
It is also difficult to choose whether to use package products or to develop systems from scratch when the decision is made to outsource IT.
For these reasons, whenever a company pursues the deployment of an IT business, it has to make an in-depth study of what method would enable the company to respond actively to changes in the environment and be of help to the continued existence and development of the IT business.
There is a growing awareness that, in order to strengthen corporate competitiveness, specific procedures must be developed for the adoption of an IT business; and that, at the end of its deployment, comes the building of the information system. As a result, for the adoption of an IT business to produce the maximum effect, a company must set up an organizational structure and process for the many different standards involved in the building and operation of the information system.

▶▶▶ Learning Objectives

1. To be able to explain the method and process of IT business adoption.
2. To be able to explain IT business outsourcing.

▶▶▶ Keywords

Method of IT business adoption, IT business adoption procedure, IT business outsourcing

✚ Preview for practical business

According to a 2010 survey by the Ministry of the Interior and Safety, 4.4 percent of the additional costs incurred due to excessive work changes were borne by central administrative agencies, while 15.3 percent were borne by local governments. These results have raised concerns that the planning and design of information systems for deployment in the public sector are performed poorly.

Legislation has been passed requiring the issuance of a detailed RFP and the PMO program when an organization seeks to deploy an IT business. However, the findings from surveys like the one described above suggest that people are still not aware of the benefits of deploying an information system and that most people also lack expertise.

Recently, the government has been working on introducing a "split order process" for the purpose of preventing irresponsible work changes and eradicating the unfair subcontracting structure which involves the ordering agency, bidding company, and sub-contractor.

The split order process roughly means that when an IT business is adopted, planning/design is split from deployment/development. In the planning/design phase, a more detailed requirement analysis of the Information Strategy Plan (ISP) is carried out with the information system master plan (ISMP) and the basic design (logical design). In the deployment/development phase, detailed design (physical design), system development (coding), and testing are carried out.

Many have voiced their concerns about the adoption of the split order process. Nevertheless, it is significant in that an environment can be created in which planning and design can be done more meticulously and systematically. This environment can also overcome the invisibility of software and lead people to understand how frequent changes in requirements can act as impediments to the adoption of IT business.

01 Summary of Lessons Learned

The adoption of an IT business must be executed in alignment with a company's IT business strategy and plans. Methods and procedures of IT business adoption must be created in accordance with the size of the organization and changes in the external environment of the company. The outsourcing of IT services should be considered for the non-core areas or processes of the company.

The IT business adoption process utilizes the ordering process and the software development life cycle of ISO/IEC 12207. This is because the core value of IT is implemented in software, and the success of software development is the key to the successful adoption of IT business.

IT outsourcing helps with improving a company's competitiveness because it relies on external expert resources. However, the work-related and technology-related lock-in that outsourcing entails is a problem that must be addressed through the introduction of regulatory measures.

02 IT Business Adoption Process

A company's ordering process is used as the basic procedure for adopting an IT business. The agent that places an order is the department or person responsible for issuing the requirements, while the agent of development is the company's computer department or an external expert on outsourcing.

Furthermore, it should be mentioned here that the lifecycle (SDLC, Software Development Lifecycle) of SW after adoption must follow the standard procedures defined in ISO/IEC 12207.

A) IT business ordering process

The IT business ordering process defines the activities and tasks of the orderer and describes a set of processes for deploying systems or software or services.

The process also includes such activities as concept definition and detailed specification of the requirements concerning the items ordered, preparation of the RFP, evaluation of the proposal, contracting, supplier management, and acquisition of the end output.

[Fig. 20] IT business ordering process

By using the IT business ordering process, a company can define the activities of the contractor and supplier that must be performed when deploying an information system and also enhance the success rate of the information service business.

The ordering process provides a means of communication between the orderer and the supplier, and lends visibility to

IT business adoption, resulting in a predictable procedure.

<Table 12> Detailed description of examples of ordering processes

Process	Key activities	Key outputs
Ordering plan	• Description of the system to be ordered. • Definition of the requirements and detailed specifications. • Writing of the plan for ordering	• Ordering plan. • Status analysis and requirements specification
RFP preparation	• Documentation of the proposal requirements. • Description of the constraints. • Establishment of supplier selection procedure and standard	• Request for proposal. • Contracting terms and conditions report. • table of supplier evaluation criteria.
Proposal evaluation and contracting	• Notice of tender and evaluation of the proposal. • Supplier selection and negotiation. • Signing of contract.	• Notice of tender. • Results of evaluation of proposal. • Contract.
Supplier monitoring	• Review and approval of the project execution plan. • Inspection of supplier contract fulfillment.	• Project execution plan. • Report on contract implementation inspection.
Acquisition and completion	• Inspection manager selection and acquisition preparation. • Inspection and acquisition test. • Acquisition and completion of the project	• Acquisition plan. • Report on test results (performance evaluation report). • Report on acquisition and project completion.

B) SW adoption process, ISO/IEC 12207

ISO/IEC 12207 is an international standard for the software adoption lifecycle. It provides a standardized and systematic process for acquiring, supplying, developing, operating, and maintaining software.

ISO/IEC 12207 consists of three main processes and a detailed procedure for each process.

ISO/IEC 12207 defines all the processes, activities, and tasks that can be applied to the adoption and development of many different forms of software, but it contains no specifications regarding the naming, form, and contents of the output. Therefore, if ISO/IEC 12207 is used together with SPICE (Software Process Improvement and Capability Determination) or CMMI (Capability Maturity Model Integration), not just the WHAT but the HOW of the SW adoption process can be learned.

① Basic lifecycle process

The basic life cycle process consists of five sub-processes and provides support to the stakeholders participating in the software lifecycle process.

<Table 13> Detailed process of the basic lifecycle process

Process	Description
Acquisition	• Defines the activities of the software acquirer. • Defines the system, output, and service acquisition activities.
Supply	• Defines the activities of the software supplier. • Centered on the supplier who supplies to the acquirer.

Development	• Defines the activities of the software developer. • Defines software output and the activities of the development team.
Operation	• Defines the activities of the operator who provides operations services.
Maintenance	• Defines the activities of the maintenance manager who provides maintenance services.

② Support lifecycle process

The support lifecycle process consists of eight sub-processes and plays the role of supporting other processes. It contributes to the quality and success of the outputs.

<Table14>Detailed process of the support lifecycle process

Process	Description
Documentation	Defines recording activities for output generated during the lifecycle period process.
Configuration Management	Defines configuration management activities and configuration details.
Quality Assurance	Defines quality assurance activities related to checking the fulfillment of the requirements and compliance with the plan.
Verification	Defines activities for verifying the software output from the developer's perspective.
Validation	Defines activities for checking the software output from the user's perspective.
Joint Review	Defines activities for comprehensively evaluating output and progress.
Audit	Defines activities for examining the software's compatibility with the plans and contracts.
Problem Resolution	Define activities for analyzing and resolving problems found in the basic life cycle process.

③ Organization lifecycle process

The organization lifecycle process consists of four sub-processes which serve to configure the underlying structure of the organization lifecycle process for the business, without being constrained by a specific project or information system deployment contract.

<Table 15> Detailed description of the organization lifecycle process

Process	Description
Management	Defines the basic management activities including project management activities.
Infrastructure	Defines the basic structure of the lifecycle process.
Improvement	Defines the improvement activities carried out by the stakeholders or the organization which is participating in the process.
Training	Defines the basic activities that must be completed when providing trained staff.

C) Tailoring process

In addition to the main processes described above, there is also the tailoring2 process. The tailoring process defines the basic activities required for tailoring. It is the process of eliminating activities and tasks that are not applied or perceived as unnecessary in the life cycle process.

Although the tailoring process is generally known as the optimization of the software development methodology, this

section explains the part of tailoring that has to do with software adoption.
Before software is adopted, the adoption procedure, method, and outputs must be optimized to accommodate changes in the internal and external requirements. The need for tailoring becomes most acute for unit-level projects. In these situations, the best software adoption environment can be created through tailoring.

<Table 16> Important considerations for the tailoring process

Considerations	Explanation
Reasons for SW adoption	Work scope (ex. Finance, Telecom, etc.), stakeholder considerations - Establish the goal and direction of SW adoption.
Timetable and scope	Scope of adoption, interfacing parts, project timetable considerations - Select the methodology and output.
Internal/external environment	Environmental considerations, e.g. regulations and laws, IT compliance, etc. - Establish the scope of application of security measures, and the internal/external environment response strategy.
Application technology	SW application framework and base technology considerations -Select the framework and attributes, inspect its utilization, and select the application base technology.

03 IT Business Adoption Method

There are two distinct methods of adopting an IT business: in-house development and package purchase. The advantage of in-house development is that it allows a company to fully reflect the needs of users by utilizing its own internal personnel. A purchased package has the advantage of being based on a standardized advanced process which is conducive to improving work efficiency.

① Characteristics of in-house development

This is a form of adoption that allows companies to set up and develop information systems using their own manpower, resulting in a system that is faithful to the internal requirements of the company. While know-how can be accumulated with this method, it involves relatively higher adoption costs, while success cannot be guaranteed.

② Characteristics of package purchase

This is a form of adoption under which a company can easily absorb the know-how gained from early cases of IT business adoption. By adopting a system that has undergone many tests and adoption verifications, uncertainty about success can be eliminated. The adoption period is short and the cost is relatively low, but the maintenance costs are likely to increase

<Table 17> Comparison of in-house development and package purchase

Category	In-house development	Package purchase
Goal	• It actively reflects a company's internal requirements.	• It uses advanced processes and cases.
Manpower	• It is centered on use of the company's own manpower.	• It uses an expert on the package.
Dependency	• Know-how is accumulated inside the company.	• A relationship of technology dependence is formed.
Advantages	• User requirements for adoption can be sufficiently satisfied.	• The deployment period and deployment costs are relatively low.
	• A company's information and information about its work processes can be guarded.	• Through the adoption of a standardized process, the work process can be innovated naturally.
	• The scope of adoption can be easily adjusted.	• Advanced management processes can be integrated into IT business.
Disadvantages	• The deployment costs are relatively high.	• A company's confidential information could be leaked to the outside world.
	• The scope of work improvements is relatively narrow.	• A company's internal processes do not have to be altered to meet requirements.

From the perspectives of the IT business, in-house development and package purchase have their own distinct advantages and disadvantages. IT business used to be adopted using either one of the methods, but these days companies frequently opt for a hybrid approach to adoption.

In other words, the in-house development method is used for the overall approach while the packaged product method is chosen when acquiring the component technologies. This method results in reduced costs and helps reduce risks when adopting IT businesses.

04 IT Business Outsourcing Service

A) Overview of IT business outsourcing

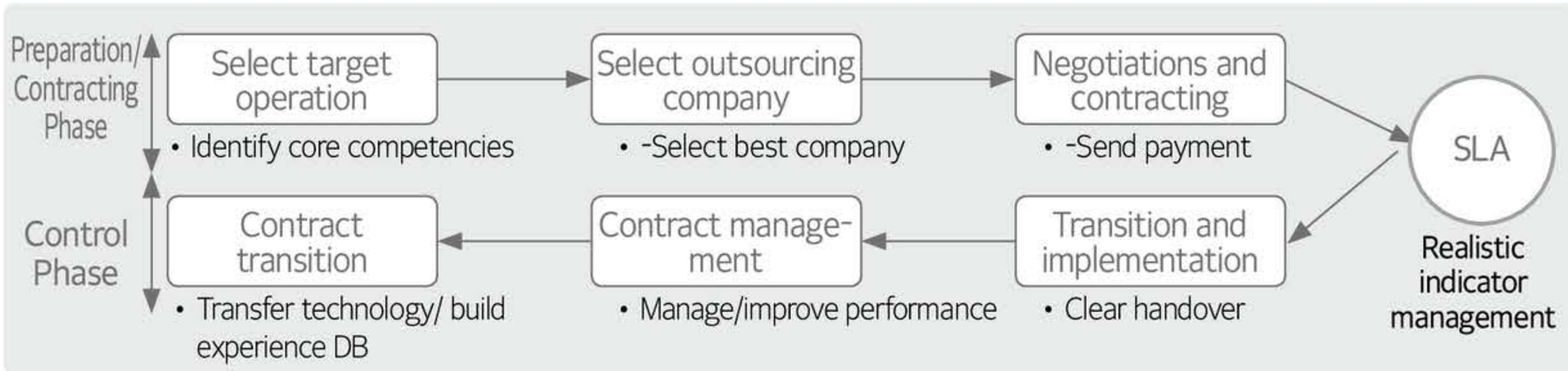
A company can turn to several strategies when it has to respond quickly to changing internal and external environments. For operational areas and processes where a company is certain that it holds a competitive edge, it will try to improve and develop further in order to strengthen its competitive advantage.

For non-strategic areas or processes where it is weak, however, a company may turn to excellent outside resources.

For this reason, a company may seek to perform important activities (or those value chain activities where it enjoys competitive advantages) in-house, whereas for non-strategic areas and areas where it is weak, it will subcontract out the work to outside experts or third-party companies. This is what is meant by "outsourcing" and, to be more exact, "IT business outsourcing" when IT resources are involved.

In IT business outsourcing, companies outsource IT resources, IT management, and IT operations and usually focus on their core operational areas, thus enabling them to retain their competitive advantages.

B) Adoption process



[Fig. 21] Conceptual diagram of IT business outsourcing adoption process

When a company opts for IT outsourcing, it begins by identifying its core competencies and selecting the tasks to be outsourced. Once the target task has been selected, the vendor will be chosen, and negotiations will proceed until a contract is signed. The most important task is for the company and the vendor to reach a clear-cut agreement on how the index for service levels will be managed.

C) Forms of outsourcing

IT business outsourcing can take one of four forms.

<Table 18> Forms of IT business outsourcing

Form	Description
Total Outsourcing	The entire IT functionality is subcontracted to a single vendor, and the accountability is clear cut and the job handling efficiency can be improved. But the absence of competition can give rise to monopolistic issues.
Selective Outsourcing	The selected function or job unit is subcontracted to multiple vendors. Price and quality improvements can be expected from competition among vendors. However, accountability issues may arise when problems occur, and there could be difficulties when communicating the exact customer requirements.
IT Subsidiary Company Outsourcing	The IT functionality is outsourced to a subsidiary company specializing in IT, which is established solely for the purpose. This is a form of outsourcing that can yield benefits like improved communication and unity by promoting a sense of solidarity among employees. However, associated costs could increase and, if the subsidiary is not profitable, it could become a risk to the parent company.
Co-Sourcing	IT planning, IT strategy, and IT service activities are separated. This is a form of adoption that offers advantages in a rapidly evolving environment, and the problems of total outsourcing can be partly addressed. However, some coordination may be required in the event of a gap between strategy and performance.

D) Considerations when adopting outsourcing

In the course of outsourcing an IT business, a company will come across many types of problems. To address these problems, the following steps could be considered:

- IT outsourcing requires continuous oversight of the outsource vendor (company). Standards like eSCM[2] and ISO/IEC20000 can be used for the oversight.
- It is necessary to establish a security system to prevent leakages of critical corporate information while managing the level of, and continuously monitoring changes in, the service so as to secure optimal service quality.
- When it is not a specific job category, but the whole or a part of the business process has to be outsourced, a company needs to adopt and operate business process outsourcing (BPO).

<Table19>Issues and considerations when adopting outsourcing

Category	Management	Contracts	Operations
Problems	• Control over subcontractors is weak. • Dependency on the vendor is increased. • Inter-company disputes could occur. • Increased management costs.	• Scope and R&R can be unclear. • Uncertainty over estimated costs. • Difficulty in awarding bonus points and imposing sanctions.	• Security concerns over corporate information. • Difficulty in accumulating know-how. • Fulfillment of requirements can be insufficient.
Considerations	• Set up a control system using IT governance. • Evaluate from the BSC viewpoint. • Set up an evaluation system using standards (eSCM, ISO20000, etc.).	• Level agreement and management using SLA. • Set up a plan for change management. • Adopt a systematic method of estimating costs.	• Set up a security training program and a security control system. • Set up a technology transfer process. • Set up a service quality

2 eSCM: e-Sourcing Capability Model.

V. Understanding the IT Business Process

Recent trends and key issues

With the IT business process, it is important for a company to optimize the process in order to respond quickly to changes in its environment. After the initial set-up, a process becomes optimized with the passage of time, with changes in the business environment playing an important role as an optimizing factor.

To improve the IT business process on a continuous basis, it is critical to monitor bottlenecks in the process. Companies in this situation usually turn to BPR or PI to rectify the bottleneck issue.

The most challenging task when pursuing BPR or PI is to persuade and convince a company's own employees. This is because it is humans who operate the process and humans who are also the subjects of any process innovations. Therefore, ceaseless persuading and the creation of an atmosphere in which employees feel they can share in the company's growth are critical elements to the success of the process.

Learning Objectives

1. To be able to explain the constituent elements of the IT business process.
2. To be able to explain the various methods of improving the IT business process.

Keywords

BPM, BAM, BRE, ILM, IRM, BRP, PI, 6 Sigma, Trees, Servqual, SPC

✚ Preview for practical business BPR Case Study: Information technology - the new business management strategy of Starbucks

Starbucks, which opened its first store in Seattle, Washington in 1971, is the world's largest multinational coffee shop and currently operates 23,187 stores in 64 countries around the world. For example, it has 12,973 stores in the United States, 1,550 in Canada, 1,088 in Japan, and 544in Korea. A unique experience, high-quality coffee and beverages, friendly employees, and a friendly coffee shop interior are just some of the differentiating factors that set it apart from the rest of the competition, and which have propelled the company to its commanding market position. However, the economic downturn that began in 2008 also affected Starbucks, whose sales dropped by more than 50 percent by the end of 2008. However, Starbucks used this seemingly disastrous market situation as an opportunity to transform its business by integrating wireless technology and the mobile digital platform into its business process. As part of this endeavor, the company conducted a customer analysis whose results indicated that more than 1/3 of its customers were enthusiastic users of smartphones. This finding led the company to introduce a smartphone app-based payment technology with which customers could pay for their purchases using their prepaid cards or rechargeable cards. It also created the 'Starbucks Digital Network' in partnership with Yahoo after noticing that visitors to its stores were regularly using its free WiFi service. This network, through its content portal function, provides free Wall Street Journal articles for customers to read and free downloadable tunes from iTunes for customers to enjoy. Furthermore, the company internally worked on making its business process more efficient. Now, Starbucks baristas no longer have to bend down when making coffee, while the total time spent waiting for the coffee to be made has been minimized and the time spent on making drinks has been reduced. To this end, the company formed the Lean Team to advise the company on benchmarking the lean manufacturing method pioneered by Toyota Motor Company. What's more, the company built a smart work environment with wireless technology that maximizes the work efficiency of its employees. Within this smart work environment, Starbucks employees can do their work in any store across the nation. This has resulted in about 25% longer store visiting times by the company's regional managers. Howard Schultz, the CEO of Starbucks said, "Most of the cost savings gained come from new ways of operating our stores and new customer services". Successful changes like this have helped Starbucks to recover its profitability and maintain its growth.

✚ Preview for practical business PI Case Study: Korea Workers' Compensation & Welfare Service opens a new era

From 2010 to 2011, the Korea Workers Compensation & Welfare Service (COMWEL) built an advanced administration system through a wide-scale process innovation (PI) project. Process innovation (PI) cannot be realized simply by setting up a system or with training alone. It can only be successful when there is a company-wide consensus from the top management level to the working-level staff of the organization, and when the best practices are applied to the organization process and fully internalized. For this reason, it is very difficult for conservative public institutions to implement project innovations. However, with COMWEL's systematic project management and utilization, it has so successfully implemented process innovation that it has become a benchmark for other institutions to follow.

COMWEL pursued process innovation under the banner of 'job efficiencies through process innovation' because it wanted to improve the quality of its public services despite having limited human resources. It began the task of increasing job efficiency with internal discussions over those areas most in need of improvement. Starting with AS-IS process diagnosis consulting, COMWEL next studied the end-to-end process of each job, and then selected the processes requiring process innovation (PI). The requirements at the working level were identified and extracted, and the information thus obtained was used in setting up the BPM, the process-based knowledge management system (PKMS), and the enterprise information display (EID) system. Among 50 core processes, systemization was completed for the 25 processes that were expected to produce the greatest effects once the process innovations were up and running. COMWEL focused on improving its public service by eliminating unnecessary procedures and simplifying unnecessarily complex ones. Process innovation (PI) was continuously performed around the framework of process establishment → monitoring → improvement activities → process establishment.

Through process innovation, when a user searches for reference data, the system provides to the user the information that is most relevant to the user's query. As the amount of information accumulates in this system, the relevancy of the information multiplies. In addition, the management was able to reduce risks by quickly modifying the management strategies after identifying the management plans and core information of all the business units at a glance. In addition, top management was able to get a quick view of the business plans of all business divisions and the key information of the COMWEL and make quick changes to its business management strategy so as to reduce risk.

01 Summary of Lessons Learned

The IT business process is both a set of tools for implementing IT business and a procedure that allows companies to continue with their activities. The IT business process can be divided into people, organizations, and job process, and is intimately tied to the core components of enterprise management.
IT business processes consist of business process management (BPM) for managing processes, business activity monitoring (BAM) for monitoring process bottlenecks, the business rule engine (BRE) for managing the business process task rules, and BPR/PI, an innovation tool for processes.
The IT business process tools described above form mutually dynamic relationships with each other, and through these relationships the process undergoes continuous improvements. The value of business process improvements plays an important role in enhancing a company's competitiveness because a system is created that can respond quickly to changes in its internal and external environments.

02 Component Elements Required in IT Business Process Execution

(Business Model)A strategic blueprint for organizing and implementing an enterprise organization's structure, processes, and systems to create value for the enterprise is called a business model. Made up of core business areas such as customers, order, infrastructure, and business feasibility analysis, a business model can enhance the value of an enterprise.

(Business Execution)To remain agile in a rapidly changing business environment, the core business processes of an enterprise must be integrated across its various departments to give the enterprise the increased flexibility it needs to survive. An enterprise also has to take care of the underlying assets that it needs to operate, such as core competencies, finance, and human resources, and have the infrastructure to make decisions quickly. There are the basic elements that an enterprise must possess to operate its business, and these include the people who make up the organization, the job system for managing the operation, and the tools for managing the business of the enterprise.

A) People and Organization

People participating in an enterprise as members of the organization, and the organization that carries out the function of dividing, consolidating, and connecting different jobs, are the key elements of IT business execution.
An organization is an activity or system consciously created by more than two people. As such, it is important to maintain internal and external balance, effectiveness, and efficiency to fulfill their desires and common objectives of communication, volunteer work, and collaboration.
Through the division of functions and responsibilities, an organization allocates human resources so that it can fulfill the agreed-upon objectives more effectively.

B) Business process

An enterprise is a formal organization whose objective is the pursuit of profits through the sale of goods or services at prices higher than the costs required to produce them.

Furthermore, an enterprise can be viewed as a collection of interrelated business functions (or activities) defined by various business rules with the aim of realizing some objectives. Here, the term "business rules" refers to the rules that determine when, how, in what order, and which rules should be applied. Business rules (i.e. processes) have a significant impact on an organization's management, performance, and value creation.

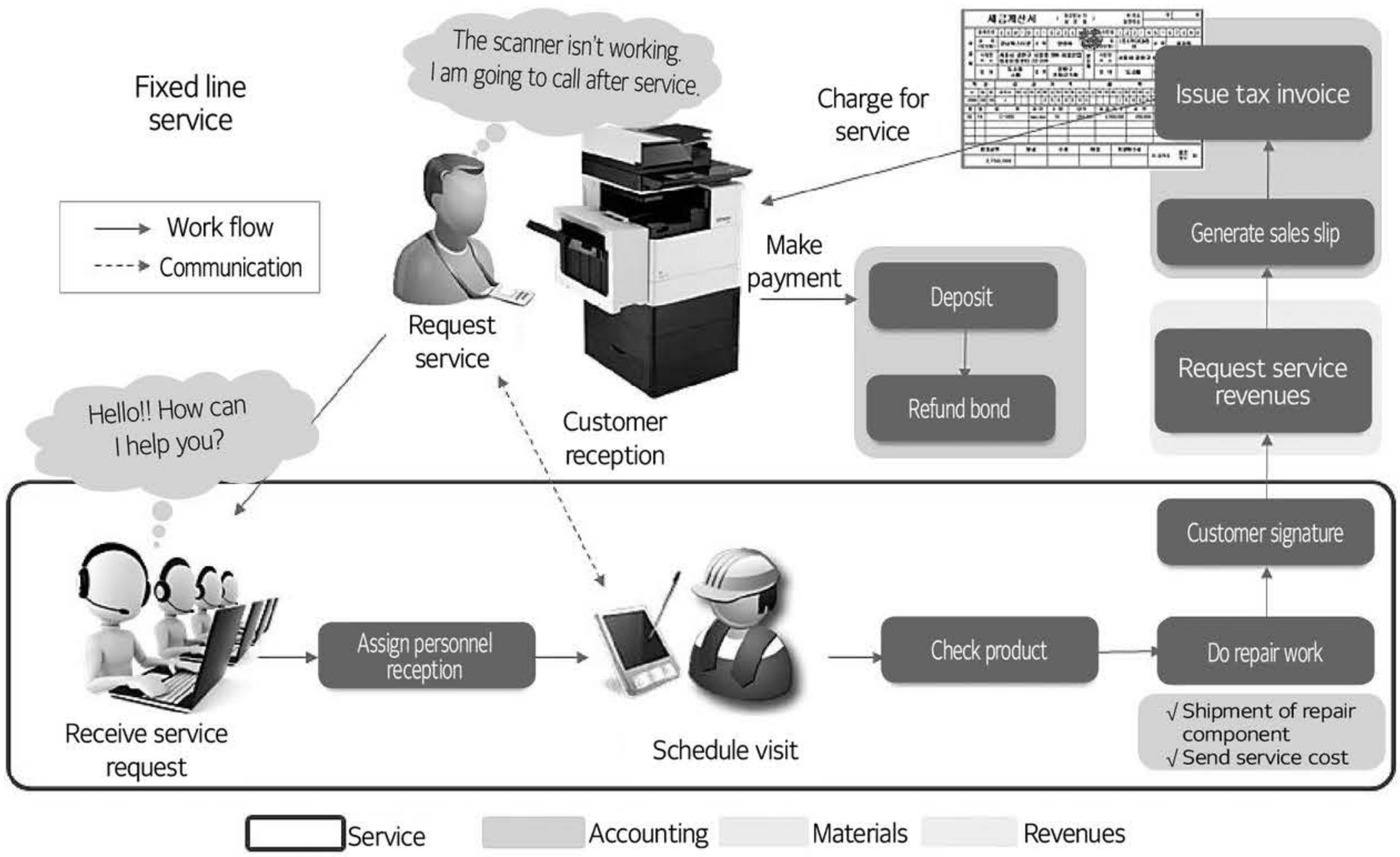
The step of describing the method and the job of organizing work in an enterprise is called the "business process". Examples of common business processes by function (such as manufacturing and production, sales and marketing, finance, and HR management) are described in the table below.

<Table 20> Relationships between the functions and business processes of an enterprise

Functions of an enterprise	Business Processes	
Manufacturing and Production	• Product assembly • Quality inspections • Raw material list production	• Ordering and procurement management • Production planning management • BOM management
Sales and Marketing	• Customer identification • Customer product management • Cost estimation management	• Product sales • Distribution management • Prepayment/borrowing management
Finance/Accounting	• Issuance of bonds • Process payment • Production of financial statements	• Settlement of payment • Tax invoice issuance • Cost management
HR Management	• Recruitment • Appointment • ardiness and absenteeism management	• Employee welfare management • Performance evaluation • Wage management

03 Examples of the IT Business Process

The figure below is a diagram of the typical service process of a company that sells multifunctional printers.If a customer encounters a problem with the multifunctional printer he/she has been using, he/she requests a repair service by contacting the customer center. The center assigns a member of the service personnel if a visit to the customer's site is deemed to be warranted. The service personnel assigned to the task talks to the customer to determine the symptoms and schedule the visit.



[Fig. 22] Examples of the IT business process

The service personnel will then visit the customer at the appointed time to examine the problem with the printer and repair it. The service personnel will request the customer's signature as confirmation of completion of the repair work. In the case of paid repairs, the customer will be billed for the repairs, which translates into revenues for the company. When the sales amount and service fee are settled and a sale is confirmed, a tax invoice is issued and delivered to the customer. Upon receipt of the tax invoice, the customer proceeds with the payment.

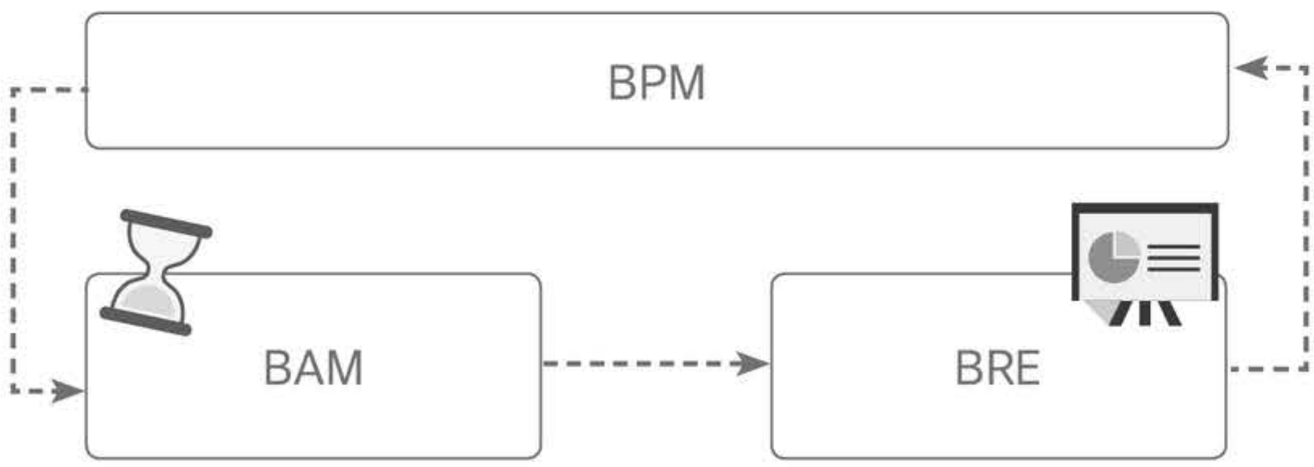
The money received and deposited by the customer is settled by crediting the accounts receivables through the deposit process. This series of processes enables the enterprise to perform two activities. First, it can provide customer services through service activities and, second, it can generate profits. The processes involved in the payment-based service fall under the following job domains: service, accounting, materials, and revenue (sales).

While some of these business processes are firmly cemented, most of them have to be improved and be able to adapt flexibly to changes in the business environment. An environment must be created wherein waste and bottlenecks can be constantly identified and jobs quickly processed.

04 Methods of Executing IT Business Processes

A) IT business process management

BPM is a key technique of IT business process management that consists in optimizing and automating business processes. In addition, BAM is a technique for discovering and managing bottlenecks in business processes, while BRE is a business rule engine that sets and manages the flow of business processes.



[Fig. 23] Conceptual diagram of IT business process management

① Understanding BPM

Business process management (BPM) is a technique for the consolidated management, optimization and automation of the flow of people, information resources, and tasks associated with IT business processes. It is also an important means of implementing IT business processes. How well the overall process is managed can have direct repercussions for business performance. Hence, it is essential to take a logical and structured approach to managing the IT business process. BPM must be capable of handling changes in the management environment and should be designed to be capable of responding actively to changes in business processes.

<Table 21> BPM design stages

Design stages	Key activities
Process definition	• Define what could be the core processes and identify the rules. • Analyze the processes and establish a method of measurement.
Process execution, operation	• Execute, operate and manage the processes according to pre-determined guidelines. • Operate the processes so that person-to-person, person-to-system, and system-to- system connections can be made.
Monitoring control	• Monitor the time points of job completion, the quality of job performance, and the job execution process. • Monitor the progression of the process in real time, keep and manage a record of the monitoring.
Process improvement	• Identify and compare KPIs for process performance. • Conduct simulations for the purpose of improving the process. • Repeat the cycle of process execution and improvement.

② Understanding BAM

Business activity monitoring (BAM) is a technique for optimizing IT business processes. It detects and controls

process bottlenecks by monitoring processes in real time and recognizing risk factors in advance.
BAM also uses extended business intelligence (BI) techniques for real-time analysis, and monitors and manages the process flow for business process monitoring (BPM).

<Table 22> Base technologies of BAM

Base technologies	Description
Integration technology	• Technology for integrating and managing important applications. • Utilize EAI (Enterprise Application Integration).
BI (Business Intelligence)	• Analyze the key business process indicators.
DW (Data Warehouse)	• Identify the risks in business processes by collecting and analyzing statistical data.
BPM	• Analyze business events on the process and make improvements to the process.
System infrastructure	• Manage the network and integrated system. • Use the system to collect, analyze and visualize data and to process events.

③ Understanding BRE

Business rule engine (BRE) is a technique for effectively managing, automating, and optimizing processes by formalizing the complex business rules and process flows of an enterprise. The ever increasing volume of information processed by IT business processes and the increasing complexity of process flows have led to the need for rule-based management. Rule-based management is also needed for service improvements and cost savings. For this reason, the adoption of BRE can help enterprises to proactively manage changes in, and reduce the operating costs of, business processes.

<Table 23> Component elements of BRE

Component Elements	Description
Rule Manager	• Develops and manages business rules, manages the process lifecycle. • Manages the repository in which business rules are stored.
Rule Service	• Acts as a server for the rule engine and provides the interface between processes. • Distributes rules that are developed and implemented, and provides a rule service.
Rule Monitoring	• Supports process improvement activities and the business rule performance tuning. • Provides analysis and statistical functions.
Rule Repository	• Repository for storing business rules.

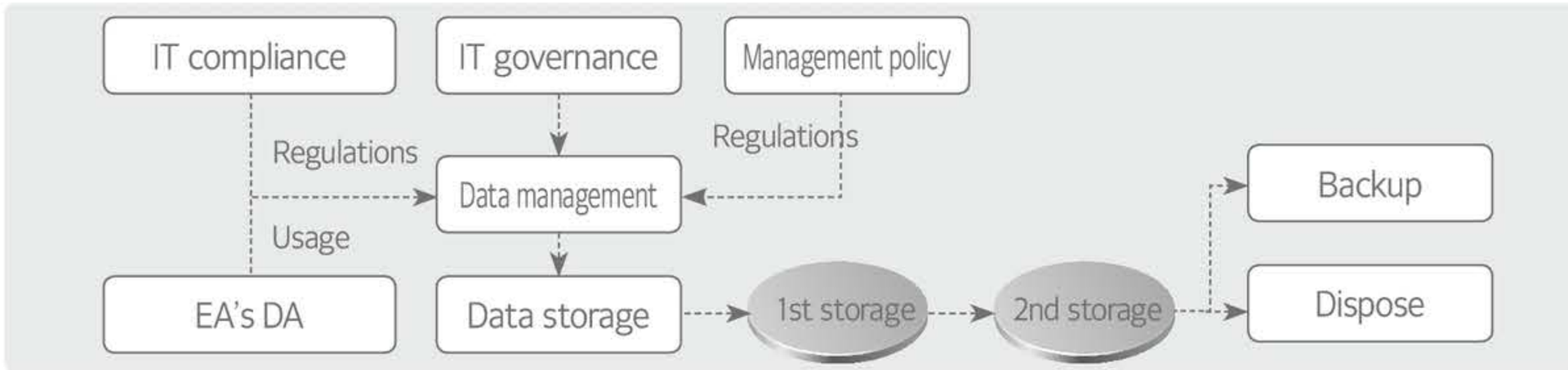
B) IT business process information management

As IT business processes become ever more complex and have to respond rapidly to environmental (both external and internal) changes, there is a growing need for the systematized management of the data generated by such processes. The data generated by IT business processes can be managed either by information life cycle management (ILM) or by information resource management (IRM).

① Understanding ILM

Information life cycle management (ILM) is a series of processes for separating and managing storage media, which is necessitated by ongoing changes in the value of data or information throughout its life cycle.

As the volume of data increases, so does the cost of managing data. In contrast, the value of data changes as it goes through its life cycle. Thus, enterprises are turning to ILM in order to reduce their data management costs and manage data in a more systematic way.



[Fig. 24] Conceptual diagram of ILM

The constituent elements of ILM belong to one of two categories, i.e. the management policy category or the technology element category.

<Table 24> Constituent elements of ILM

Category	Element	Role
Management policies	IT governance	Provides guidelines on the generation, storage and disposal of data.
	IT compliance	Provides legal, regulatory and policy standards.
	Enterprise data management policy	EA[3] 's DA[4] system and data operation policy.
Technology elements	1st storage	The utilization rate of the storage is high, and it must be used repeatedly; therefore, only high-performance, expensive storage solutions are used.
	2nd storage	The utilization rate and value are relatively low; therefore low-performance low-priced storage solutions are used.
	Data archiving	A technology that allows data to be archived periodically and processed automatically by the system.
	Backup	Store separately using a tape library or an affordable disk (backup policy).

② Understanding IRM

The purpose of information resource management (IRM) is the efficient and integrated management of IT resources. Here, efficient and integrated management means preventing redundant investments in IT resources and increasing returns on investments. It also means managing all types of IT resources from HT resources to IT equipment, budgets and outputs.

3 EA: Enterprise Architecture.

4 DA: As one of the component elements of the EA, the DA describes the architecture of data.

Faced with the increasing complexity and scale of enterprise information systems and the growing need for the systemized management of information resources, enterprises have become dependent on IRM because it provides a common standard and management system for the entire range of informatization procedures (informatization planning, development, and performance evaluation).
The IRM informs the EA of its framework for information resources, and the EA presents the IRM with guidelines for enterprise resource schemes and reference schemes. That is, IRM and EA exist in a complementary relationship.

<Table 25> IRM process for EA

Process	Key activities	Output
Information resource planning	• Develop strategies and objectives of information resource management; establish the plan for inducing the active participation of the top management..	Information resource management plan
Set up organization structure	• Form the architecture team and committee. • Appoint the chief architect.	Team organization chart Work assignment chart
Set up architecture	• Setup the AS-IS & To-BE architecture. • Establish the architecture conversion plan.	Architecture analysis report Conversion plan
Utilize architecture	• Implement the investment plan & control. • Develop information resources and use them in operation.	Utilization guidelines
Architecture maintenance management	• Continuously update and manage the architecture. • Conduct evaluations of the link between architecture and information resources.	Report on information resource utilization
Evaluation of information resource management	• Conduct an assessment of the performance of information resource management. • Develop improvement plans on a regular basis.	Analysis of information resource management/ utilization, information resource management evaluation report

05 IT Business Process Improvement Techniques

Improving business processes is seen as an essential means of securing competitiveness in a rapidly changing business environment. All enterprises are committed to maximizing their operational efficiency by structuring their organizations in order to respond quickly to the market environment and gain price competitiveness over their competitors. They also focus on technology innovations for the purpose of developing new business models and services.
To realize these business objectives, enterprises try to improve themselves by adopting a number of innovation techniques. Despite these efforts, many companies often suffer from weakened market competitiveness and economic losses. This is because the larger the scale of the enterprise or the number of employees, the harder it becomes to manage the organization, while the ways in which business tasks are carried out in practice often contain unrealistic or inefficient elements. Innovative techniques such as BPR and PI described below, along with management tools like 6 Sigma, are being used strategically by enterprises as a means of improving their business processes.

A) Understanding BPR

The concept of business process reengineering (BPR) was first introduced in a paper published by Professor Michael Hammer of MIT in 1990. As products from Asian countries began to penetrate the US market, US products began losing their competitiveness, so Professor Hammer sought to address the root causes of this problem in his paper.
After analyzing the causes of the decline in U.S. competitiveness, Hammer found that U.S. products were not actually lagging behind in terms of product competitiveness, but that they were losing competitiveness in terms of price and quality. For American companies to provide the product values that customers were looking for, Hammer felt that the solution lay in resolving the problems in the overall business process, and thus proposed the concept of BPR as a solution to those problems in his paper.

① Concept of BPR

BPR is a technique for redesigning business processes in a fundamental way in order to bring about a radical improvement in such performance indicators as cost, quality, service, and quickness. There are four attributes of BPR that should be mentioned here.

- The first attribute is 'Basic': In BPR, activities are performed to address the basic problems of an enterprise. Through BPR, answers are sought to such questions as "For what purpose is a business task performed?" "What are the current problems?" and "What are the inefficient elements of an enterprise's operations?"
- The second attribute is 'Zero Base': BPR is all about designing a new way of performing business tasks by abandoning existing task procedures or processes.
- The third attribute is 'Dramatic Improvement': BPR is used only when an absolute innovation is needed. Thus, BPR signifies a radical improvement rather than a gradual improvement.
- The fourth attribute is 'Process': The targets of BPR are mainly task processes. BPR strives to resolve problems through process-centric thinking, without relying on jobs, workers, or organizational structures. The aim is to internalize the processes that drive business values.

② BPR implementation procedure

<Table 26> BPR implementation procedure

Implementation procedure	Description
Set the corporate objectives	• Establish objectives behind the corporate vision and process redesign. • Reduce costs, save time, improve tasks, increase quality levels, etc.
Select the target process	• Identify the key processes and demarcate the scope of each process. • Conduct a strategic evaluation and rank the priority of each process.
Understand the current process	• Understand the selected process and check the current mode of operation. • Evaluate the current process performance level.
Select the process goals	• Select the improvement goals of the process. • Link the corporate vision with the goals.
Design the improved process	• Design a new process for realizing the selected process goals.
Develop the change model	• Design and pilot a prototype of the improved process. • Lowe the resistance of company and technology and address issues.
Implement	• Transition from the current process to the improved process. • Implement strategies for reducing risks.

Operate	• Operate the new prototype and transition to quality control management.

B) Understanding PI

① Concept of PI

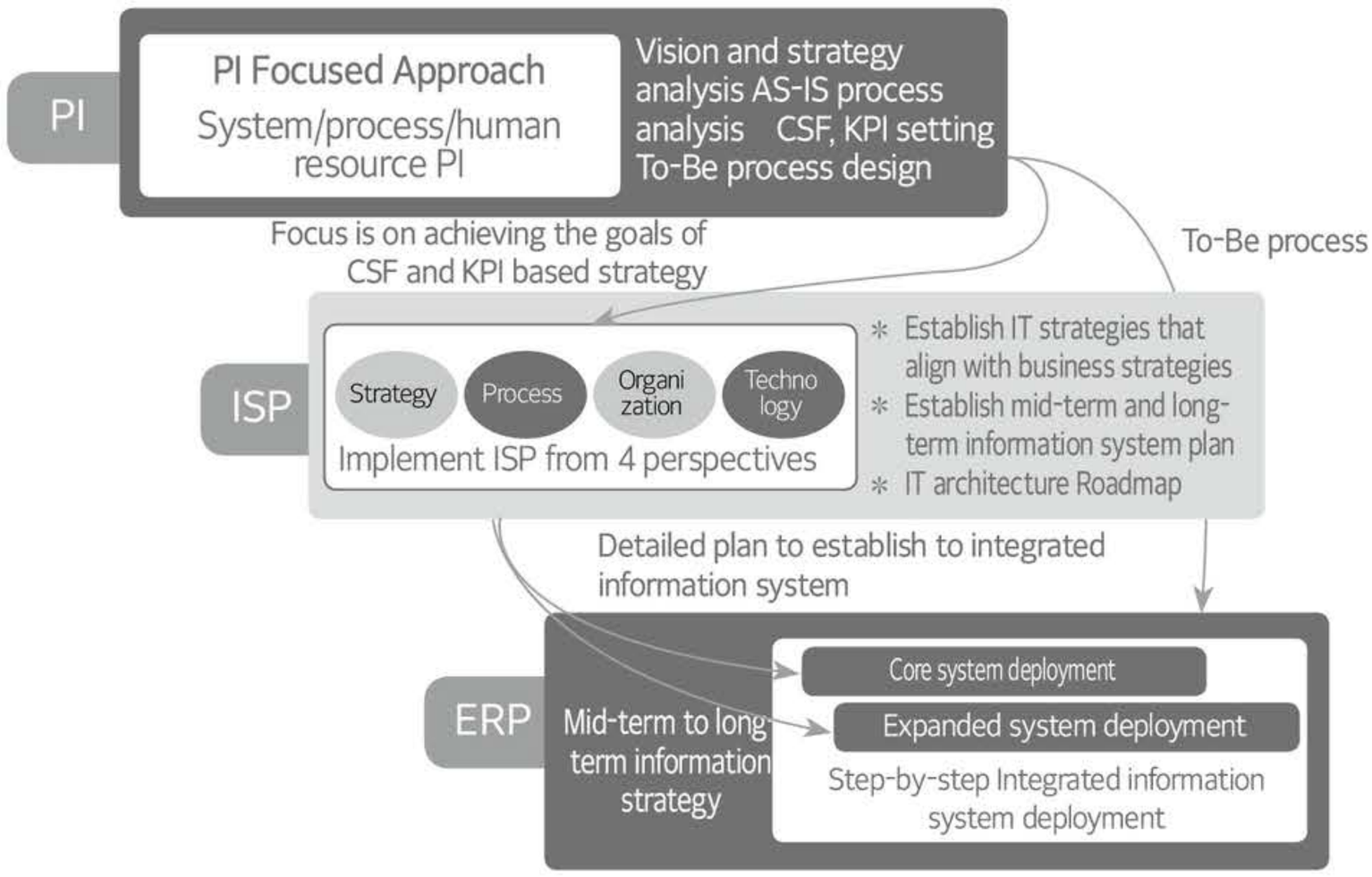
Process innovation (PI) is the activity of improving the business environment to maximize corporate value. PI seeks to eliminate unnecessary elements (across all aspects of corporate activities ranging from business process to organization and IT) and rebuild effective business processes.

PI is similar to BPR, but it was introduced in 1993 when David Port of the United States published his paper titled 'Process Innovation'. PI can be understood best as BPR, but with a greater emphasis on the integration of information technology.

The objective of PI is to build a structure that can respond to changes in the business environment surrounding an enterprise by improving the current business processes and the flow of information, logistics and values in a direction that is more customer-centric. Internationally, the concept of BPR developed by Michael Hammer is used widely. But in South Korea, the concept of PI became more popular after it was first used by Samsung Electronics and after POSCO adopted a PI-based ERP as a strategy for improving its business processes. In South Korea, PI is used in a broader sense than BPR.

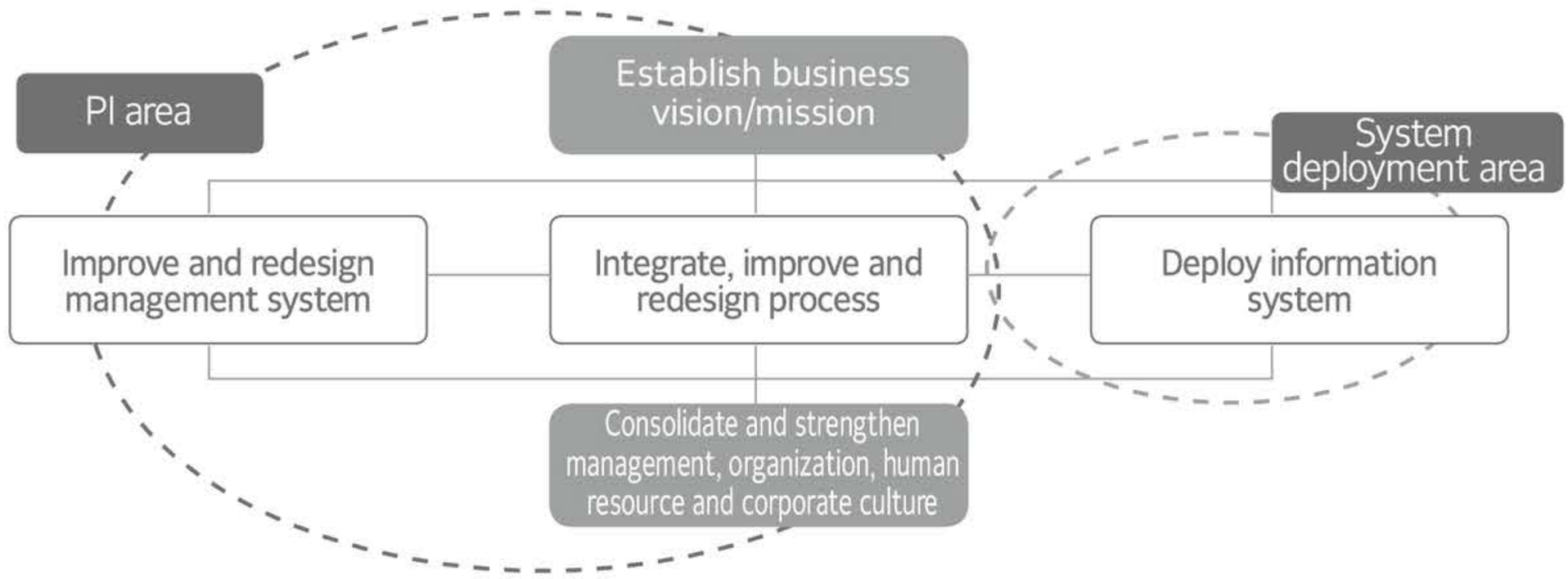
② Example of PI implementation procedure

Generally, PI is implemented in conjunction with the deployment of information technology. A typical situation is when an enterprise carries out sudden improvements of its business processes through integration with ERP. The PI develops into a system that performs improvements to plans and processes, establishes an information service plan, and then realizes the planned items as a means of execution, whether ERP or CRM. The implementation of PI begins with improving the processes and systems of an enterprise, after which an informatization plan is established through the improved systems and processes, followed by the deployment of a system that is capable of executing the plan through ERP or CRM.



[Fig. 25] Example of the PI implementation procedure

The relationship between PI and ERP can be explained as follows. First, PI is implemented to bring about improvements to an enterprise's systems, processes, and workforce and to lay the groundwork for the integration of data and processes. This is followed by the procedure for constructing the integrated system.

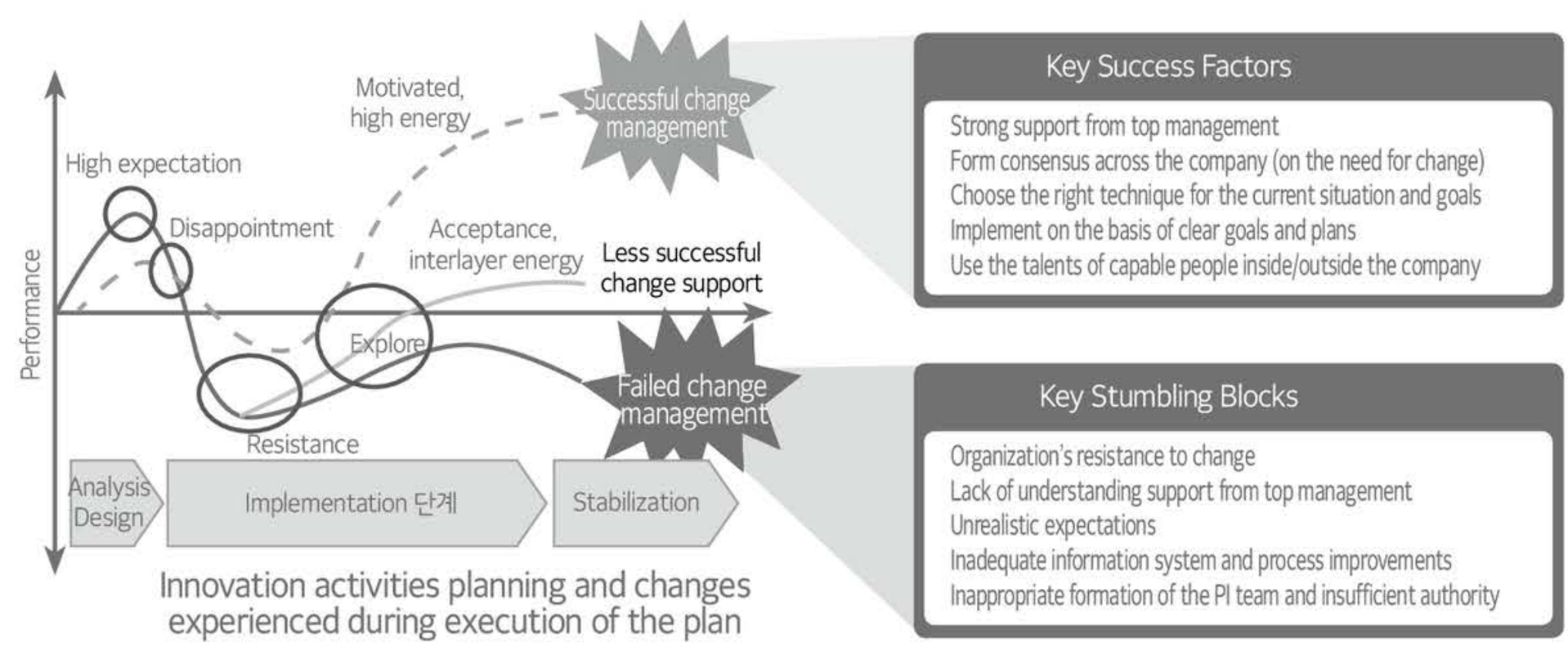


[Fig. 26] Relationship between PI and ERP

With PI, IT business innovation can be approached in two different ways: one method consists in adopting ERP through PI, while the other consists in using ERP to accelerate the implementation of PI. Irrespective of which approach is taken, an enterprise must strategically establish an adoption plan and a direction that reflect the circumstances of the enterprise.

③ PI and change management

Once the process of an enterprise has been innovatively improved, the enterprise must grant itself sufficient time to adapt to the changed process. In such a situation, the organization's productivity drops rapidly, and in order to ensure the success of PI projects and mitigate the decline in productivity, issues like expectations, resistance, insecurity, and motivation must be effectively managed at each stage of the project.



[Fig. 27] Change management with PI

For the efficient implementation of PI, all executives and employees of the enterprise must be familiar with and share in the vision of change. The activities and resources needed for implanting change must be organized and strategies must be developed. The CEO must display strong leadership and active participation. Leaders should encourage the completion of changes, take responsibility for activities, and encourage active participation by the stakeholders. Leaders must also turn the management vision into reality and increase the ability of individuals and teams to perform their jobs effectively in the new environment.

PI can be established stably only if change management with PI is successful. An organization's ability to adapt to change will eventually determine the success or failure of the project.

C) Understanding Six Sigma

① Overview of Six Sigma

"Six Sigma" is a quality innovation movement that was started by Motorola in 1987 with the aim of achieving a defect rate of less than three out of one million products and of reaching the so-called "6 Sigma" level of quality by analyzing and quantifying the causes of inefficiencies in management. Thus, the three main pillars of Six Sigma are statistical measurement, business strategy, and philosophy (transformation of the way work should be performed).

② Characteristics of Six Sigma

- The statistical measurement of process innovations is critical. Quantification and objective measurements are performed.
- It is an enterprise-wide process innovation activity that is not limited to a specific department, team or area.
- Its ultimate goal is to improve the value and satisfaction perceived by customers who are at the end of the value chain.
- "Six Sigma" strives for a passionate organizational culture in which all members of an organization participate in the pursuit of continuous improvements.

③ Six Sigma Hierarchy

<Table 27> Six Sigma Hierarchy

Levels	Qualifications and roles
Champion	• (Qualifications) An executive of the company who has demonstrated leadership skills. • (Role) Suggest a philosophy and vision for Six Sigma; disseminate the concept; oversee its implementation; and provide the necessary resources.
Master Black Belt	• (Qualifications) A person who has both practical experience and knowledge. • (Role) Provide black belt and green belt training and teach the concept of Six Sigma and its methodology.
Black Belt	• (Qualifications) A manager- or assistant manager-level employee who is knowledgeable about statistics and can put that knowledge to use. • (Role) Operate Six Sigma projects, provide entry level ~ greenbelt training.
Green Belt	• (Qualifications) A person who has sufficient levels of job-related knowledge and experience. • (Role) Act as an expert in Six Sigma project execution, and apply Six Sigma techniques at work.

④ Six Sigma implementation methodology

The Six Sigma implementation methodology can be separated into the design program and the manufacturing program. The design program uses the DMADV methodology, while the manufacturing program uses the DMAIC methodology. Another characteristic is that the design program is focused on preventing errors and defects, whereas the manufacturing program is focused on reducing defects and preventing recurrences.

<Table 28> Six Sigma implementation methodology

Program	Description
Design program (DMADV)	1.0 Define → 2.0 Measure → 3.0 Analyze → 4.0 Design → 5.0 Verify • The design program is for designing a process that surpasses the core requirements and the customers' expectations. The design program is focused on preventing errors and defects. It is suitable for developing new products or processes, and for redesigning existing products or processes. - (Define) Establish the goals of design activities that satisfy the requirements put forth by users. - (Measure) Select factors that impact quality in a critical way. - (Analyze) Assess the feasibility of the design and conduct analysis for development of the best design. - (Design) Detailed agenda, optimize design, and plan for design verification. - (Verify) Activate testing of the design and verify the application of the product development process.
Manufacturing program (DMAIC)	1.0 Define → 2.0 Measure → 3.0 Analyze → 4.0 Improve → 5.0 Control • The manufacturing program makes repetitive improvements while focusing on reducing defects to the levels required by manufacturing, production and mass production. The manufacturing program also improves existing products and processes. - (Define) Define the problem, set the goals, and estimate CTQ(Critical to Quality). - (Measure) Select theitems for measurement, establish the method of measurement, and analyze the current status. - (Analyze) Analyze the causal relationship of the identified problem and determine the root cause. - (Improve) Derive the optimal method for eliminating the root cause and improving manufacturing. - (Control) Prevent recurrence, maintain the improved condition, and analyze the effects of improvements.

D) Understand TRIZ

① Overview of TRIZ

TRIZ is a systematic methodology for solving the problem of invention, which was developed in the Soviet Union by Genrich Altshuller.5 In the 1940s, Genrich Altshuller worked for the Soviet Navy as a patent examiner. He discovered that there were some common rules and patterns in inventions. Out of 1.5 million patents worldwide, 50,000 creative patents were extracted and analyzed, resulting in four important discoveries which are summarized in the table below.

<Table 29> Four important discoveries

Discovery	Explanation
Definition of invention problem	• The invention problem has at least one contradiction.
Level of invention	• There are 5 levels of invention..

Type of invention	• There are 40 principles concerning the type of invention.
Types of technology system evolutions	• There are 8 rules concerning the way technology systems evolve.

② Types of TRIZ contradiction

In TRIZ, contradictions are classified as either a physical contradiction or a technical contradiction. Physical contradictions are mainly solved using the principle of separation, whereas technical contradictions are solved with 40 inventive principles, 76 standard solutions, 8 laws of technology evolution, and various effects of natural science.

<Table 30> Types of contradiction

Classification	Physical contradiction	Technical contradiction
Meaning	• Physical Contradiction • One variable can assume two different values at the same time.	• Technical Contradiction - Two variable characteristics are in conflict with each other.
Solution	• Separation in time • Separation in space • Separation in scale • Separation in condition	• 40 inventive principles • Contradiction matrix

③ Utilization of TRIZ in business management

TRIZ has been widely recognized for its effectiveness in management as well as in engineering. Furthermore, many studies and cases of its application are being reported.

<Table 31> Management technique using TRIZ

Classification	Utilization technique
Management support	Quickly resolve management difficulties and contradictions. Save money and time and approach management issues from an engineering perspective.
Innovation support	The purpose of support is to avoid compromises and resolve fundamental problems. Secure innovativeness by resolving the fundamental problems.
Thinking management	Develop a business management technique in which the thinking process is internalized. Provide a rational decision-making system and process.
Fusion management	Create synergies through fusion with other sectors.

E) Understanding SERVQUAL

① Overview of SERVQUAL

SERVQUAL is a technique for analyzing the gap between the level of service quality expected by users and the actual level of service quality provided by an enterprise.

- Using the following five dimensions, SERVQUAL prioritizes the relative importance (as felt by the user) of service attributes, thus making it possible for an enterprise to provide a service based on its scale of priority.
- SERVQUAL was first proposed by Parasuraman, Zeithaml, and Berry in 1985.

② The 5 dimensions of SERVQUAL

SERVQUAL consists of 5 dimensions: tangibles, reliability, responsiveness, assurance, and empathy.

<Table 32> 5 dimensions of SERVQUAL

Dimensions	Descriptions
Tangibles	• Physical facilities, equipment, attire, etc.
Reliability	• A service company's ability to perform the services promised in a contract.
Responsiveness	• The attitude, behavior and willingness associated with customer response and service provisioning.
Assurance	• An employee's ability to communicate knowledge, good manners, trust and confidence.
Empathy	• The attention, effort and consideration given to customers by a service company.

The 5 dimensions of SERVQUAL are often subdivided into the following 10 categories and utilized in investigations and evaluations.

- Tangibles: Physical facilities, equipment, employees, outward appearance of data.
- Reliability: Ability to perform a promised service in a manner that can be trusted and is accurate.
- Responsiveness: Readiness to assist users and provide quick services.
- Competence: Possession of the technology and knowledge required for the provision of services.
- Courtesy: Courtesy, respect, consideration, and friendliness of front-line workers.
- Credibility: Credibility and honesty of the service provider.
- Safety: Absence of the likelihood of risks and doubt.
- Accessibility: Accessibility and ease of access.
- Communication: Communication with users in a language that is easy to understand, listening to what users have to say.
- Customer understanding: Making the effort to understand what customers want.

F) Understanding SPC

① Overview of SPC

SPC stands for "Statistical Process Control": This term contains the word 'statistical' because it relies on statistical data and analysis techniques; the word 'process' because it represents a given product quality specification and the capacity of the process; and 'control' because the technique allows enterprises to control the condition of the product when it is produced.

- SPC is a management technique that allows enterprises to make repeated improvements to a process and maintain high rates of production of goods of satisfactory quality.
- SPC allows enterprises to conduct an engineering analysis of the causes of defects and establish the best way of rectifying the problem in a reasonable manner.

② Effects of SPC

The objective of using the SPC technique is to produce goods of uniform quality within a narrow range of quality distribution. Therefore, SPC-oriented management reduces process variations and ultimately stabilizes each

process,thus laying the foundations for the production of zero-defect goods. With SPC, enterprises can produce high-quality goods, and enhance their productivity to levels that will lead to significant cost reductions, thereby contributing to higher profits.

③ Constituent elements of SPC

<Table 33> Constituent elements of SPC

Component elements	Description
Deviation	• A product attributes which indicates the product's quality. Deviation refers to the distribution of values around a central value or the trend of this value. • Deviations occur mainly due to a common cause5 or an assignable cause.6
Process management and process capability	• Managerial ability for reducing deviation. • Deviations are kept within the allowable range of the product by the repeated elimination of common causes and assignable causes. .
Distribution and statistics	• This refers to a schematic diagram of the deviation trend caused by common causes and assignable causes. • Creating a minimum amount of spraying is an important goal: In order to achieve this goal, the cause of 'coincidence' must be continuously managed and the cause of 'sputum' removed. • Keeping the distribution to a minimum range is an important goal: In order to meet this goal, an enterprise must continuously manage the common cause and eliminate the assignable cause.

Besides the component elements described above, statistical data must be collected for the variance analysis. The instruments used in data collection include the work log, checklists, and inspection device data among other things.

The statistical techniques used in SPC analysis include the control chart, histogram, scatter plot, Pareto diagram, and cause-effect diagram.

VI. Understanding IT Business Services

Recent trends and key issues

The most important thing when providing an IT business service is the quality of that service. Quality comes from the customer's eye level, that is, the customer's requirement level. Therefore, if you want to provide an IT business service, it is imperative to understand precisely what the customer's requirements are.

IT business services are intricately intertwined. There are customers who buy from the company to which one belongs, and there are also partner companies (suppliers) who do business with the company. Sometimes partner companies can be important customers. As a result, the many stakeholders in the value chain must be linked to the company's solution, making it absolutely necessary to conduct an integrated analysis.

In the past, the operations of systems for delivering IT business services were fragmented. However, in recent years the trend has switched towards operating the cycle of "purchase-production-sales-post management" as a single connected process.

Consequently, because the quality of a service from the suppliers is virtually equivalent to the quality of service from one's own company, continuous quality control is something that is required from the very beginning to the very end of a service. For this purpose, the flow of information between the general-purpose systems (which function like the "blood vessels" of the organization) within a company must be managed in a systematic manner.

Learning Objectives:

1. To be able to explain the general-purpose work support system for IT business can be explained.
2. To be able to explain the decision-making support systems for maximizing business value.
3. To be able to explain IT service management.

Keywords

Enterprise solution, ERP, SCM, CRM, PLM, EDW, DSS, BI, ITIL, SLA, SLM

✚ Preview for practical business

Company K is a large-scale trading company that aims to become a world-class e-trade company that can grow together with its customers. Company K decides to adopt IT service management (ITSM) for the purpose of bringing about effective improvements to the quality of its maintenance & repair of its IT resources, stabilizing the operation of its infrastructure, and deploying an advanced operational process.

In order to use the global standard for ITSM, company K applies the following criteria to the IT Infrastructure Library (ITIL)-based processes, service levels, personnel, etc.

- Implementation of ITIL-based processes to improve the operational efficiency of ITSM.
- Transparent management and real-time monitoring of service levels.
- Preservation of the high-quality level of its services through effective management of suppliers.
- Development of strategies for preventing malfunctions and monitoring/analyzing key logs in realtime.

Also, to aid in visualizing the ITSM, company K introduces events/performance management, configuration management, malfunction management, report management, and a dashboard for operating the help desk. The dashboard reports the malfunction status of each server by the type of malfunction and the level of severity. Through the dashboard, company K is made instantly aware of individual events. It provides a framework for quickly recognizing and responding to various situations that may arise during the delivery of IT services.

As a result, company K is able to quickly respond to malfunctions that occur during IT service delivery by communicating them to the malfunction manager almost as soon as they occur. Furthermore, by building a knowledge DB of malfunctions, the company is able to establish measures for averting the recurrence of similar mishaps in the future. In addition, ITSM enables the company to carry out service-level management (SLM) using a system, thereby greatly contributing to the comprehensive evaluation of service levels and the building of trust with customers.

01 Summary of Lessons Learned

IT business services consist of a general-purpose work support system that assists in performing some of the tasks involved in running a business; a system that assists decision makers when making decisions; and IT service management (ITSM), a management technique for the systematic management of IT services.
The general-purpose work support system is composed of ERP (enterprise resource planning), SCP (supply chain management), and CRM (customer relationship management), all of which can help an enterprise to maintain close relationships with its customers by analyzing their needs.

The decision support system consists of the business intelligence (BI) unit and the decision support system (DSS) for providing support when making decisions. In both units, the backbone is the enterprise data warehouse (EDW) that collects data internally and externally and analyzes the data.

ITSM, the IT service manager, leverages the IT Infrastructure Library (ITIL) in defining the processes and activities of the IT services. ITSM, when used in combination with international standards like ISO/IEC 20000, can improve and enhance the quality of IT services. It can also provide IT services that will satisfy the users, but only when the definitions of service levels and the management of service levels are installed in advance.

02 IT Business General-Purpose Work Support System

A) Enterprise solution

IT business is a key enabler of enterprise competitiveness and continuous innovation. In the past, it was simply a tool for supporting business activities, but today it plays an important role as a tool for survival within a highly competitive environment.
During the short 30-year period since the introduction of enterprise computing in the early 1980s, the power of computers has grown exponentially and enterprises have left many examples of how computers should be used in the business environment. These examples have now evolved into formal solutions.

- An "enterprise solution" is a collective term for the information systems that support the management activities which an enterprise must perform in order to maximize business efficiency and gain competitive advantages in its business environment.
- The value and utility of an enterprise solution will vary depending on the business processes and activities to be defined, and not by the function provided by the information system.
- Enterprise solutions are a broad concept encompassing advance IT planning, job specific solutions that will be configured together for building a business operation system using IT systems, and maintenance& repair for directly operating the aforementioned IT system.

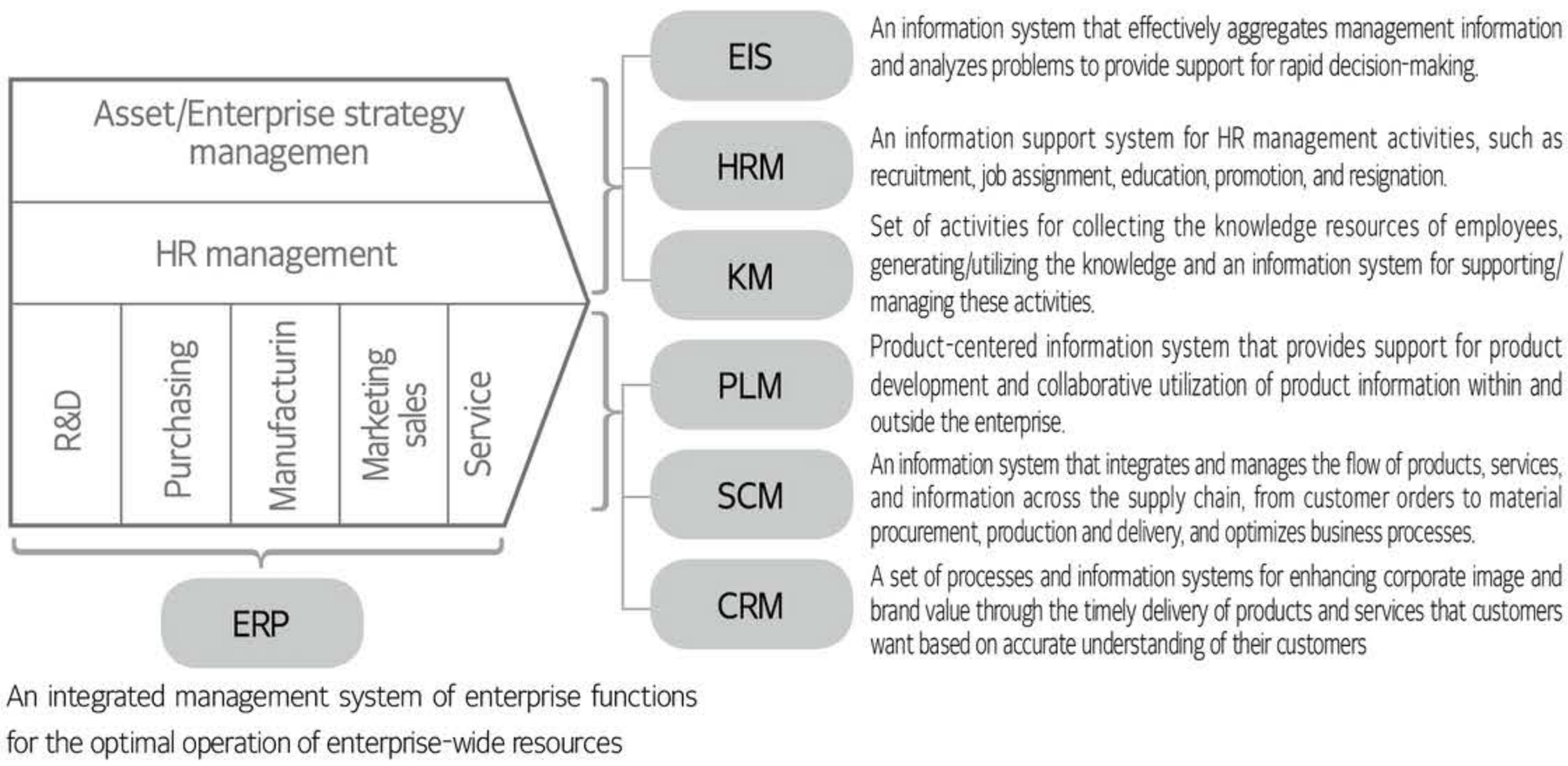
As such, enterprise solutions are focused on maximizing business efficiency. Work efficiency directly leads to productivity improvements and also plays an important role in strengthening the competitiveness of an enterprise. The following table summarizes the key role of these enterprise solutions.

<Table 34> Key roles of enterprise solutions

Key Role	Description
Optimize business operation	Enterprise solutions are used as a means of maximizing profits by shaving time off business operations and reducing costs.
Innovate business process	Enterprise solutions function as enablers for work process innovations. They are essential for the rebuilding of business processes.
Improve quality	Enterprises apply information technologies to their product quality improvement activities. Items in need of quality improvements are identified based on sales data and customer data.
Strengthen the customer-supplier relationship	Enterprise solutions enable companies to secure a loyal customer base through customer relationship management and realize cost reductions and the smooth delivery of products by continuously improving relationships with suppliers.
Improve the quality of decision making	Enterprise solutions provide information to executives who need to make the right business decisions in a timely manner by giving them access to real-time market data.
Secure competitive advantages	Enterprise solutions increase the likelihood of achieving business objectives, including excellence in enterprise operations, the development of new products and business models, the strengthening of customer/vendor relationships, and decision-making improvements.
Shorten the time to market	Through technologies like CAD/CAM, enterprise solutions enable companies to gain early dominance of their markets by helping them reduce their product development times and innovate their engineering processes using IT.

B) Types of enterprise solutions

The various solutions needed for an enterprise's activities must be used in a way that is appropriate to the enterprise's purpose and objectives. Looking at some of the leading enterprise solutions, the first that comes to mind is enterprise resource management or ERP. ERP provides enterprises with a means of optimizing, distributing and properly deploying/operating its entire resources.



[Fig.28] Types of enterprise solutions

There is the supply chain management (SCM) system, which integrates the entire supply chain from purchasing to production and eventual delivery to customers. With SCM, an enterprise can manage how many raw materials to purchase, sort them into product groups, and manufacture products in a timely manner ready for delivery when the customers need them.

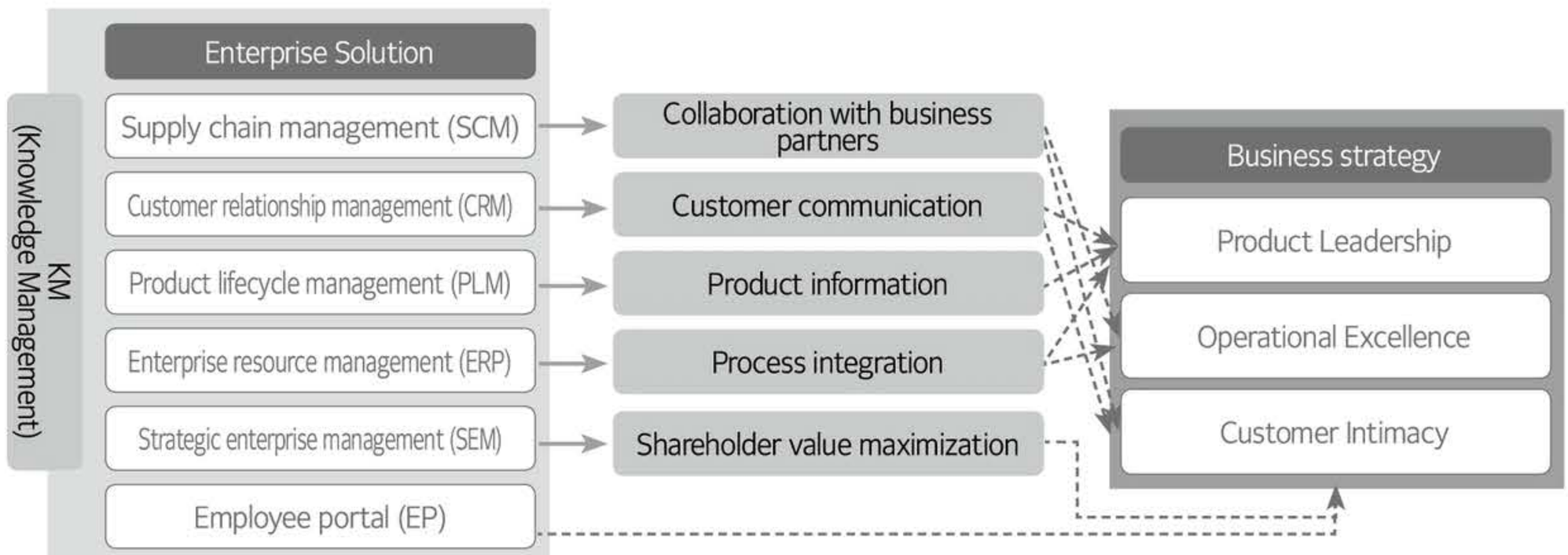
Because the analysis of customers is a critical factor of competition, the customer relationship management (CRM) system is a solution on which enterprises depend to properly analyze customer needs, enhance the service for customers, and strengthen customer relationships for additional value delivery.

C) Business strategy and enterprise solution

In enterprise solutions, communication with customers, product management, and process integration should be organically linked. These aspects must be comprehensively managed so that enterprises can execute their business strategies efficiently and achieve their business goals.

The environment surrounding an enterprise changes fluidly every minute;as such, enterprises are always faced with the challenge of responding nimbly in order to survive. Thus, companies have no other choice but to tailor and change their strategies to fit the environmental changes. The adoption of enterprise solutions that satisfy the strategic goals of an enterprise is an unavoidable choice.

There are countless enterprise solutions required by businesses. However, the solutions that most enterprises absolutely need to deploy or need to develop on their own in one form or another can be defined using just a handful of solutions. There are also situations in which enterprises, as they grow in scale, are forced to adopt a particular solution to meet the IT compliance requirements.



[Fig. 29] Overview diagram of an enterprise solution for implementing a business strategy

The figure above illustrates the interrelationship between a business strategy and various enterprise solutions. For each application and purpose, an enterprise solution is tied to a particular strategy item. In other words, enterprise solutions are adopted in a manner befitting a particular strategy (as well as the sub-details of each strategy) of an enterprise.

D) Understanding ERP

① Definition of ERP

ERP (enterprise resource management) is a system that maximizes enterprise productivity by integrating the various management resources of an enterprise into a single system.

- The goal is to maximize enterprise-wide business efficiency by integrating the company's key business processes and sharing information.
- Integrated work-related support for various aspects of business operation and the systematic linking of different aspects of business operation contribute to the efficient sharing of data and increased organizational flexibility.

<Table 35> Characteristics of ERP

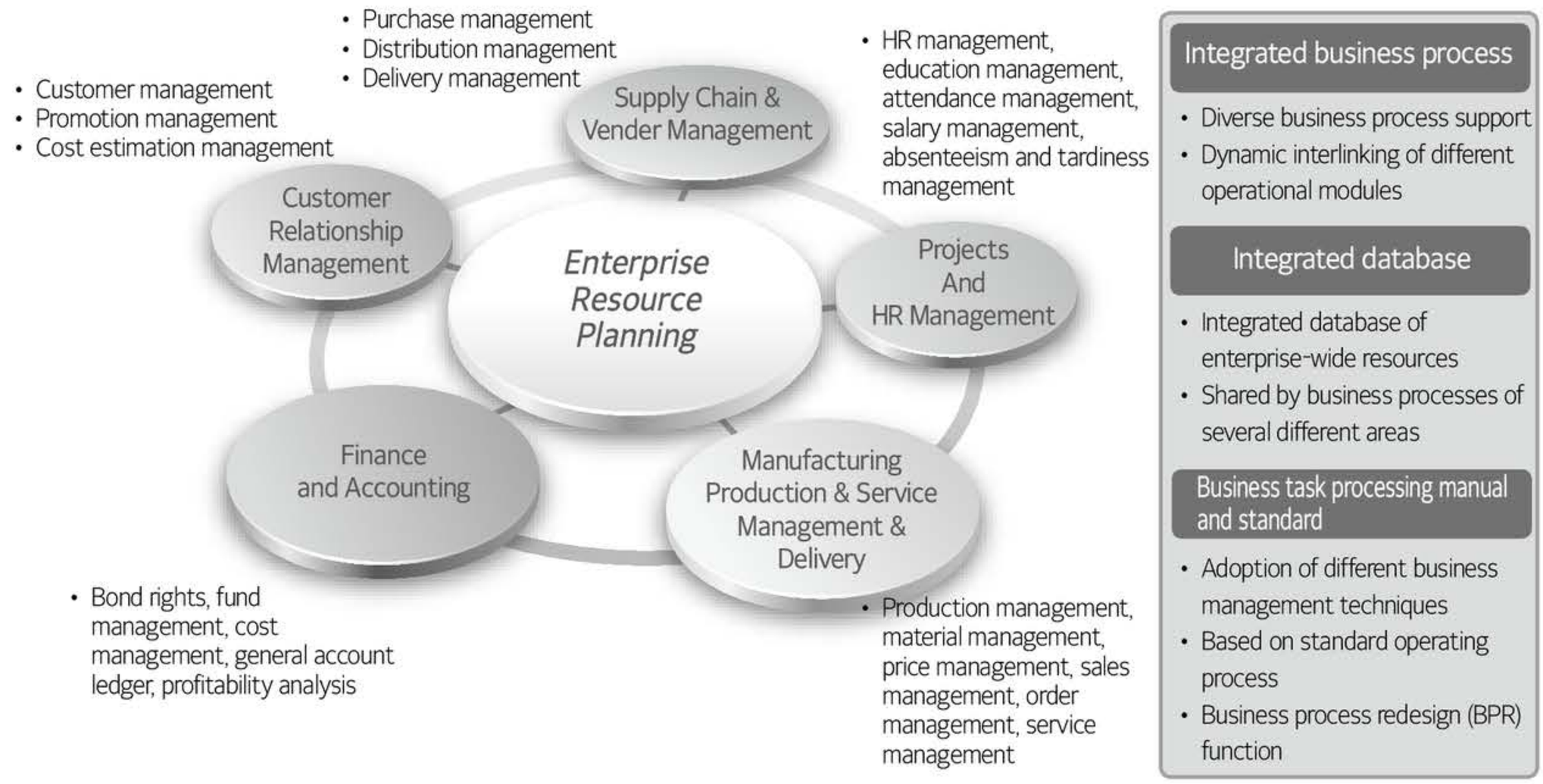
Characteristics	Description
Integration	Through the immaculate connection of business operations that are related, ERP is designed in such a way that all of the operations (finance, accounting, manufacturing & production, sales & marketing, service) of an enterprise can be integrated with zero redundancies.
Flexibility	Users can define how their ERP is configured. Each individual business and user can change the settings to suit the unique nature of whichever operation must be performed, customizing ERP so that it can be used flexibly.
Openness	ERP is designed in accordance with international standards and has an open structure which enables it to be integrated with different kinds of platforms, hardware and software.
International	ERP is designed to support multiple languages since it has to be used by multinational corporations. It can also manage local data such as different national tax items, address management systems, and currencies.

② Configuration of ERP

Most operational functions of an enterprise, from purchasing to production, distribution, marketing, sales, service, finance, accounting and human resources, are organized in a way that ensures interdependencies between the functions and a balanced distribution of resources.

For example, when a customer places an order, the sales representative enters it into the ERP system and the finalized order data (how much, where and when the delivery must be made) are communicated to the department which requires the data. To meet the order, the data concerning raw materials (when, how much and at what price they were procured) are also sent to the relevant department in a similar fashion. The factory will produce the order on schedule, and the production data will be entered into the ERP system and transmitted to the shipping department. The shipping department will then deliver the goods to the customer on the desired date.

The ERP system provides an environment in which these operations can take place organically.



[Fig.30] Configuration of ERP

③ ERP deployment procedure

The deployment of ERP should be approached as a concept of enterprise business innovation, and not just as the simple introduction of a system. The legacy operating procedures of the enterprise must be analyzed, and any problems and improvement points must be identified. Through process innovation (PI) activities, the enterprise must undergo a radical transformation. Job activities must be innovated so that they can be performed by employees from a common perspective and handled using standardized procedures that are integrated across the enterprise. To this end, the ERP implementation project must be wholeheartedly supported by the CEO and pursued at the company level in order for it to be successful. The typical ERP implementation process includes the following:

<Table 36> ERP deployment process

Deployment steps	Description
Project launch	• Write the project plan. • Write the quality assurance plan.
Analysis	• Analyze the current process. • Analyze the future process. • Conduct a gap analysis. • Draw up the gap response plan. • Provide package education, i.e. module education, supported language education. • Process setting, function setting, master data setting. • Define the interface and prototyping.
Design	• Additional development design • Data code design • Test plan establishment • Interface design • Implement

Development	• Develop the functions. • Perform unit-level testing. • Perform regression testing: testing of connection between existing modules and newly developed modules. • Conduct outside link (interface) integrated test.
Implementation	• Data conversion. • Provide training on using the system. • Carry out a pilot operation.

④ ERP deployment strategy

There are three approaches to ERP deployment. With the Big Bang method, all modules and functions of the ERP system are deployed across the place of business at the same time. In the phased and function-based approach, the ERP system modules are separated by their functions and the ERP system is deployed only on some modules. In the phased and place of business approach, the ERP system is deployed in phases at each place of business. When the operation of ERP is shown to be stable, its deployment is then expanded horizontally through the remaining phases.

<Table 37> ERP deployment strategy

Method	Description	Strengths	Weaknesses
Big Bang	All modules and functions of ERP are deployed at the same time for all operational areas of an enterprise.	Easy integration of the package itself. Implementation is easy.	Projects tend to be large-scale and thus project management is rather difficult.
Functional approach, phased approach	ERP modules are deployed by function and in phases	Because ERP is deployed in phases, there is little resistance to changes in the place of business..	Additional programs should be developed to link to existing systems.
Place of business tailored approach	ERP modules are deployed in each place of business in phases.	The use of human resources is good because they are recycled in each phase.	Problems of project prolongation and high likelihood of redundant work.

ERP solutions are supplied by both domestic vendors and foreign global vendors. Depending on the deployment strategy, the ERP solution could also be developed in-house. Leading foreign ERP solutions include SAP ERP and Oracle ERP, while leading domestic ERP solutions include Younglimwon ERP and Douzone ERP. Commercial ERP products offer the advantages of ERP deployment using standardized processes; however, customized development to match the environment of an enterprise is somewhat difficult. Another thing worth mentioning is that when adopting an ERP solution, an enterprise must check whether compliance with the IFRS (International Financial Reporting Standards)[5] must be observed.

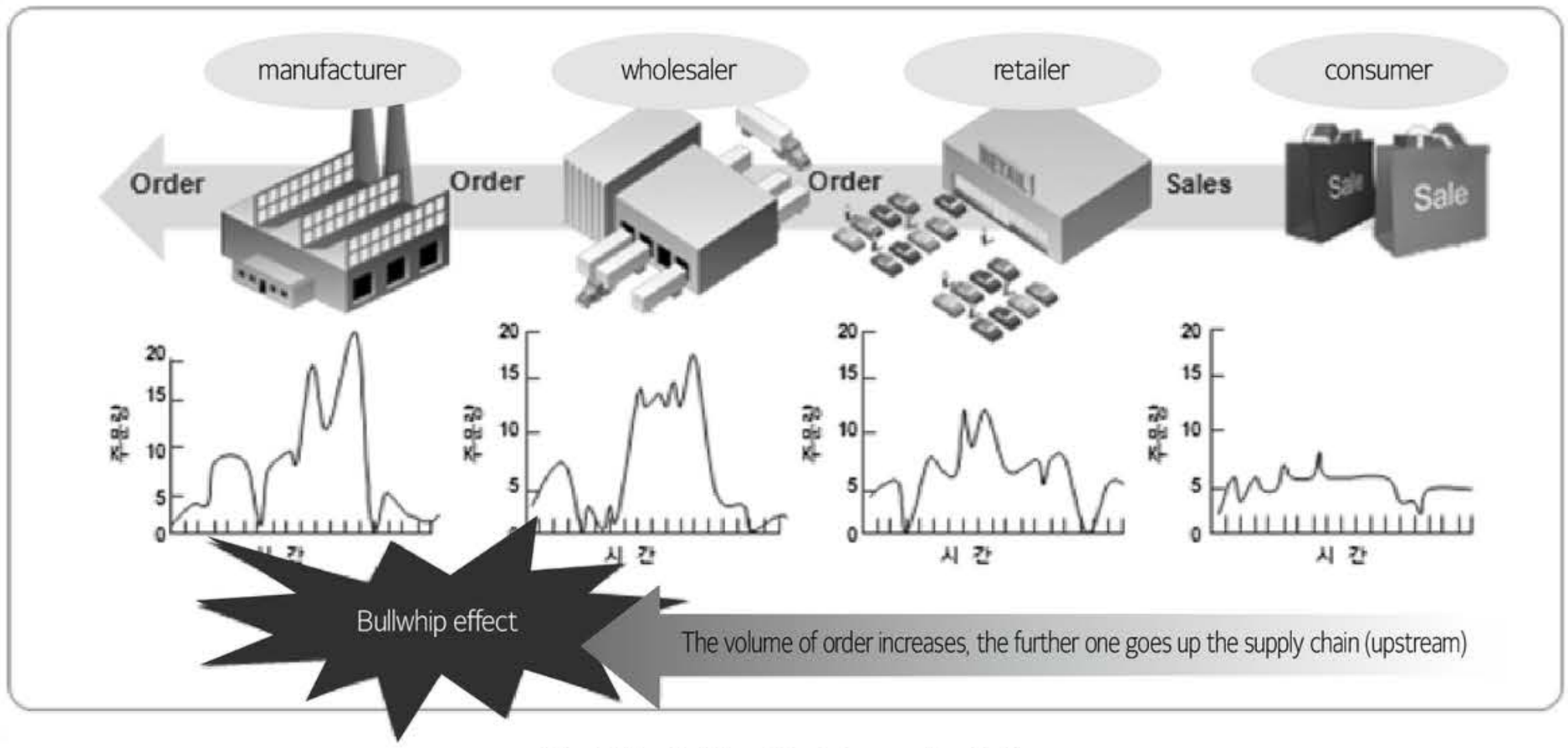
E) Understanding SCM

① Concept of SCM

SCM refers to supply chain management solutions. To understand SCM, one has to understand the supply chain. The

5 IFRS: The International Financial Reporting Standards (IFRS) published by the International Accounting Standards Board to ensure international acceptance of enterprise accounting standards.

supply chain encompasses the entire process from order placement and the supplying of raw materials needed for the production of goods, to the production process, distribution network, and final delivery to the customer.
The biggest problem with the supply chain is the whipping effect, a phenomenon in which decisions that are made further up the supply chain result in a sudden expansion of demand. What this means is that a small change in the end-consumer demand for a product will cause a chain reaction furtherup the supply chain, increasing the demand from retailers to wholesalers, then to manufacturers, and finally to parts suppliers.



[Fig.31] Bullwhip effect in supply chains

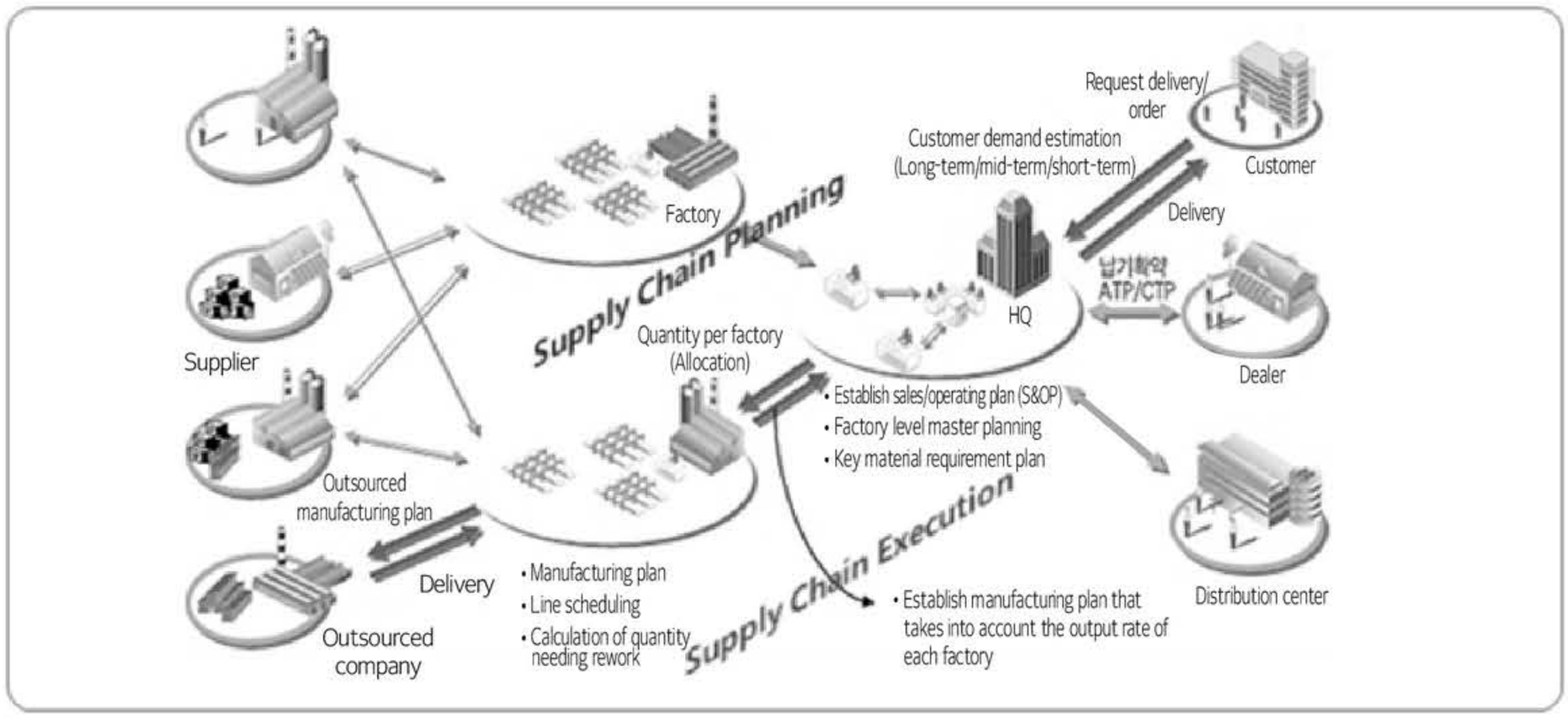
As shown in Figure 31 above, if a consumer places an order for 10 goods to a wholesaler, the wholesaler will place an order for 12 goods just in case. The manufacturer will in turn manufacture 15 goods just in case. In this way, the supply chain will become overstocked and resources will be wasted, with unnecessary investments in manpower and facilities.

If market demand is transmitted in this way to the upper level of the supply chain, the demand gets distorted and increases variance at each step. In addition, the supplier who supplies the raw materials at the end of the value chain becomes exposed to huge risks, which seriously increases the inefficiency of the entire supply chain due to the imbalance in demand across the supply chain, ultimately resulting in surplus orders, excess inventory, and overinvestment. Therefore, supply chain management is a strategy that aims to maximize efficiency by rectifying the whipping effect problem and by eliminating waste throughout the supply chain.

To be more specific, in supply chain management the players in the supply chain cooperate with each in managing materials, funds and information, with the objective of linking and integrating the flow of all goods, services and values (purchasing, manufacture, allocation and distribution) from the suppliers to the end customers. The effects of these activities manifest themselves as a shortened lead time and reduced uncertainties and variabilities. It is the goal of supply chain management to support these activities and address the issues that arise in the supply chain.

It is a management technique that seeks to optimize inventory management and other such supply chain decisions

through the sharing of information and collaboration with suppliers throughout the entire process from production to distribution.



[Fig. 32] Conceptual diagram of supply chain management

To implement supply chain management (SCM), an enterprise must have in place some crucial functions in supply chain planning (SCP) and supply chain execution (SCE).

② Function of SCM

SCM carries out the 3 functions of supply chain planning, supply chain execution, and supply chain visibility. These three functions form a positive feedback cycle, a structure in which their functions can be improved when the working environment changes.

<Table38>Functions of supply chain management

Function	Description
Supply Chain Planning	Establishes the optimal plan for the daily operations of the supply chain, such as demand forecasting, global production plan, transportation/delivery plan, distribution allocation plan, etc.
Supply Chain Execution	Enhances the efficiency of logistics in the field, such as warehousing, product transport/delivery management, order management, and distribution management. Manages logistics in the field through digital tools and interfaces such as bar codes and RFID.
Supply Chain Visibility	Monitors the supply chain, identifies cost across the supply chain, and performance, looks out for anomalous operations from the service perspective, and fulfills a preventive function by recommending corrective actions.

③ Comparison of SCM and ERP

SCM and ERP are the parts of the work support system operated by enterprises. Logistics and distribution management are the critical areas of SCM that are intimately tied to ERP. In recent years, some ERP have been implemented with a part of the functionality of SCM, but the detailed flow is managed by SCM.

<Table 39> Comparison of SCM and ERP

Category	SCM	ERP
Key viewpoint	Planning and decision making	Work process-centered
Data handling	Process-centered	Transaction-centered
Major functions	Demand forecasting, order management/ planning, distribution management, warehouse management	Purchasing, production, raw materials, finance, accounting, sales, HR
Industrial sector	Manufacturing and distribution	Manufacturing, public organization, finance
Size of enterprise	Even small manufacturers can see benefits in the form of reduced inventories.	Mainly operated by conglomerates. SMEs should consider ROI before adopting.
Benefits of adoption	Production planning and demand forecasting that factor in sales opportunities. Benefits for inventory management.	Faster work processing time, labor cost savings.

④ SCM deployment effects

Dell Computer, the most successful company in introducing SCM, said that after adopting SCM it became possible to link information between customer, company, and component suppliers in real time, and reduced its inventory from 8 weeks' worth of supplies to 12 ~ 15 days' worth of supplies.

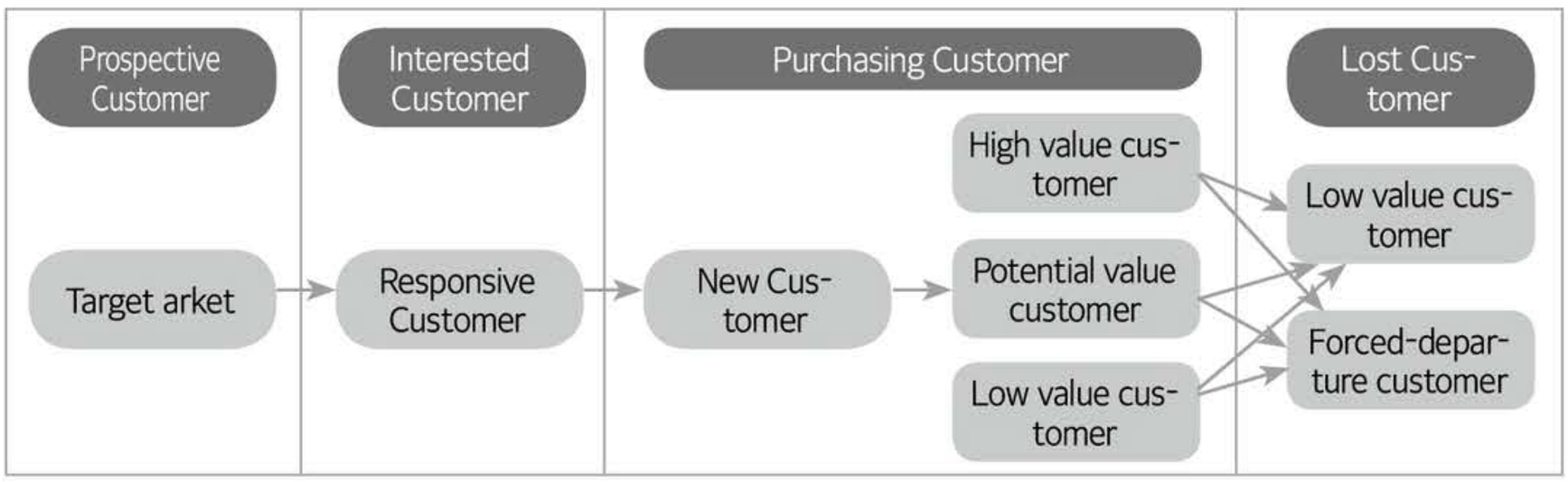
- The introduction of supply chain management can improve customer satisfaction by increasing transportation delivery capacity and reducing inventory, reduce logistics costs, and reducethe customer order processing time through strict adherence to delivery schedules.
- It can also improve the efficiency of fund flow by standardizing work and by reducing the product delivery time and the order processing time.

F) Understanding CRM

CRM stands for customer relationship management. It is a management strategy system for studying customers' tendencies and requirements in advance in order to create the products that customers want and to develop marketing strategies.

Because today's customers' knowledge of product and service information has vastly increased and customer expectations and customer churn are higher than ever before, enterprises are compelled to establish new business management strategies, such as adopting a customer-centric corporate structure, establishing diverse customer interface channels, and implementing customer management that leads to better earnings.

To implement these strategies, enterprises must analyze customer behavior patterns and consumption patterns. In recent years, enterprises have felt the need to consolidate internal/external data and analyze markets and customers to derive insights. Big Data analysis is a good example of this.



[Fig. 33] Life cycle of enterprise customers

- Enterprises can gain opportunities to acquire new customers through focused marketing or promotional activities that target responsive customers among potential customers in the target market who show interest in their products.
- Enterprises should strategically manage customers who purchase their products as well as high-value (highly loyal) customers. To this end, enterprises should have a system in place that can sort their customers based on such criteria as personality, type, and interests, and provide their services and conduct their marketing accordingly.
- This requires an entity to establish a strategy for maximizing customer lifetime value, i.e. the total value generated throughout the customer's lifecycle, rather than the temporary profitability generated by individual transactions. This is the goal of CRM.

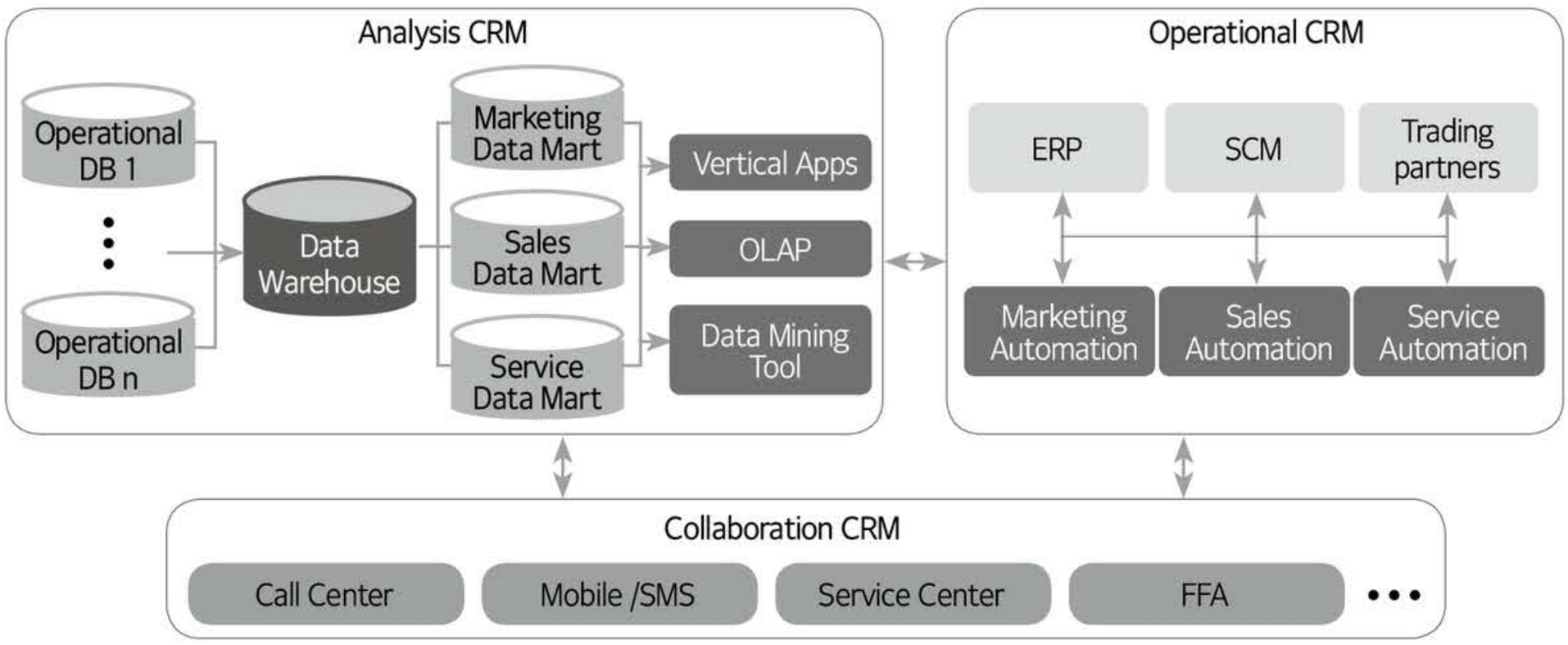
① Definition of CRM

The CRM defined by Gartner is 'a strategy for optimizing corporate sales and expanding the customer base by creating and supporting relationships with profitable customers'. In other words, CRM is a management technique that integrates and analyzes customer data across the enterprise and customer-related data inside and outside the enterprise, and then provides the findings to customer points of contact for use in interactions with the customers. This is an integrated process that enables enterprises to continually deliver the products and services customers want, based on an accurate understanding of the customers, thereby maximizing customer lifetime value and increasing profitability.

② CRM Classification

From a process perspective, CRM collects and analyzes the various data generated by the entity and provides it with meaningful information.

CRM can be classified as analysis CRM, operations CRM, or collaboration CRM. With analysis CRM, information generated through interactions with customers is gathered, and meaningful insights are derived and then supplied to the enterprise. With operations CRM, these insights form the backbone of marketing, servicing and sales activities. Finally, with collaboration CRM, the enterprise engages in interactions with the customers through a diverse range of channels.



[Fig. 34] CRM classification

Categorizing CRM in this way is only done for the purpose of increasing people's understanding of CRM. In fact, the ultimate target of CRM is to get inside the minds of the customers. In order to accurately read the customers' minds, data analysis has to be performed, while assistance from a business support system is also helpful. A diverse set of customer points of contact (channels) for interacting with customers has to be secured as well.
The table below explains the characteristics of CRM (by category).

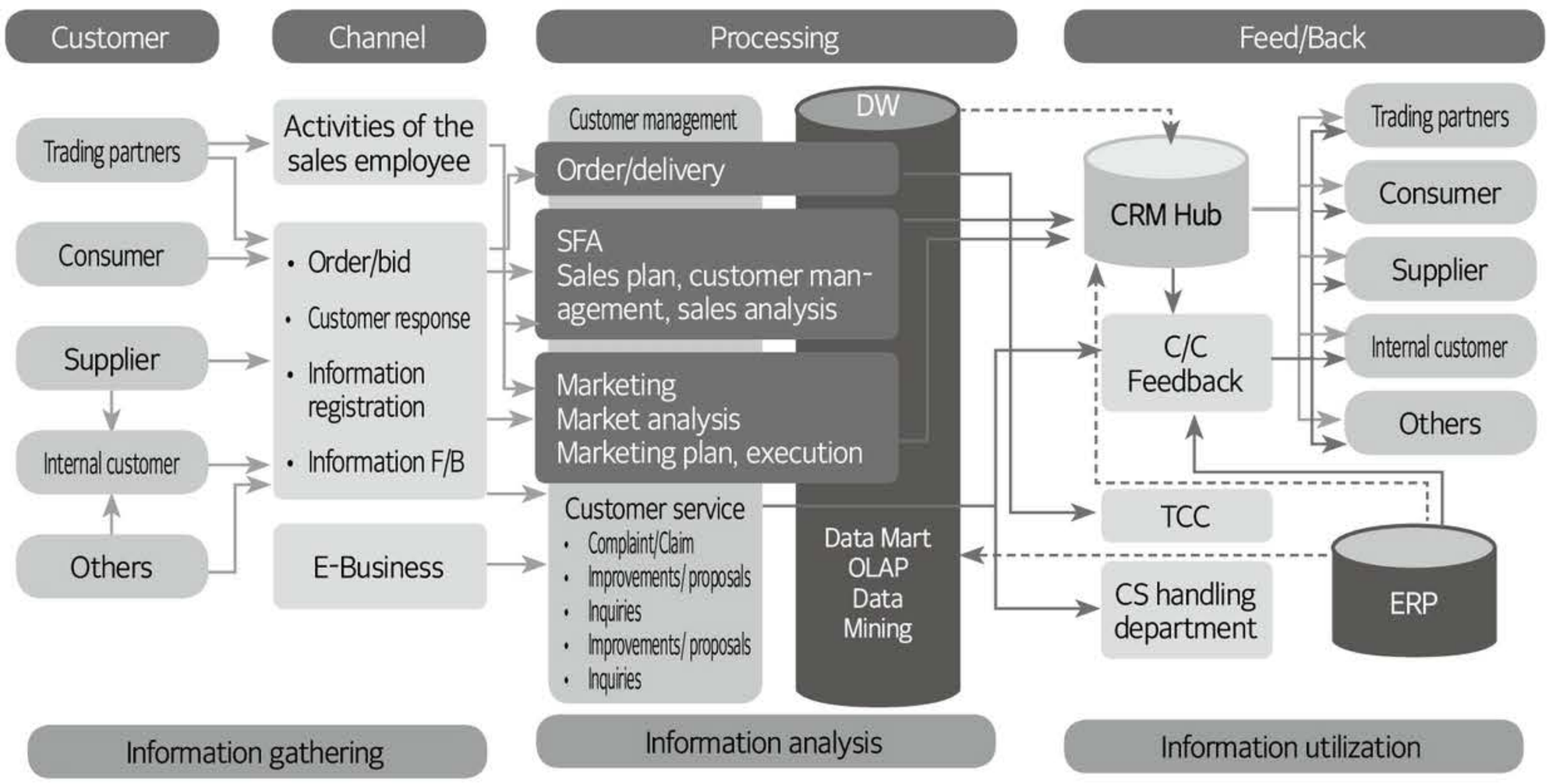
<Table 40> Comparison of CRM classifications

Category	Operations CRM	Analysis CRM	Collaboration CRM
Concept	• Customer management support at customer points of contact. • Links to marketing and customer service at customer point of contact. • Provides front office functions, automated function for business process & work support.	• Marketing analysis and sales analysis using data generated during operations. Linked to DW.	• Provides customer points of contact channel. • Provides interconnected services for the purpose of improving communication and consolidating tasks between customers and companies and between different departments within the same company.
Compo-nents	• Marketing information management • Campaign management system • SFA(Sales Force Automation) • Customer service system	• Enterprise-wide DW deployment • Data Mining • OLAP	• Call Center • Mobile collaboration system • eCRM
Conside-rations	• Integration of processes in each channel, integrated management of the customer contact history. • Rapid development of business functions, access to back office.	• Provision of analysis techniques and technologies for identifying the needs of customers. • Construction of a knowledge base and data reliability are the key.	• Diversification of channels • Provision of a uniform service across all channels.

③ Configuration of the CRM system

In CRM, information begins to flow from the customer point of contact and ends at the customer point of contact.

Amid this flow of information, the information generated by the work support system gets utilized and the operation of the work process occurs at the same time.



[Fig. 35] Configuration of the CRM system

In CRM, the customer point of contact has huge significance. The customer point of contact or channel collects the customer's VoC and communicates the results produced by the internal process to the customer. Therefore, when the component elements of CRM must be identified, it is advisable to investigate the channel first of all, since this is the point of contact with the customers. Also, if information analysis is conducted, followed by information utilization, it becomes very easy to understand the constituent elements of CRM.

<Table41>Components of the CRM system

Components	Description
Customer data warehouse	• As the date storage that keeps customer data, each constituent element of CRM fetches, updates, and adds information to the data warehouse.
OLAP, Data mining	• Using the information from the data warehouse, OLAP and data mining can perform diverse analyses of customers and investigate the relationships between the extracted indicators, as well as support decision-making on customer acquisition
Campaign system	• A system that provides services tailored to customers' needs and recommends business directions that might generate profits.
Channel system	• Utilizes methods like the system call center (call center), which provides 1:1 or 1:N marketing support, emails, direct mails.
SFA	• A system that uses customer information for sales planning, customer management and sales performance evaluation and also provides sales support to sales staff.
Customer service system	• A system that leverages the VoC (voice of customer) for customer service support and product maintenance (A/S), etc.

④ Effects of CRM deployment

With the introduction of CRM, enterprises can improve their relationships with their customers and prevent customer churn, thereby increasing customer loyalty. Furthermore, enterprises can provide high-quality services by analyzing customers' tastes, and can also induce linked sales and realize upstream sales. Furthermore, they can build a competitive edge in terms of customers through differentiated policies in products and services.

<Table 42> Benefits of CRM deployment

Item	Benefits of CRM
Marketing opportunity analysis	• Attraction of new customers and invigoration of the existing customer base. • Increase of earnings and customer lifetime values. • Effective marketing based on the customer life cycle.
Marketing management	• Development of products that satisfy customer requirements and changes in the market. • Supplement the product after observing the reactions/results from the market.
Customer service	• Strengthens customer loyalty. • Customer satisfaction management. • Customer service management.
Customer channel management	• Secures the most optimal channel that meets customer requirements. • Minimizes customer management costs.

G) Understanding PLM

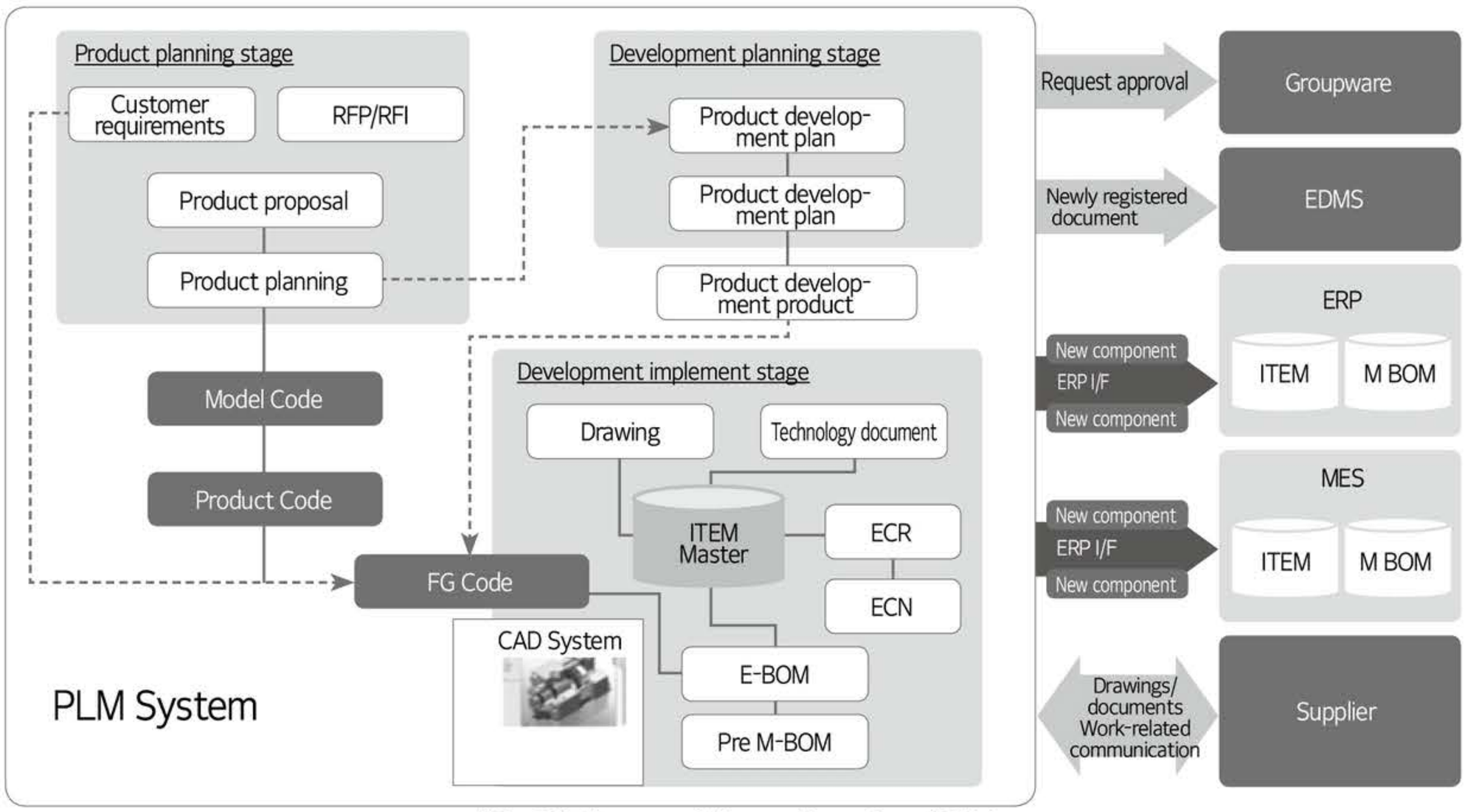
Product lifecycle management (PLM) is a product life cycle management solution. It is a production/design process that increases a product's added value and reduces costs by uniformly managing the entire process from creation of the product design drawings to production of the final product. PLM provides product information data management server system, both of which are related to the product life cycle and the network of multiple client systems.

① Definition of PLM

PLM can be defined as a support system that integrates and manages information related to products - such as drawings, documents, CAD/CAM information, basic parts information, design changes, and process information. These forms of information are generated throughout the entire product life cyclesof the products that are developed and manufactured by an enterprise.

② Configuration of PLM

Recently, PLM has come to be understood as a concept that includes not only product planning, but also the post-sales services provided to customers. Managing the entire cycle of an individual product from the planning stage until it is sold is the key role of PLM. However, organic support from other work support systems is a prerequisite for fulfilling this role. To understand the components of PLM, it is sometimes helpful to visualize the flow of a product's entire life cycle.



[Fig. 36] Diagram of the configuration of PLM

The main components of the process presented in the PLM configuration diagram shown above are derived and described in the table below.

<Table 43> PLM components

Component	Description
Project management	Schedule management, output management and task management for product development.
Drawing management	Drawing approval/information management, drawing revision management, drawing viewer.
Design change management	ECR/ECN process management, management of revision by type, component revision management.
BOM management	Link to CAD, BOM revision management, EBOM/MBOM generation/approval.
Technology document management	Listing/correction of technology document, revision management, link to document and related information, approval.
Product information management	Model/product/goods code management, product spec management, management of related output.
Security management	Document/drawing encryption, leakage prevention, security level setting, DRM/DLP.

③ PLM trends

Product development was always a collaboration-centered effort. To more effectively manage product development activities, beginning in the 1990s, enterprises began to operate storages in which they kept the system design information of their engineering teams.

- As the number of projects and products in need of development increased and became more difficult to manage, it became necessary to consolidate the scattered information.
- Included in the centralized system were a number of items that served as important reference data when designing items and products; such as BOM (bill of materials) management, development process standardization, and the workflow-based change management function, etc. The inclusion of these items made it possible to maximize the efficiency of product development.
- Recently, the trend among companies has gravitated towards consolidating the PLM through the integration of ERP and MDM solutions for the purpose of managing the reference data from the enterprise-wide perspective. In the future, PLM will be expanded to include the social PLM area by linking it with external data.

03 IT Business Decision-Making Support System

In order for an enterprise to make a business decision, it has to have access to internal/external information, as the collection, analysis and processing of such information is critical to making a rational decision. Data generated by a general-purpose work support system are simply too voluminous to be analyzed by hand in the expectation that some meaningful implications could be derived from them. In particular, there are many times when decisions have to be made within a limited timeframe; and, in recent years, the fast changing nature of business environments has led to rising uncertainties, which has in turn forced companies to frequently conduct complex analyses, increasing the demand for systems capable of supporting decision making.

The two leading information systems that provide such support to enterprises are the decision-making support system and the business intelligence system. The decision-making support system is used when making make decisions that require a quantitative analysis, such as an analysis of a company's return on investment and its break-even points. Meanwhile, business intelligence systems enable companies to respond with agility by monitoring the business operating environment and detecting changes through the discovery, extraction, and analysis of business data.

Before looking at the two systems, let's start with the concept of the enterprise data warehouse (EDW), an enterprise data repository that underpins enterprise data analytics.

A) Understanding EDW

① Definition of EDW

The enterprise data warehouse (EDW) is a system that can address, by subject matter, information analysis requests by users, through the integration of internal and external data. The EDW requires the construction of infrastructure that serves as the backbone of enterprise data. This infrastructure touches every area and aspect of an enterprise's business.

- In the beginning, the EDW mostly encompassed the internal data of an enterprise. Today, however, it is evolving into a forecasting system that integrates both the internal and external information of an enterprise.

② The necessity for the EDW

If an enterprise wishes to maintain uniformity of viewpoint across its entire organization, it must consolidate the information that it possesses and any external information it needs from an enterprise-wide perspective and keep it as the master information.

In today's rapidly changing business environment, enterprises have to extract enterprise-perspective data by conducting diverse data analyses for users in diverse sectors. This is because enterprises need to have sufficient forecasting capability for making strategic choices and responding to changing user requirements brought about by changes in the business environment. Enterprises also have to integrate their information resources and reorganize their management system as part of redesigning their system to prevent data duplication.

③ Characteristics of the EDW

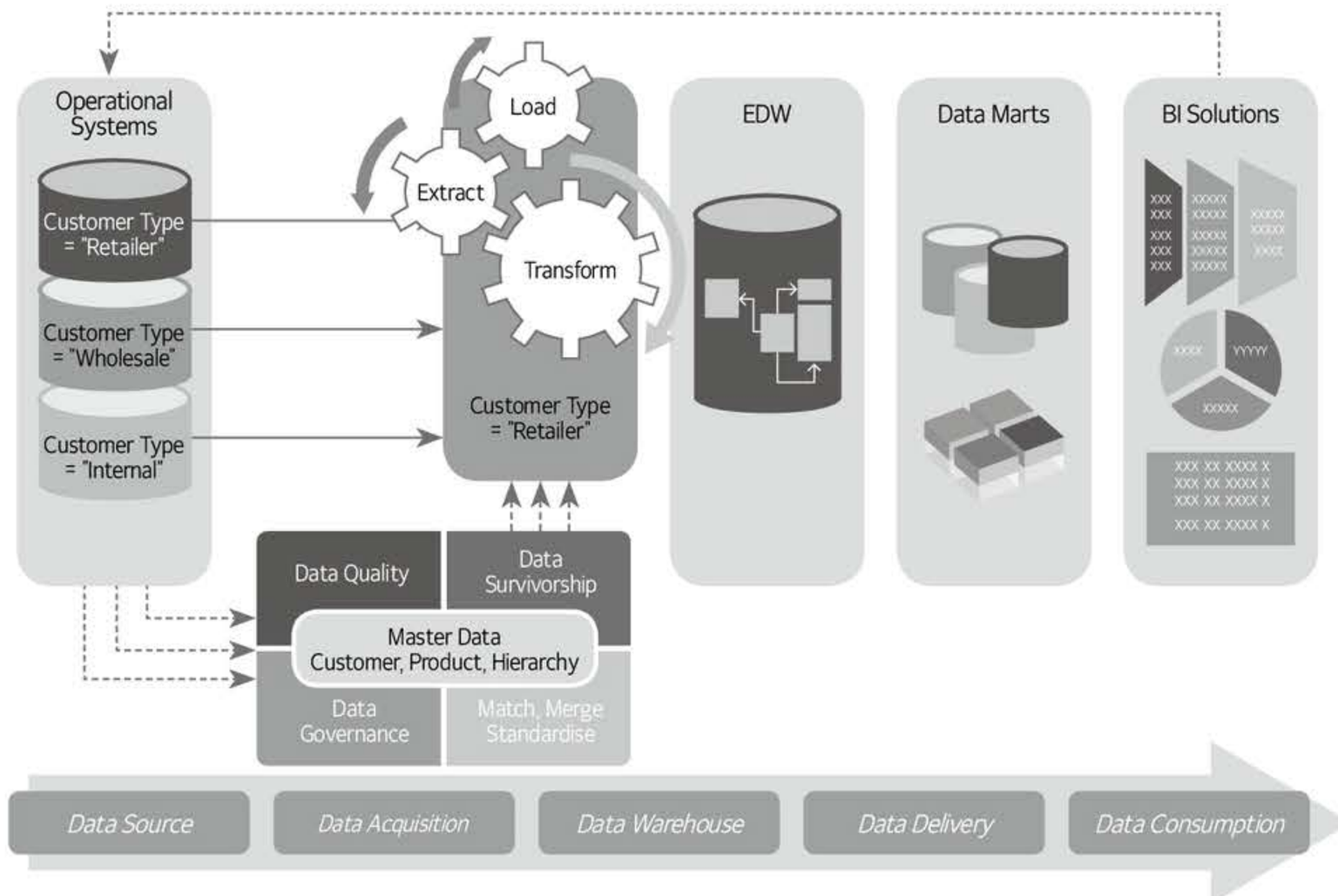
The EDW was created with a clear purpose for its use. The concept explains a very import characteristic of the EDW, namely, that of being topic-centered. Upon adopting the EDW, critical data within and outside the company become concentrated and consolidated in one place; and data are loaded and used in a time-based order. Once stored, data will not be destroyed or changed unless there is a particular reason for doing so. These characteristics of the EDW are described in detail as follows.

<Table 44> Characteristics of the EDW

Characteristics	Description
Subject-Oriented	• Structures the system around the topic of processing the data to be analyzed like a daily transaction.
Integrated	• Extracts and integrates the internal and external data of an enterprise. • For different formats of data expression, when extracting data, the process is managed so that data can be expressed in a uniform format.
Time Variant	• While preserving the accuracy of the data for a certain period of time, time elements like the day, week, and month are properly reflected.
Non-volatile	• To maintain consistency of analysis, properties do not change when they have been recorded properly. • The stored data exist as read-only, and will not be deleted unless there are special rules or events requiring their deletion.

④ Configuration of the EDW

The EDW is configured so that the work support system collects, transforms and loads data during operations, analyzes data that meet the given requirements, and visualizes them in such a way that they will be of assistance when making decisions. From a macro perspective, all these processes are referred to as the EDW, and from a microscopic point of view, the repository for storing data is referred to as the EDW.



[Fig. 37] Concept diagram of the EDW

As shown in the figure above, transaction data are acquired from the legacy system of the enterprise and stored in the data warehouse. The analyzed data carry considerable value as information and are made visually presentable by using BI solutions.

B) Understanding the DSS

① Concept of the DSS

As a system that supports decision making, the Decision Support System (DSS) provides interactive dialogue support to decision makers during the decision-making process.

- This is an interactive dialogue-based system that assists decision-makers with solving semi-structural and non-structural problems using data and analytical models.
- The core elements of the DSS are the enterprise data (both internal and external) and the analytical model for processing quantitative data. These perform a critical role in decision making.

② Characteristics of the DSS

The key feature of the DSS is its ability to solve non-structural problems through interactive dialogue. Here, "interactive" means that issues can be explained or expressed from many different angles as desired by the user. The focus of the DSS is on how analyzed data should be represented.

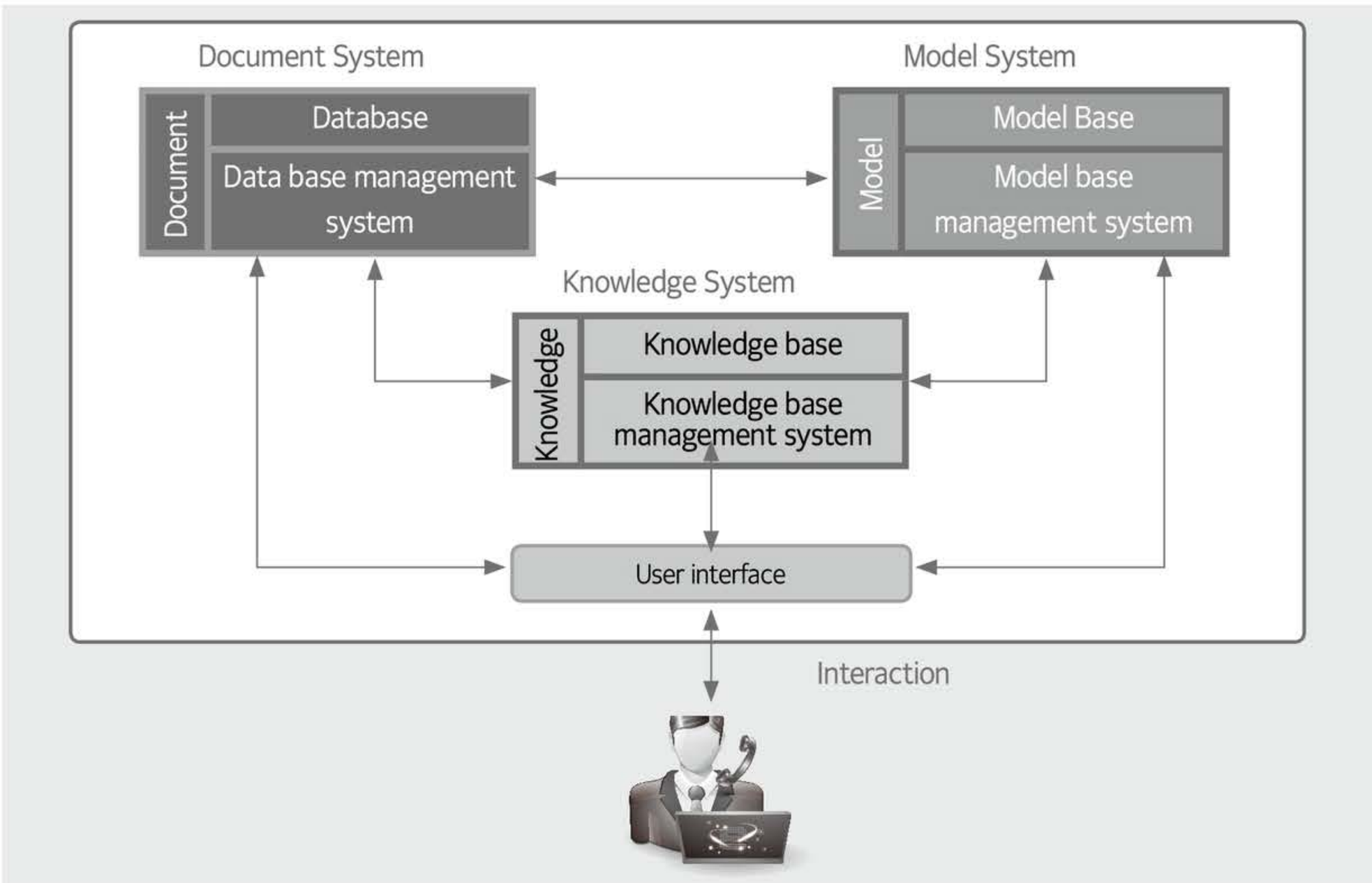
<Table 45> Characteristics of the DSS

Characteristics	Description
Resolves non-structural problems	• The objective is to resolve non-structural and semi-structural problems which are primarily the responsibility of CEOs and middle managers.
Easy-to-use user interface	• Improves user interfaces by adopting an interactive interface that is easy to use.

Improves the effectiveness of decision making	• The focus is on enhancing the effectiveness of the decision-making process so that optimal solutions can be obtained, rather than on a decision-making process that is efficient.
Model and DB support	• Provides financial/statistical models, simulation features, statistical techniques, and analysis tools to help solve complex problems.

③ Configuration of DSS

The configuration diagram below shows how the DSS is made up of a document system, a model system, and a knowledge system. These components interact with each other to deliver the necessary information to the user.



[Fig. 38] Configuration of the DSS

The user obtains the information required to make decisions by accessing the knowledge system through the user interface. In addition, for model system management and database management, the user must access the respective system to perform necessary tasks

<Table 46> Constituent elements of the DSS

Constituent Elements	Description
Database management system	• Data generated by all corporate activities, including corporate financial data, accounting data, revenue/marketing data, production, and human resources data that could be used as the basic data for decision making.

Model base management system	• This is an analytical tool developed to consistently solve similar types of problems. Quantified models perform complex calculations that result in increased efficiency and accuracy of problem solving. • Model base management systems include statistical models, forecasting models, linear planning models, simulation models, etc.
Knowledge base management system	• This system provides support for solving unstructured decision-making problems that are difficult to quantify through the role of providing qualitative information.
User interface management system	• The user interface is a window that includes all forms of communication between the decision maker and the decision-maker support system. The interface ensures flexibility, performance, and convenience.

④ DSS data model

The data model in the DSS provides a framework for analyzing data, along with the data with which decision makers can make rational decisions. Different types of data models are generated from different types of algorithms and are continuously being developed and improved. In recent years, the DSS has been evolving in the direction of actively employing AI for better forecasting, and the types of models are also diversifying.

<Table 47> Types of DSS data models

Type of model	Description
What-if Analysis	For a specific resolution method, the what-if analysis investigates how changes in a given variable could impact another variable. This is a useful technique for testing assumptions about uncertain future situations.
Sensitivity Analysis	This is a technique for observing how changes to one or two variables affect the rest of the variables in an equation model consisting of input and result variables.
Goal-seeking	After setting a goal, this technique is used to find the values of variables that will enable an enterprise to achieve its goal.
Optimization Analysis	This is a technique for obtaining the optimal value of one or more target variables given a particular constraint.

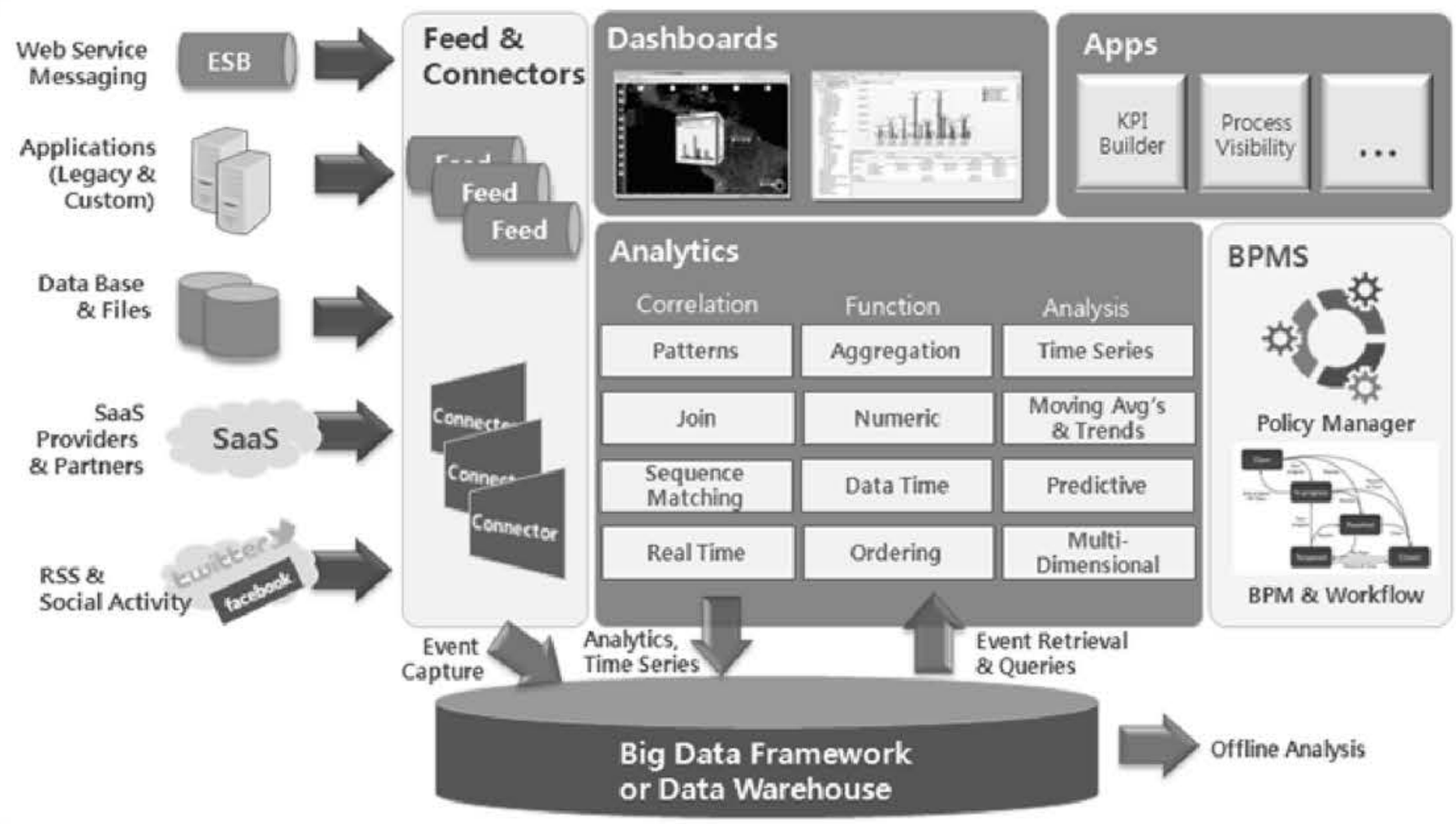
C) Understanding BI

① Concept of BI

Business intelligence (BI) is a set of processes that seeks to improve the quality of business decisions and business performance through the summarization, analysis and use of enterprise data and information. If the DSS is the system for decision makers, and the traditional concept is a support system for decision-making, then BI is the decision support system that can be adopted for use by regular employees.

- In the narrow sense of the term, BI is a system that improves the quality of decision-making in business management and improves the performance of a business by summarizing and analyzing enterprise data and information.
- Intelligence is the ability to understand the interrelationships between given facts, which could produce guidance for achieving a desired goal. (Hans Luhn, IBM, 1958)
- The general consensus is that today's BI evolved from the DSS. Analysis technologies such as data warehouses, OLAPs, and BI began to be developed in the late 1980s based on the DSS.

② Configuration of BI



[Fig. 39] Configuration of BI

BI provides ETL (Extraction, Transformation, Load) operations on data with which enterprises can maintain the consistency and compatibility of OLTP (Online Transaction Processing) data. These features, naturally enough, are also included in the EDW described earlier; and, as indicated by the component elements, it needs to be understood that the set of processes for collecting, analyzing and visualizing data, as well as the functions for supporting decision-making, are in an organic relationship with each other.

BI consists of a data warehouse that stores data, a data mart where different perspectives can be applied and analyzed in multi-dimensions, analysis tools, and dashboards that generate charts, simulations, statistical analysis, and predictions for visualization.

In addition, for decision makers, BI can supply them with a visual presentation of an analysis of key management metrics that would normally be released as a standardized summary report. For managers in the field, BI provides a multidimensional analytical tool called OLAP with which they can perform expert-level analyses.

③ Types of BI

The types of BI can be explained by separating them into 3 following areas. They are BI, which represents the goals and strategies of an enterprise; analysis BI, which is about data-driven analysis BI; and operational BI, which is centered on the day-to-day operations of the personnel in charge of a specific operation. These types of BI are summarized in detail as follows.

<Table 48> Types of BI

Classification	Strategy BI	Analysis BI	Operations BI
Main business focus	Realization of the long-term goals and targets.	Analysis of information and data on realizing the corporate goals.	Management of daily operations of the business.
Key users	CEO, decision makers	Task supervisor, analyst	Task specialist, operator
Measurement target	Tracking of feedback on the strategy plans.	Tracking and analysis of feedback on strategy execution.	Personalized BI for supervisors so they can gain insights into their performance.
Frequency	Monthly, quarterly, annually	Daily, weekly, monthly	On the spot, any time of the day
Types of data	Past data, forecast data	Past data, forecast data	Present/working hours

④ BI dashboard

The BI dashboard is one of the most important elements of the BI functions because it permits users to make intuitive judgments.

This is a data visualization tool that displays in one glance the status of key quantified metrics and performance metrics for an enterprise. Through dashboards, metrics such as sales, costs, profits, and risk levels in various areas are presented on a single screen so as to help decision makers make quick decisions by making it easier for them to identify the areas they should pay close attention to.

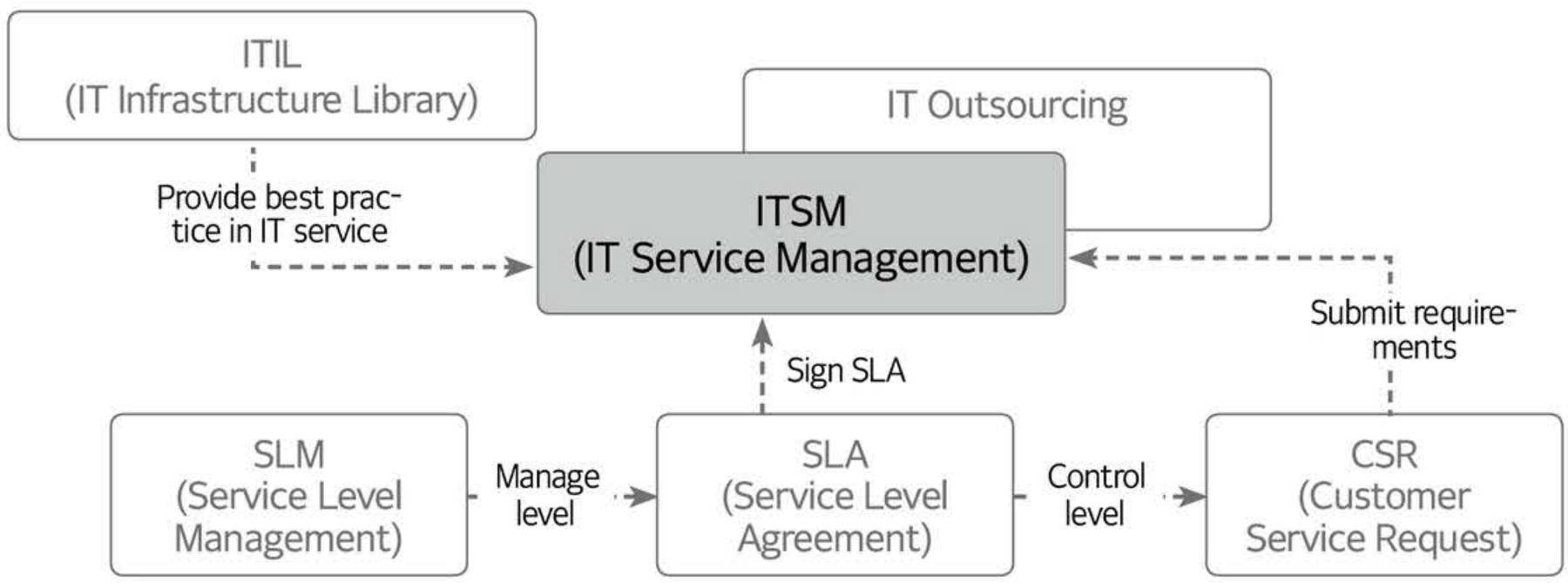
[Fig. 40] Example of BI dashboard

In general, the screen configuration of dashboards is easy to customize as it supports easy customization and easy integration with tools such as spreadsheets and real-time data analysis.

04 Understanding IT Service Management

A) Overview of IT service management

IT service management is commonly referred to as ITSM. ITSM is used as a systemized method of managing IT services and the quality of such services.



[Fig. 41] Interrelationships of IT service management technologies

- ITSM uses ITIL (IT infrastructure library), which is the standard model (best practice) of the IT service. Depending on the form of trade between companies, ITSM could be outsourced.
- An IT service can only be realized when a service level agreement (SLA) has been signed.
- The signed SLA becomes the standard for measuring the quality of the IT service, and systematic management of the IT service can be pursued using SLM.
- The customer service request (CSR) process is for requesting an IT service.

ITSM uses the ITIL (IT infrastructure library), which is the standard model (best practice) of the IT service. Depending on the form of trade between companies, ITSM could be outsourced.
In addition, an IT service can be only realized when a service level agreement (SLA) has been signed. The signed SLA becomes the standard and the baseline for measuring the quality of the IT service. Therefore, it is important to establish and manage these standards.

Once the level of a service has been decided between the user and service supplier, the IT service is delivered at that level. User requests for IT services will be handled by the CSR (Customer Service Request) process.

Some of the leading standards associated with IT service management include eSCM and ISO/IEC 20000. These standards are all rooted in ITIL.

- The eSCM (eSourcing Capability Model) is an international quality assessment model used by service providers to objectively evaluate quality and capabilities in order to provide IT services to customers. It provides guidance on implementing IT services at all phases of the business.

- ISO/IEC 20000 is an international standard which clearly defines the requirements for IT service management activities. It was developed by modifying the BS15000 certification of the BSI (British Standard Institute), the de facto international standard and certification specification on IT service management.

B) Understanding ITIL

① Definition of ITIL

The IT Infrastructure Library (ITIL) is a guideline for IT management developed by the Central Computer & Telecommunications Agency (CCTA) of the UK for public agency users in the late 1980s. ITIL is an IT service management framework which is a compilation of the best practices in IT service management, and which provides standard guidelines for IT service management.

It also provides a process for clearly and transparently identifying the complex IT service framework so that enterprises can realize their business objectives.

② History of ITIL

ITIL is an intellectual property and a registered trademark managed by the British government, but it is effectively used as a de-facto global standard for managing IT services.

- Version 1: In the 1980s, the British government's CCTA developed a standard reference document to address its reliance on IT. In this version, several books on the specialized field of IT services were collected and published.
- Version 2: During the period 2000~2001, ITIL version 2 was announced and an ITIL v2 glossary was published.
- Version 3: Version 3 was announced in 2007 by the OGC, an organization under Her Majesty's Treasury, and is known as the ITIL 2007 edition. In July 2011, ITIL 2011 was published as an improved version of ITIL 2007. Since then, the ownership of ITIL has belonged to the British government.

③ ITIL v2 process

The key component elements of ITIL v2 are service delivery and service support.

<Table 49> Component elements of ITIL v2

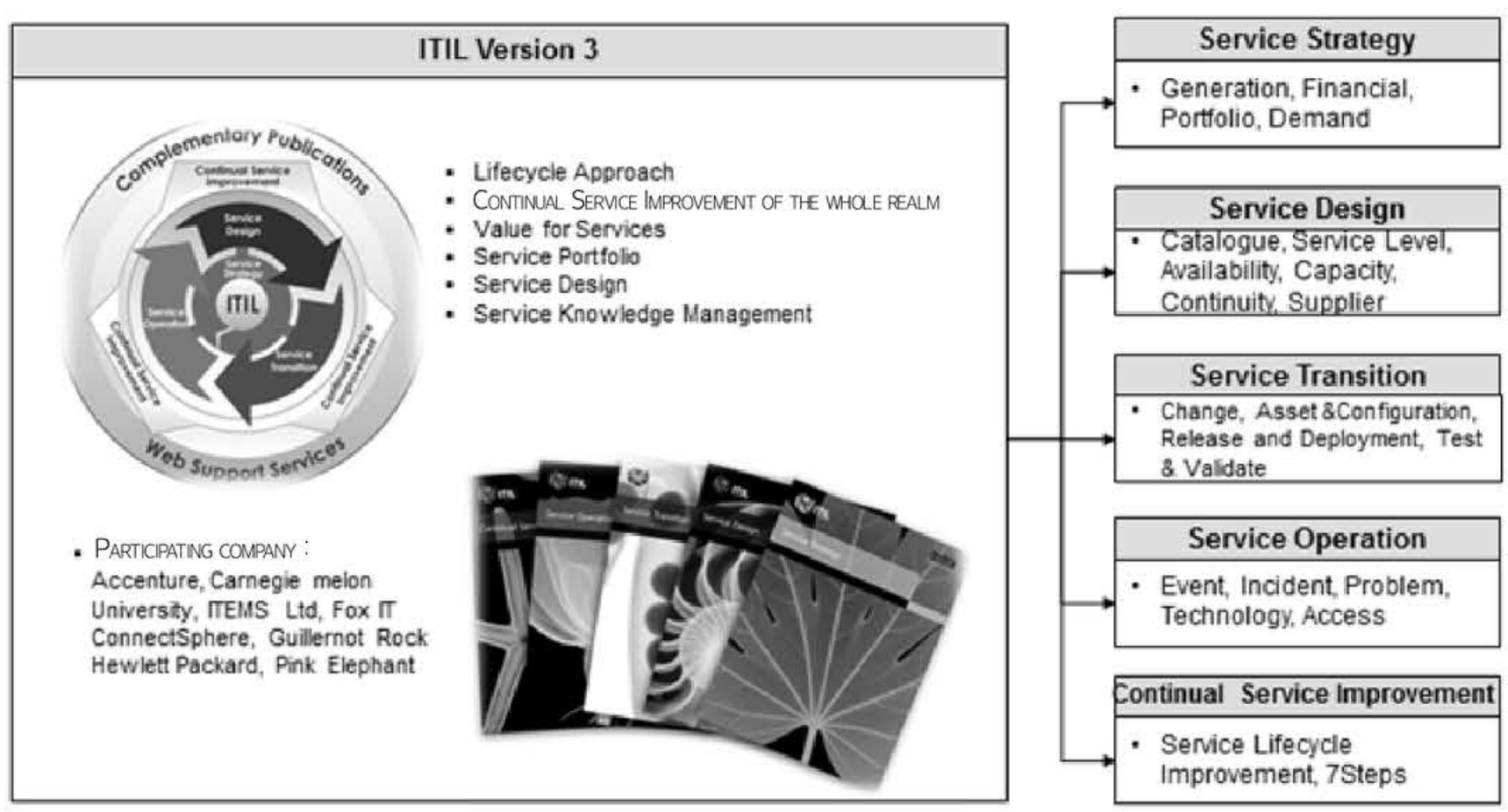
Area	Process	Key activities
Service Delivery	Service level management	Management of service quality as dictated by SLA.
	Capacity management	Estimation of required resources, management of transaction load.
	Availability management	Work continuity plan and control.
	Financial management	Management of quantitative cost and income.
	IT service continuity management	Management of disaster and recovery efforts.

Area	Process	Key activities
Service Support	Service desk	Reception of incidents and problems, processing of inquiries.
	Incident management	Management and evaluation of malfunction level.
	Problem management	Application of emergency measures for solving a problem.
	Change management	Management of service level, program changes.
	Configuration management	Management of configuration items.
	Release management	Management of release of products approved for distribution.

Besides the two areas mentioned above, there is also the Business Perspective area, which deals with business continuity management and partnership outsourcing, and ICT Infrastructure Management, which deals with network service management and operations management, computer installation and accessibility, and system management.

④ The ITIL v3 process

ITIL v3 was born as a business value model from ITIL v2. It supports IT governance (lacking in ITIL v2), and extends IT service management to all areas of a business.
(NOTE: In the box above, capitalization of names is inconsistent, e.g. Carnegie Mellon University.)



[Fig. 42] Overview of ITIL Version 3

ITIL v3 strengthens the service support area and service delivery area of v2 and includes the Requirement Process of ISO/IEC20000. The goals of v3 are to formulate strategies for alignment with business through a lifecycle perspective

and to improve the IT service life cycle.

<Table 50> ITIL v3 process

Process	Contents	Key activities
Service Strategy	• IT service strategy planning. • IT service organization and relationship specification. • IT investment management. • Dissemination of top management's goals and policies. • HR management. • Compliance with outside requirements.	• Planning and organization. • Understanding of customers. • Determining the order of priority of competition and investment.
Service Design	• Negotiation and contract drafting through requirement analysis. • Service solution design. • Alternative solution evaluation and procurement of preferred solution.	• Adoption and deployment. • Design based on requirement, application, system, process consideration.
Service Transition	• Release planning and preparation. • Build, test and service pilot. • Establishment and preparation of transition plan. • Transition, adoption and disposal. • Service transition review and termination.	• Operation and support. • Transition plan. • Service verification and testing.
Service Operation	• Monitoring and control. • Customer request processing and communication management. • Event, incident, problem management. • Service level metrics management. • Strategy/design/implementation phase participation.	• Monitoring efficiency in management. • Safety, accessibility management.
Continual Service Improvement	• Service report analysis and trend identification. • Establishment of baseline of performance evaluation and service results. • Operation of service improvement program. • Feedback across the strategy/design/implementation phases.	• Continual service improvement. • PDCA[6] Model implementation. • Service report and measurement.

ITIL v3 consists of 5 process areas. This 5-step process of continuous service improvement (Service Strategy → Service Design → Service Implementation → Service Operations) is a continuous, repeated cycle. In particular, the performance evaluation (ROI) area was strengthened in ITIL v3 because it was deficient in v2. By reflecting the performance results back into service strategy, ITIL v3 further strengthens the IT service capabilities of an enterprise.

6 PDCA: Plan - Do - Check - Action cycle model.

⑤ Comparison of ITIL v2 and v3

<Table 51> Comparison of ITIL v2 and v3

Item compared	Version 2	Version 3
Library	• 8 volumes (Core Service Support, Delivery)	• 5 volumes and additional volumes • (Introduction & Dic)
Process	• 1 function + 10processes	• 5 major processes
Usage	• Best Practice • ISO20000 Guideline(Part II)	• Best practice • Framework + standard expansion • ISO20000 revision
Key Points	• IT Service Management Library • Book of best practices • Service management system centered on service level management	• More libraries, book of best practices • Provides business value-centered IT service asset (IT Governance) • Lifecycle Approach • Continual Service Improvement
Restrictions & ITIL Version 3 Improvement	• Support is lacking across the entire area of the IT service. • Alignment with the business is weak (performance, indicator, process). • Inadequate coverage of IT governance (alignment, model). • Gap with current process (SOA, BSM).	• Presents an IT service lifecycle. • Presents an IT service driven by business values. • Design, execution and improvement model of IT strategy and IT service. • Links to SOA, BRM, IT operation process currently in use.

C) Understanding the SLA

The quality-of-service issue between a company that supplies IT services and its customers can become a sensitive subject during the servicing period. Therefore, there is a need for clear guidelines on the level of service between the party supplying an IT service and the party using that service.

The agreement between an IT service provider and its customers on the scope, item, form, performance, measurement methods, and price of the provided service is called the SLA. The framework for continuously monitoring and changing/managing the SLA (Service Level Agreement) is called SLM (Service Level Management).

[Fig. 43] Chart showing the flow between SLA and SLM

Statement of Work (SOW) is a work statement that specifies the details of a service or the work described in the SLA that must be performed. It is also used in project management as a work statement that describes the requirements of the project.

① Effects of SLA deployment

- Seamless communication: Used as a communication tool between consumers and suppliers of services.
- Prevention of conflicts: Narrows the expectation gap (vs reality) for service levels and lays the foundation for resolving the gap.
- Objective evaluation: An objective and quantitative evaluation of service quality is possible.
- Continuous control: Provides a control system for managing services.

② Component elements of the SLA and the metric for each item

An SLA sets the service target levels for service level management metrics, provides performance measurement standards for the objectives of the service, and has a system for reporting service levels.

<Table 52> Component elements of the SLA

Component elements	Description
Service Level Metrics	Provides performance metrics for quantitatively judging a service levels (i.e. each service area).
Service Level Objectives	Establishes the standards of the service. For example, the target level and the minimum level of the service level management metric. Imposes penalties when the service level falls short of the target, and provides incentives when the service level exceeds the target.
Service Level Measurements	Method of quantitatively measuring the pre-defined service level metrics (includes measuring interval, measuring team, frequency of measurement, etc.)
Service Level Reports	Format and method of reporting the service level used in the communication system.

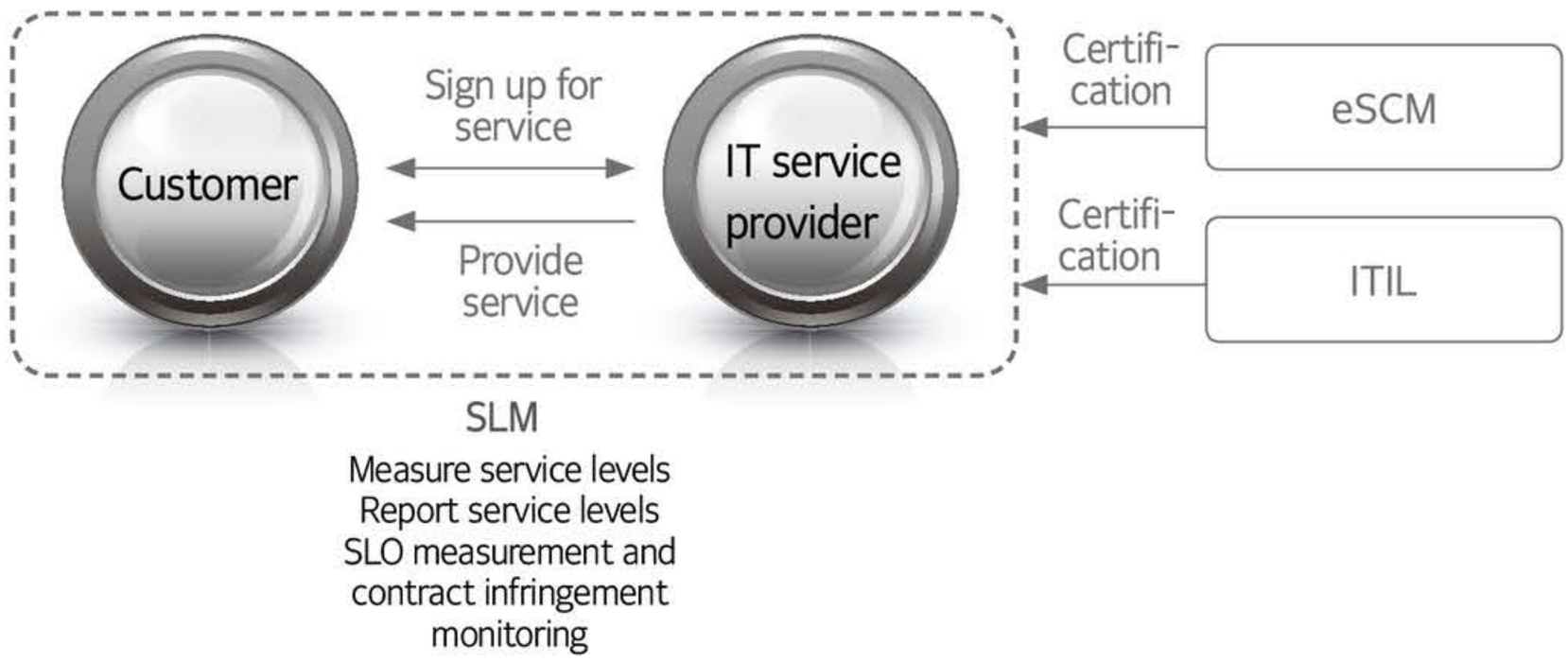
Some examples of metrics defined in the SLA are shown in the table below. In particular, the items described using metrics are also called "service level items" or "configuration items" (CI).

<Table 53> Examples of SLA metrics

Item	Examples of metrics
Application system	On-time CSR processing rate, program revision and increase rate, system response speed and time, number of malfunctions, etc.
HW	System operation rate, backup compliance rate, malfunction handling rate, number of system malfunctions, malfunction handling procedure compliance rate, number of transactions for each type of transaction, monthly disk usage data management, etc.
Network	Line failure rate, network equipment and line availability, network utilization rate, network troubleshooting compliance rate, etc.
Service desk	Call processing rate, number of calls handled for each type of call/job, call waiting rate, help desk system availability, call desk employee absenteeism, etc.
Security	User IT request immediate processing rate, customer profile accuracy, number of security training sessions, number of inspections for protecting personal information, etc.
Strategy planning	Number of suggestions and recommendations received, compliance with the informatization training plan, etc.

D) Understanding SLM

SLM (Service Level Management) is one of the core processes of ITIL. The use of SLM ensures that the level of service quality agreed upon with the customers can be delivered and that the process for increasing customer confidence and improving service levels can be managed.



[Fig. 44] Concept and scope of SLM

SLM provides the ability to manage service level objectives (SLO), which are the contents of an SLA, and to notify an enterprise of any infringements of the SLA. Therefore, the implementation of SLM is essential for managing the IT service levels.

<Table 54> Component elements of SLM

Component elements	Concept
Service Catalog	• Metadata (document) that explains the entire list of services.
SLA	• Service Level Agreement -Written contract on the mutually agreed level of IT service.
SLO	• Service Level Objectives - List of IT services covered by the SLA.
OLA	• Objectives Level Agreement - Agreement on the interdependent relationships between the internal departments of a service supplier, which will enable the internal departments to effectively communicate and manage the service level agreement.
Service Quality Plan	• An internal plan that describes everything required to ensure the agreed level of service.
Service Report	• Periodic assessment of violations of the service level agreement.
SLM engine	• An automated engine for managing service levels. The engine measures the values of service level management metrics, report automation function, and monitors the service with real-time information.

When operating SLAs and SLMs, the evaluation criteria for established service levels must be specific, quantitative, and objective. The evaluation criteria must be verified, and seamless setting of the baseline and smooth management of any changes must be ensured.

In addition, the responsibilities under each item should be clearly specified in anticipation of potential disputes. In this regard, the use of an automated and reliable management tool for managing the service level can be of great assistance when executing tasks.

VII. Understanding the IT Business Performance Evaluation

▶▶▶ Recent trends and key issues

The IT business performance evaluation is a procedure for reviewing how IT has contributed to the growth of an enterprise. In the past, IT business performance evaluations were mainly performed on the financial aspects of a business. This made it easy to quantify the results of IT's contribution to the earnings of an enterprise and its affiliated organizations. However, this type of evaluation failed to cover all aspects of how IT business could contribute in the aforementioned regard.

In recent years, enterprises have been expanding the scope of their IT business performance evaluations with the aim of creating a more comprehensive evaluation. Current evaluations cover not only financial aspects, but also non-financial areas such as efforts to enhance the corporate image or raise employees' morale or satisfaction with their work.

When evaluating the performance of IT business, one particularly important consideration is the degree to which enterprises can align individual performance goals with the enterprise's performance goals. To this end, communication among employees is of paramount importance, and enterprises must utilize various techniques for bringing into alignment top-down goal setting and bottom-up goal setting when they operate their businesses

▶▶▶ Learning Objectives

1. To be able to explain the various types and methods of IT business performance evaluation.

▶▶▶ Keywords:

Financial performance evaluations, BSC, IT-BSC, KPI, MBO

✚ Preview for practical business

With the aim of improving the quality of patent administration and laying the foundations for customer-oriented administrative services, the Korean Intellectual Property Office (KIPO) declared its core vision of 'Promoting Technology Innovation and Establishing an Environment Conducive to Innovation by Effectively Protecting and Promoting the Use of Intellectual Property' and its mission of 'Becoming an Intellectual Property Powerhouse through the Innovation of Patent Administration'. Based on this vision and mission statement, the patent office developed five strategic objectives, taking into account the unique nature of public institutions and the two conflicting interests of public benefit and financial profit. In 2005, the patent office created the BSC system, which links the performance targets of individual employees to the five strategic objectives of KIPO.

The Korean Intellectual Property Office developed the BSC system in three phases, as follows. In the 1st phase (second half of 2004), KIPO established the performance management model for each department. It also established its mission, vision, and strategic goals, and then derived the key success factors (19) and the key performance indicators (32) for realizing those goals.

Thus the strategic framework of the office was completed by November 26, 2004. Based on this strategic framework, and in alignment with its strategic goals, the office announced the performance goals, key success factors and key performance indicators that each department/bureau must pursue, on December 21, 2004. These factors and indicators were the core areas of the one-year job performance agreements signed between the commissioner and the bureau/department heads, and between the bureau/department heads and the team managers, on December 28, 2004.

In the 2nd phase (first half of 2005), the organization-level BSC design was followed by the individual-level performance management model design. The organizational performance indicators were distributed to individual employees, who were asked to align organization-level performance with individual performance by reflecting the organization's performance score in the individual performance score. By April 30, 2005, an individual performance and competency evaluation system had been established through which employees could be motivated to meet their job goals. At the same time, as part of its effort to introduce a more performance-centered HR policy, the office announced a new plan in which the result of each individual employee's performance evaluation would be more closely linked to the compensation system.

In the 3rd phase, deployment of the information system began on April 1, 2005, and was completed by the end of June. Concurrently, the information system construction work was carried out from April 1, 2005 and completed at the end of June. The performance management system was implemented using the best solution so as to enable the office to manage performance as a whole. A strategic operational system was also put in place to monitor the execution of the strategies at all times, and thereby permit the office to respond quickly.

01 Summary of Lessons Learned

When pursuing an IT business, investment in IT must be executed in accordance with the business strategy of the enterprise in question; and analyses of the effectiveness of IT investments must be fed back into the IT business performance evaluation.

The evaluation of IT business performance can be broadly divided into financial performance evaluation and balanced score card assessment. Financial performance evaluation is a technique for quantitatively evaluating the performance of a financial investment by analyzing the financial benefits. In addition, the balanced score card assessment complements the financial assessment by providing the qualitative elements which are missing from the financial indicators. The balanced score card brings to the table many non-financial perspectives which could peak the interest of the enterprise.

Enterprises can develop very clear indicators for IT business performance evaluations by setting up the key performance indicators (KPI), which measure the goal attainment levels, and by utilizing the management by objective system (MBO), which sets the objective levels of employee skill development.

02 Financial Performance Evaluation Technique

A) Overview of financial performance evaluation

Financial performance evaluations are done using financial indicators, the traditional performance evaluation metrics. They are also called "quantitative performance evaluations" because they use a common unit called "currency", and can evaluate products or services with different characteristics in quantitative terms.

- The reason why financial performance evaluations are used is because the shareholders and managers of companies are more interested in the financial results than in the specific production process involved in producing the results; and, with the financial indicators, it is easy to understand the management situation in one glance.
- Financial indicators have a strong result-oriented nature and tend to ignore the process involved in attaining the results. For this reason, financial indicators are not great boosters of employees' motivation.
- Because financial indicators are abstract accounting figures, it is difficult to accurately convey their meanings to all the members of an organization.

B) Types of financial performance evaluation techniques

Some of the most well-known techniques for evaluating the financial performance of an enterprise include return on investments (ROI), net present value (NPV), internal rate of return (IRR), and payback period (PP). These financial performance evaluations can be used to evaluate performance for both a specific period of time and a specific point in time.

<Table 55> Types of financial performance evaluation techniques

Technique	Description
ROI	• Return on Investment • Ratio of net effect to total cost • Use das assess investment feasibility. • The time needed before an investment yields net income can never be estimated.
NPV	• Net present value • Expresses the relationship between the cost and effect of the present value of a currency, taking into account the discount rate of the currency. • Reflects the accurate amount of future net profits and the monetary value over time. • The risks associated with the payback period should be considered separately.
IRR	• Internal rate of return • Revenues generated from investments against cash flows • Expresses the expected annual revenues for the purpose of judging the reduction of risks. • The size of the investment and the payback period are not taken into account.
PP	• Payback period • The time it takes for the cumulative effect to exceed the cumulative cost and reach the break-even point. • Expresses the point of transition to surplus or the point when visible success can be seen. • Shows when revenue is generated, but not how much revenue is generated

03 Balanced Score Card Technique

A) Overview of the BSC technique

The balanced performance evaluation technique is referred to as BSC (Balanced Score Card). BSC is a technique for managing balanced performance by evaluating not only financial performances but also non-financial performances. It was introduced to the world by Harvard Business School Professor Robert Kaplan and consultant David Norton in 1992 in the Harvard Business Review.

- The traditional performance management system is so restricted to financial indicators that enterprises experience difficulties in executing their strategies in a systematic manner. This has raised the need to consider non-financial evaluations.
- BSC is utilized as a tool for maintaining a balance between indicators, for the concretization and linking of strategies, and for communication within the organization.

<Table 56> Characteristics of BSC

Category	Description
Balance between indicators	• IT business performance evaluation can be approached from many different perspectives, in addition to the financial perspective. • Provides a balance between the short-term view and the long-term view. • Provides a balance between leading and trailing indicators.

Concreteness of strategy	• Secures the concreteness of a strategy through KPI. • Aims for company-wide rather than partial optimization.
Connectivity of strategy	• Aligns feasible strategies to correct business directions. • Establishes causal relationships between strategies and links core strategies after focused selection.
Internal communication tool	• Builds executive capability within the organization by using detailed KPI. • Serves as a common language in a horizontal/vertical organization.

B) Component elements of BSC

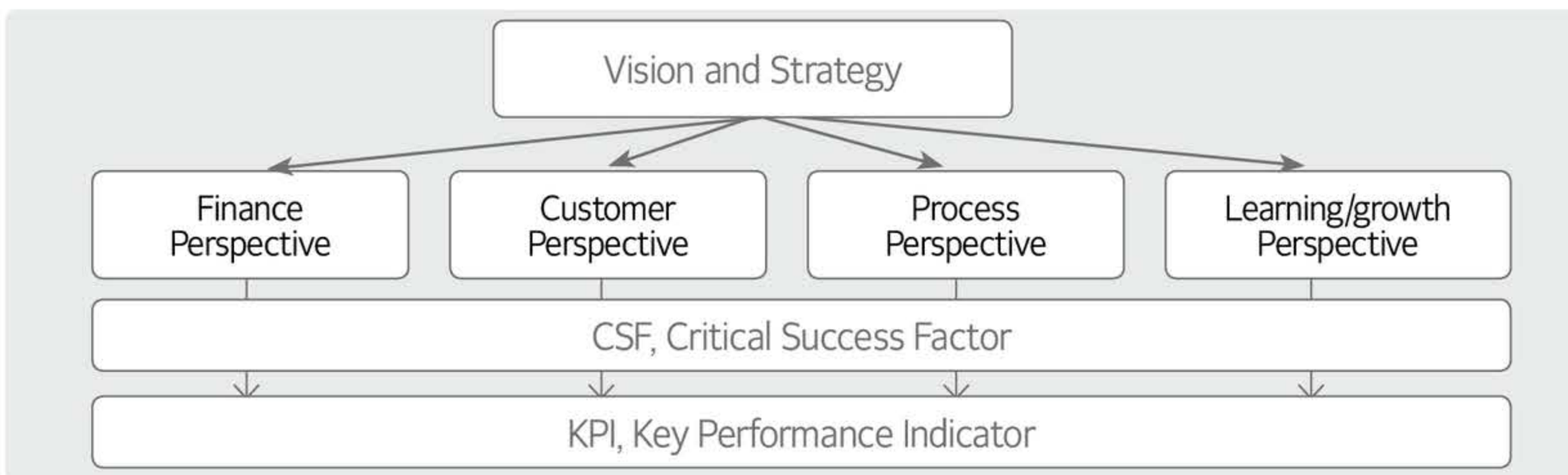
In BSC, performance is evaluated from four different perspectives. It contains elements for managing enterprise goals and elements for ensuring that the goals are met. A balanced performance evaluation is possible with BSC

<Table 57> Component elements of BSC

Component elements	Description
Perspective	• Finance, customer, process, learning and growth perspective.
CSF (Critical Success Factor)	• Factors which are critical to successfully realizing the vision and strategy of an enterprise.
Strategy Map	• A picture that shows the causal relationships among CSF. It illustrates how an organization creates values.
KPI (Key Performance Indicator)	• An indicator of how to measure and manage the level and success of a CSF.

C) Four perspectives of BSC

The BSC is composed of four perspectives: Financial, Customer, Process, and Learning & Growth. The BSC manages both financial and non-financial views.



[Fig. 45] Four perspectives of BSC

The four perspectives are managed in organically interconnected relationships. For example, i) new product development is managed from a learning and growth perspective; (ii) product quality and production efficiency

improvements are managed from an internal process perspective; (iii) customer satisfaction and delivery time compliance are managed from a customer perspective; and (iv) shareholder dividend income is managed from a financial perspective.

<Table 58> Description of the 4 BSC perspectives

Perspective	Key Items	Key Indicators
Financial perspective	• Revenue, net profits, cost reductions • Financial evaluation	• Cash flow, inventory, and bonds • Operating profit ratio
Customer perspective	• Increase of customer loyalty • Enhancement of customer satisfaction	• Customer satisfaction, on-time supply rate
Internal process perspective	• Optimization of processes • Removal of process bottlenecks	• Process cycle time • Product unit cost
Learning and growth perspective	• Employee's learning efforts • Measurement of performance gains achieved by enhancing skill levels	• Employee satisfaction • Number of newly developed products

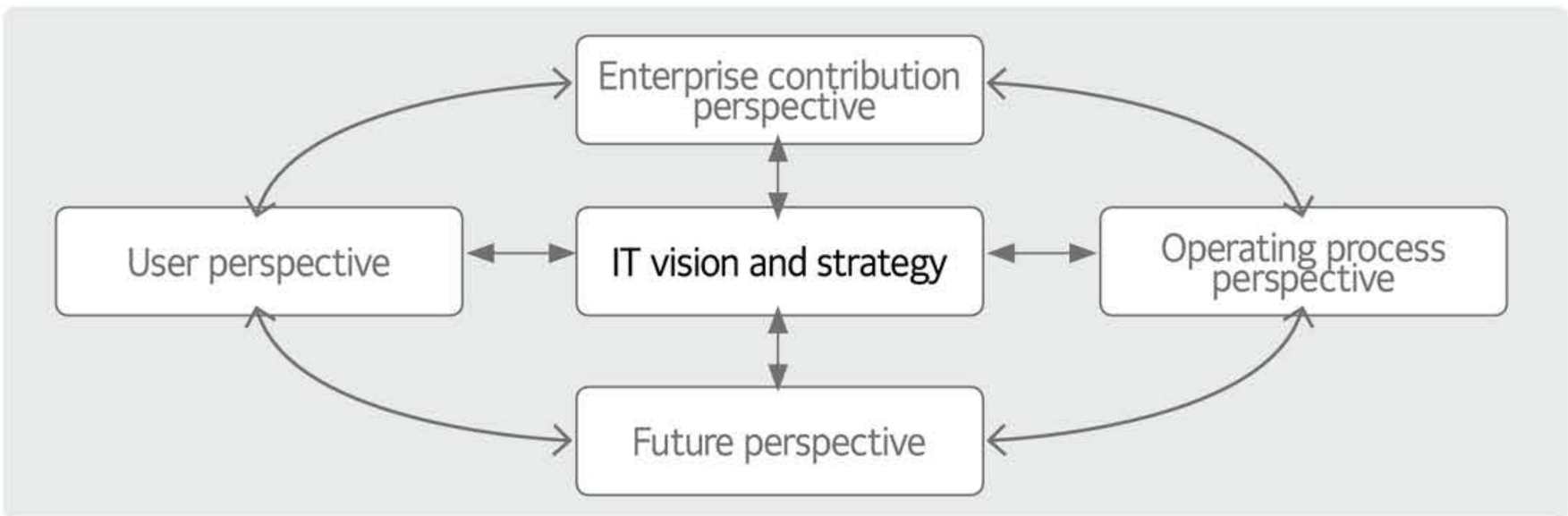
04 Balanced IT Performance Evaluation Technique

A) Overview of IT-BSC

IT-BSC (IT-Balanced Score Card) is a performance management tool that helps enterprises to achieve their goals by introducing the concept of BSC in the evaluation of investment performance in the IT sector.

The growing importance of IT in corporate activities has led enterprises to recognize the need for a method of systematically evaluating IT investments. With the traditional finance-based investment evaluation technique, it is difficult to quantify intangible IT investments, and hence enterprises have rushed to adopt IT-BSC.

B) Component elements of IT-BSC



[Fig. 46] 4 perspectives of IT-BSC

IT-BSC has four perspectives as its constituent elements, and they are linked to the enterprise BSC. That is, causal

relationships exist among the indicators within a structure where results are shared. IT-BSC and BSC not only help managers to make decisions, but also provide a balanced view of performance evaluation in the IT sector because they are ultimately linked to the financial indicators.

<Table 59> BSC link structure of IT-BASC as seen from different perspectives

Perspective	Measurement	BSC link
Contribution to the enterprise	• Create enterprise value from IT investments.	• Financial perspective
User perspective	• Maximize the value of IT service providers and users.	• Customer perspective
Operational process perspective	• Ensure efficient delivery of IT products and services.	• Internal process perspective
Future-oriented perspective	• Provide IT service and technology development support for continuous development.	• Learning and growth perspective

05 Management of the Key Performance Indicators

A) Overview of KPI

KPI stands for key performance indicator and is a quantifiable indicator that contains the critical success factor (CSF) of an organization. The KPI is used to measure the achievement of a goal. Therefore, KPIs must accurately reflect the goals of the organization and they must be selected from among the elements that are critical to realizing those goals. KPIs are the factors (means or determinants) that could determine victory in competition as well as the factors (ends or results) related to the success of the selected strategy. Generally set by the organization and its employees, KPIs are important indicators that are widely used in performance evaluations. Therefore, depending on which KPIs are selected, the employees could start behaving differently at work.

B) KPI establishment procedure

The right KPIs should be compatible with the vision and objectives of the organization, should function as strategic drivers, and should allow the members of the organization to move forward in accordance with the same purpose and strategy. Therefore, KPIs should be able to provide guidance for the entire organization, and should not be limited to specific areas. The derived KPIs should be made to match the strategy and goals of the organization after undergoing a validation process.

<Table 60> KPI establishment procedure

Stage	Key activities	Output
Definition of the KPI area	• Specify the characteristics of the entire organization or the operational unit. • Select the participants.	• KPI establishment plan • Organizational chart
Collect data	• Collect and review vital documents. • Develop interview questions. • Establish and execute the interview plan.	• Interview questionnaire • KPI portfolio
Analyze	• Create an activity description sheet. • Analyze affinity. • Develop the topic.	• Job-KPI affinity analysis chart
KPI derivation	• Derive the KPIs. • Refine, classify and integrate the KPIs.	• KPI list
KPI verification	• Establish criteria for comparison. • Develop a comparison matrix. • Compare associative relations. • Set the target.	• KPI verification matrix

C) Precautions to take when deriving KPI

① KPIs need the strategic support of top management

KPIs should be kept separate from legacy processes and instituted as an internal process that could lead to the best performance from the organization as a whole. The task of managing the KPIs should not be delegated to a task force composed of middle-level managers; rather, it should be the responsibility of the top management, who must make sure the strategic vision of the organization, is reflected in the KPIs.

② Use a reference model but do not imitate it!

Even a set of KPIs from a great company is of no use to another enterprise because the goals and strategies are different for each enterprise. Therefore, an enterprise must develop its own KPI which matches its strategies.

③ KPI derivation is a process of making continuous improvements.

Starting with a balanced set of KPIs, the KPIs should be derived in gradual steps so as to allow them to evolve into a mature set of KPIs. It must be possible to modify a set of KPIs in order to allow enterprises to respond promptly to changes in the business environment.

06 Goal Management System

A) Key perspectives of MBO

MBO (Management by Objective) is a system for managing the goals of an organization. MBO is also a business management technique for setting goals and controlling/managing the path to meeting those goals for the purpose of improving individual performances and capabilities.

- MBO sets goals whose levels can be measured quantitatively by the employees through their own decision.
- Because, in MBO, achievable goals are set in a bottom-up fashion, employee goals are not necessarily in full alignment with the enterprise goals. However, employees finalize their goals through discussions with their supervisors. Therefore, when individual employees do meet their individual goals, this can have a sufficiently positive effect on how close the enterprise comes to reaching its corporate goals.

B) The main reasons why enterprises are adopting MBO

MBO begins with a clear understanding of an enterprise's objectives and makes each individual responsible for meeting their own individual goals. Also, under the MBO system, efficient organization management can be secured since the members of the organization work hard to achieve their respective goals.

<Table 61> Main reasons why enterprises are adopting MBO

Reasons	Description
Goal alignment	• To improve individual and enterprise performance by systematically linking the overall and individual goals of an enterprise.
Motivation driver	• During the course of voluntarily and creatively setting goals and trying to meet them, employees are motivated to achieve the enterprise goals.
Organizational integration	• By developing their abilities and improving their job performance, a foundation can be built for all the employees to move in one direction.

However, the goals set by MBO will likely not align with the goals of the enterprise if the enterprise does not set the goals of MBO or provide any guidelines. Consequently, the goals have to be revised through a separate discussion process. In addition, special care must be taken when adopting MBO, because if the goals of individual employees conflict with each other, it could lead to serious disputes.

C) Component elements of MBO

From the very goal setting stage, MBO encourages the participation of supervisors and subordinates. Therefore, the MBO approach works interactively to align the goals with the enterprise strategies. In addition, continuous feedback in the form of evaluations and encouragement is needed to align the MBO of employees to the goals of the enterprise.

<Table 62> Component elements of MBO

Component elements	Description
Setting of Objectives	• Must be measurable, specific and achievable. • Objectives should be established in a direction that continuously improves every year. • They must be established within the organization's goals and capabilities.
Participation	• During the course of setting and executing the objectives, there must be interactions among the employees. • In particular, consultations with the superior (manager) must take place.

Feedback	• Objectives and evaluations must be interlinked. • Feedback must be given during the entire evaluation period when employees are monitored so as to allow them to continuously improve their performance.

VIII. IT Business Rnvironmental Transformation and Response

Recent trends and key issues

In recent years, the IT business environment has been transformed rapidly with smart mobile as the base. This is a transformation that has put IT in a position where it can lead business as the core service of many different business models. The role of IT is no longer limited to just supporting business. Rather, IT is increasingly accelerating the transformation of the business environment as mobile, open-source, and social services are combined with infrastructures such as cloud, big data, IoT, and AI.

Learning Objectives

1. To be able to explain the trend in the transformation of the IT business environment.
2. To be able to explain enterprise activities for responding to transformations of the IT business environment.

Keywords

Disruptive innovation, crowd sourcing, open innovation, business platform, API economy, servitization

✚ Preview for practical business

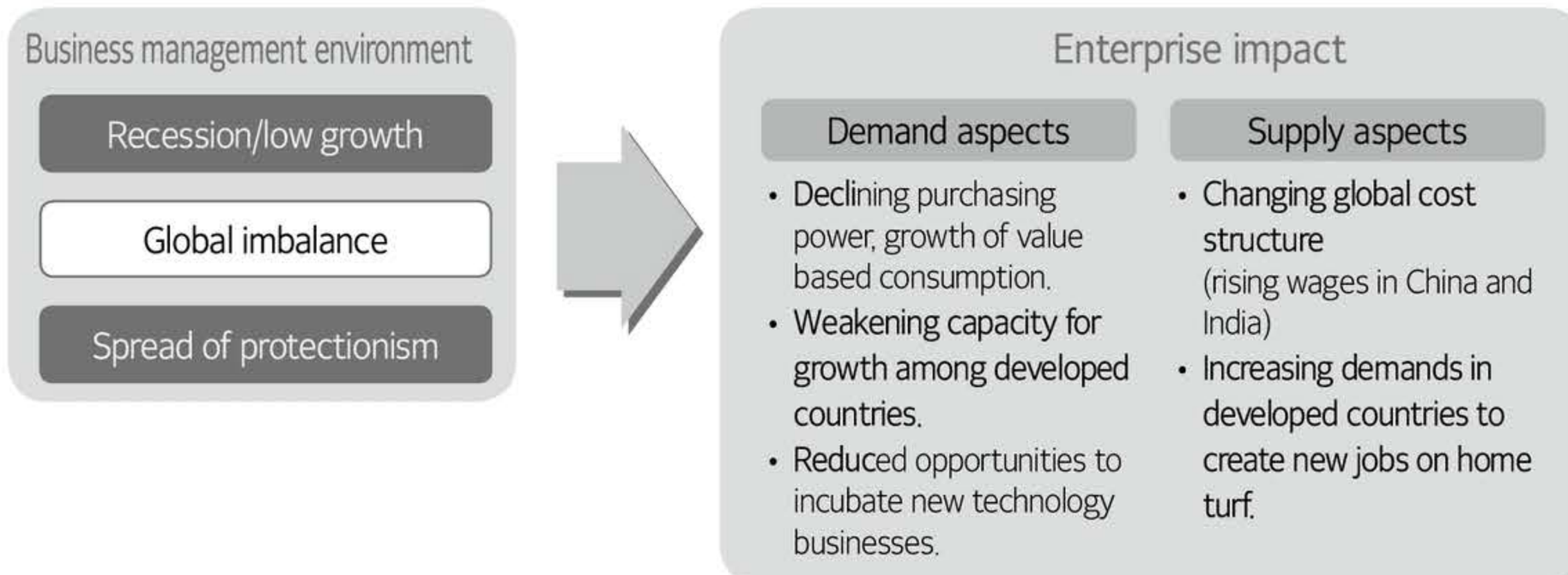
Kiva, the robot responsible for Amazon's delivery of goods

Amazon, the giant conglomerate that operates 109 delivery centers around the world, has managed to reduce its shipping center operating costs by 20% by using a warehousing robot called Kiva. Amazon developed a plan to deploy the robots in its shipping center and acquired the Kiva system in 2012 for $775 million. Over the past two years, the number of robots deployed has exceeded 15,000, resulting in savings of up to KRW 990 billion in human labor costs. This is one of the best examples of a company maximizing its operational efficiency with IT technology.

01 Trends of Change in the IT Business Environment

A) Understanding the transformation of the IT business environment

① Rapid transformation of the IT business environment



[Fig. 47] Transformation of the business environment

Many companies that have entered the global market are now experiencing difficulties because of the long global economic downturn and low growth. As domestic growth slows and direct overseas investments increase, the costs that companies have to bear are increasing, while the corporate business environment is becoming ever more complicated due to the opening of markets and fluctuations in currency exchange rates. To overcome this situation, large companies are implementing a number of different strategies, such as expanding global sourcing and entering the service industry in the case of manufacturing companies.

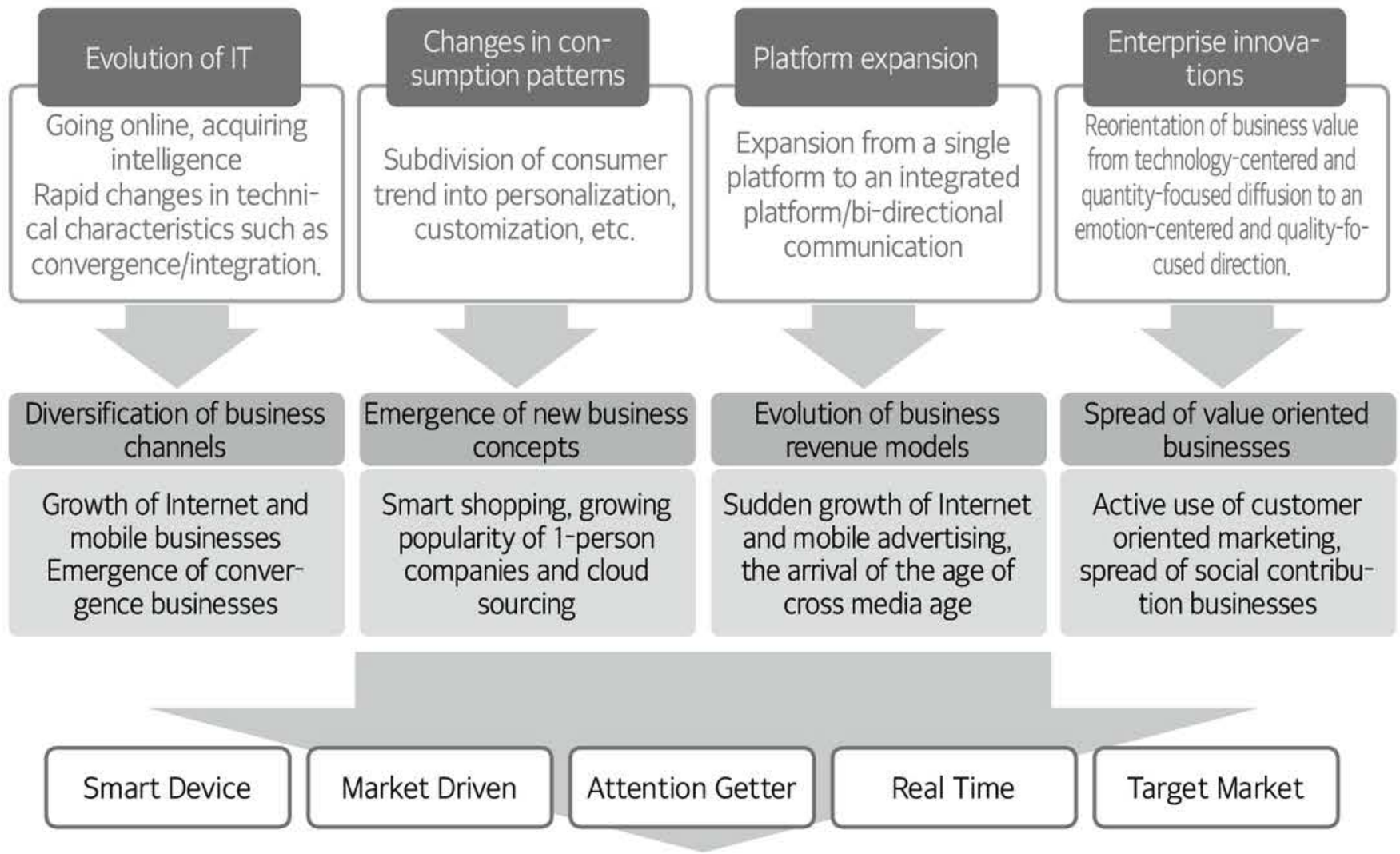
② Characteristics of IT business environment transformation

To respond to the ongoing transformation of the business environment, companies are diversifying their businesses to gain a competitive advantage in the market through new business models. Among the approaches that companies employ to develop new business models are specialization, modularization, scaling up, internationalization, and networking. The rapid development of IT technology and the advent of the smart era are also driving the latest shifts in the business paradigm.

Changes in the internal and external environments surrounding corporate business activities are accelerating, manifesting themselves in the form of endlessly evolving IT, changes in consumption patterns, diversification of platforms, and increasing calls for innovation from companies.

The gradual blurring and disappearance of business boundaries (occasioned by offline companies' entry into the online market, the growth of mobile businesses, and the emergence of convergent businesses, etc.),which previously guarded different areas of competition, have diversified business channels by, for instance, paving the way for the rise of the online market. Through the online market, enterprises have gained the opportunity to meet diverse customers and create new synergies. In addition, new business concepts have emerged that reflect the latest consumption trends, such as SNS-based smart shopping and the growth of one-person Internet companies and crowd sourcing.

Customer-oriented marketing is becoming more popular, and more free services are being offered to customers. Furthermore, value-oriented businesses such as social work businesses that could support the sustainable business activities of companies are also growing.



[Fig. 48] Business environment transformations and trends

The trend in business transformation brought about by the smart society is progressing rapidly. As such, enterprises should react proactively to this trend and work hard on strengthening their IT business capabilities so that they can provide a broader range of products and services.

02 Enterprises' Response to Changes in the IT Business Environment

A) IT business innovation activities

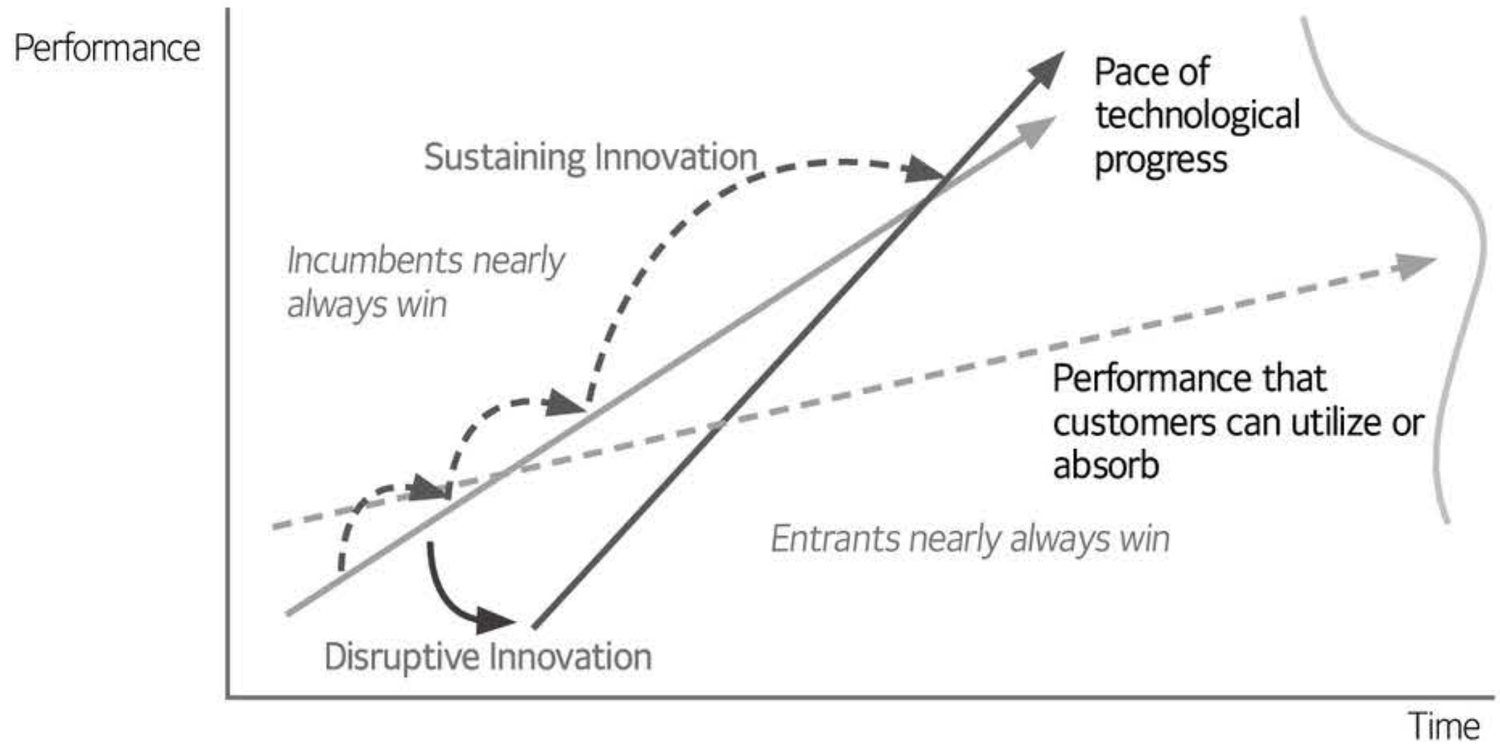
① Disruptive innovation

Disruptive innovation is receiving a lot of attention as the solution to the persistent problem of slow growth and depression in the business market. Disruptive innovation is a technique for destroying existing markets and creating new markets.In essence, it consists in dominating the market with technological innovation/price destruction or in pursuing a business strategy aimed at beating the market leaders.

Disruptive innovation is an innovation technology that can alter the hierarchy of competition in existing industries, have impacts on other industries, and produce new markets and businesses by changing consumer behaviors and ways of thinking. Disruptive innovation has the potential to surpass the performance of existing technologies in an instant, just like smartphones did when they appeared in the late 2000s and quickly revamped the existing mobile

phone market.

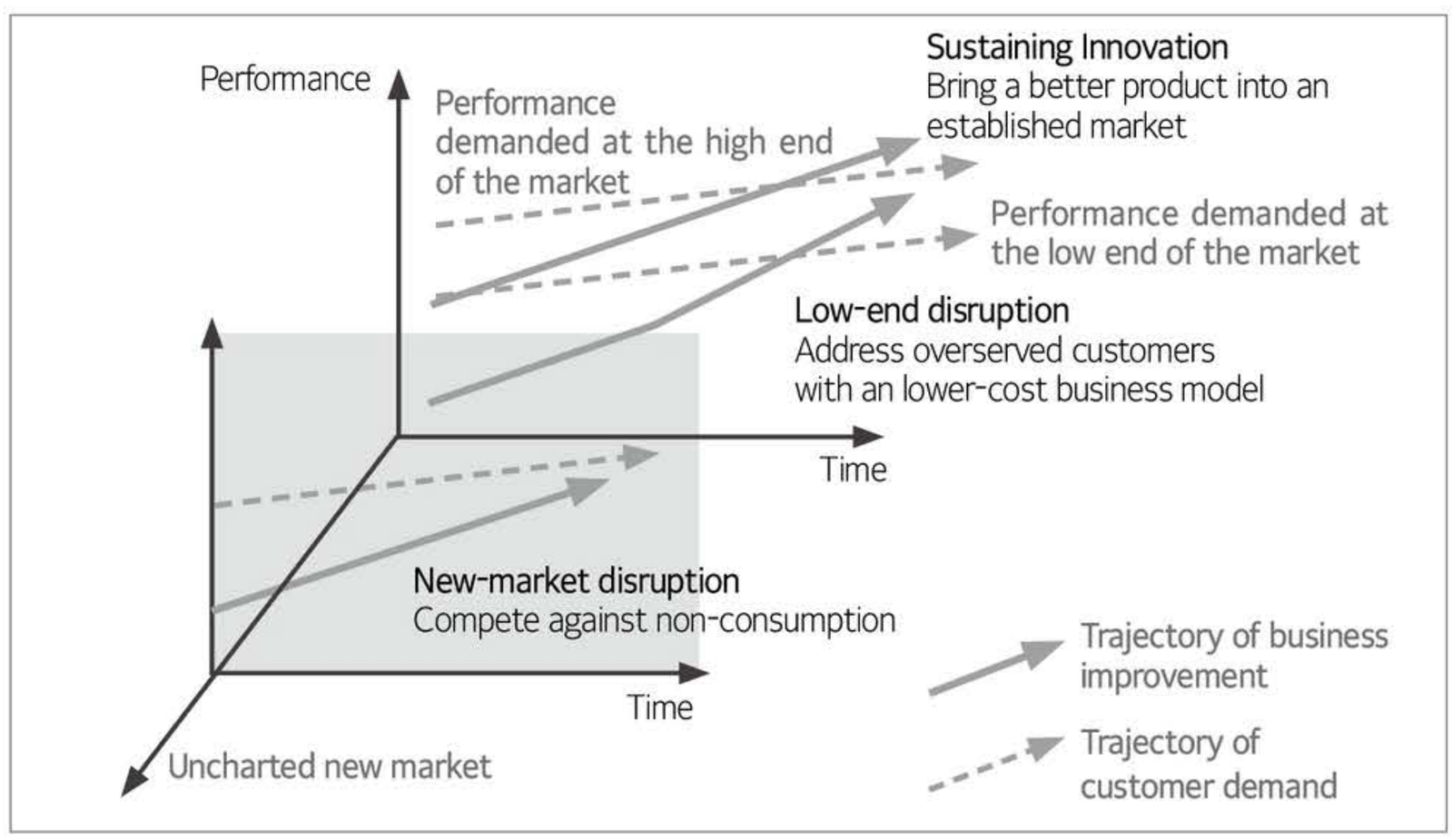
To understand disruptive innovation, one also has to understand the meaning of "sustaining innovation". Sustaining innovation is the strategy of continuously improving existing products to satisfy and retain key customers in the market, with the goal of providing high value at a high price through gradual improvement. In contrast, disruptive innovation is the strategy of targeting niche markets by creating low-priced but good-quality products through simplified functions and enhanced convenience.



[Fig. 49] Relationship between disruptive innovation and sustaining innovation

In other words, the market targeted by disruptive innovation is the overshot customer7 base. This market has emerged from the argument that there is a limit to the performance that customers are willing to use or accept. Overshot customers are not in favor of paying for high-end features that they do not need.

There are two approaches to introducing disruptive innovation: low-end disruption and new market disruption. Low-end disruption is the strategy of entering the low-end market by resolving the product complaints of overshot customers and entering the market through low-priced products that perfectly match the satisfaction levels of the customers.



[Fig. 50] Disruptive innovation method

In new market disruption, enterprises target non-customers who consciously reject the products in the market or customers who are dissatisfied with existing products. By launching innovative new products that utilize new technologies, the enterprises try to build a presence in niche segments of the market dominated by existing leading companies.

In low-end disruptive innovation, enterprises target customers who have been overserved by leveraging a new process and by employing a financial approach. By using a combination of low margin and high utilization of resources, enterprises provide customers with discounted prices that are critical to succeeding in the business. In new market disruptive innovation, enterprises target non-consumers who previously could not afford to purchase a product or who had no access to the technology with low-feature products that are simple and convenient to use. This is a business model in which enterprises make money with low-priced products that are mass produced in small volumes. The total takeover of the mobile phone market by smartphones is a great illustration of disruptive innovation at work. The traditional industry shifted from a voice-centered industry to a data-serviced industry and from a hardware-centered (i.e. mobile terminal) industry to a platform-based market structure. In addition, if one examines the impact on other industry sectors, the high-performance functions installed in smartphones have obliterated the markets for conventional MP3, digital cameras, game consoles, car navigation equipment, and tablet PCs.

Smartphones also created a variety of new markets and business models, including app stores, location-based services, SNS, social commerce, social games, Big Data, and smart services. Naturally, there have to be some core technologies for such disruptive innovations to occur. Some of the latest technologies driving disruptive innovations that have recently attracted attention include:

<Table 63> Latest technology for disruptive innovation

Area	Technology	Description	Predicted change
Electronics /Telecom	Wearable computer	A computer device that can be worn on the body or clothing and used freely.	• High tech driven textile industry. • Growth of machine dependent healthcare.
	3D printing	Technology that prints three-dimensional shapes by building or manufacturing materials one layer at a time according to three-dimensional design.	• Growth of personalized manufacturing. • Used in nano, bio and aerospace applications.
Services	Situation awareness technology	Automatically performs some specific function appropriate to the situation (action/biometric/personal history/ environmental) in which a user finds him/ herself.	• Refined and detailed target marketing. • Accelerated shift to a new paradigm in which changes can be predicted and responded to in advance.
Automobile	Self-driving cars	With no input from the driver, this system can control the speed and steering of a vehicle by sensingits position and situation.	• Effective road infrastructure building. • Lower insurance and hospitalizations due to reduced accidents. • Growth of rental service.
Material	Ultra-lightweight material	Lightweight yet strong material such as microratis.	• Expanded applications from aerospace to transportation. • Reduced energy consumption/prices can be expected.

Area	Technology	Description	Predicted change
Bio/ medicine	Genetic therapy	Diseases can be cured completely by replacing the faulty gene which is the root cause of a disease with a normal gene.	• Changes in medical expense payment standards. • Introduction of preventive health insurance. • Growth of the beauty and anti-aging industry.
Energy	Post battery	Flexible, high-density (metallic container), low-price (metal ion) batteries.	• Popularization of wearable devices. • Growth of the IoT device industry. • Expanded base of electric vehicles and power storage systems.

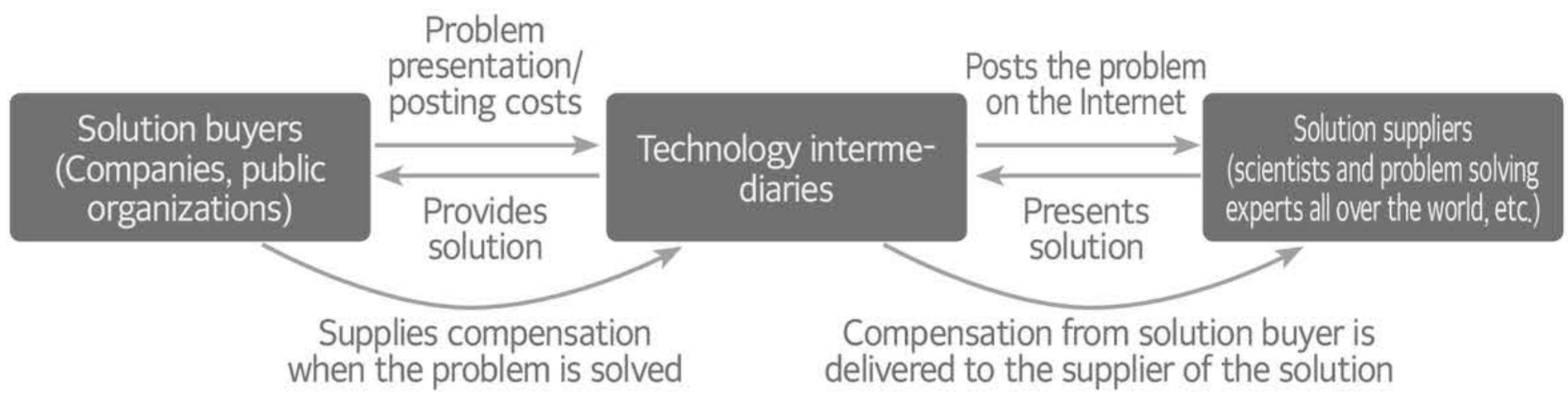
Disruptive innovation can be leveraged as a strategy for overcoming the barriers to technological innovation and reshape future industries. Enterprises that are planning disruptive innovations must clearly specify the target technology and its area of application, and seek outside resources in order to lay the foundations for dominating market opportunities.

② Crowdsourcing

As a composite word coined by combining 'crowd' and 'outsourcing', crowdsourcing is the concept of opening up all phases of an enterprise's operations to the participation of consumers and the general public alike. If the activities of an enterprise or its revenues improve, the revenue is shared with the participants. With the recent development of SNS, companies have been using social networks a lot more, and crowdsourcing has gained traction as an activity that can generate ideas by exploiting the power of the masses using these new channels of communication with the public.

Dell Computers succeeded in collecting 10,000 ideas during an 18-month period after starting a blog where consumers could exchange business-related technologies directly. Like Dell, crowdsourcing allows an enterprise to present some very creative ideas for solving an enterprise issue to a group of specialists. The enterprise can then receive help from the specialists, which can then translate into time or labor cost savings.

In recent years, crowdsourcing services have begun to partner up with professional technology brokerage firms to successfully complete diverse types of crowdsourcing; and, in the process, they have begun to build an ecosystem with a positive virtuous cycling structure.



[Fig. 51] Crowdsourcing business model

Furthermore, because it is so well coupled with information technology (IT), the rapid advancements in IT have made crowdsourcing one of the key elements for success in business. By allowing consumers or the public to directly

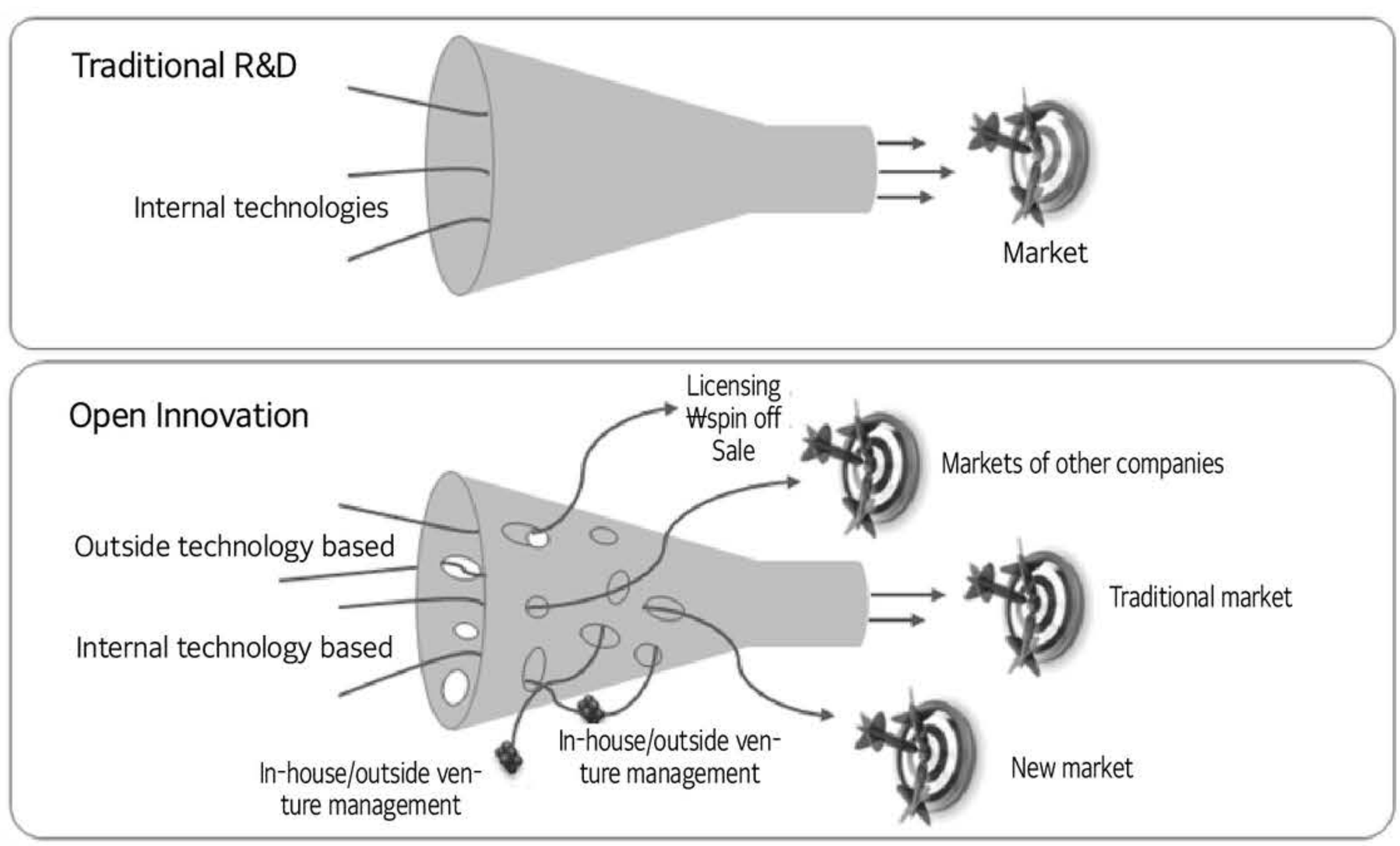
participate in the manufacturing of products or the service delivery process, enterprises are creating better products and services. The profits generated in this way are shared with the participants, while the enterprises themselves are able to obtain creative ideas from potential future consumers at very little or no cost at all. Therefore, through crowdsourcing, enterprises are able to acquire insights about consumers in a rapidly changing market; and, through the success of early adopters, they can also ascertain the need for their products or services. For this reason, the utilization of crowdsourcing by companies is expected to increase in the future.

③ Open innovation

Open innovation is a method of enterprise innovation. During the research and development and productization processes, an enterprise can open up the whole process and invite outside experts to share their ideas and knowledge. Through this form of sharing, enterprises hope to reduce costs and increase the likelihood of success. In the past, enterprises approached R&D activities more as an opportunity to augment and boost the efficiencies of their R&D manpower and their technological prowess, rather than as a chance to cooperate with outside parties. In fact, enterprises kept the lid on the output of their development activities firmly sealed.

This kind of corporate activity had its limitations when it came to responding to the rapidly changing market environment, and it became more difficult to launch products on time and satisfy the changing needs of consumers. In traditional R&D, the size of investments grew year by year, but the chance of succeeding was small and the risks borne by enterprises wereon an upward trend. In order to address these problems, enterprises began to actively explore the option of developing new products or services in collaboration with outside experts, institutions and organizations that held the required core capabilities.

Today, the sources of technology development (venture companies, SMEs, research institutes, and universities) have become even more diverse and the scope of potential technologies has expanded, and the development of network infrastructures has led to an era in which business connections with the outside world can create ever greater value. Thus, enterprise improvements triggered from the outside are accelerating more than ever before.



[Fig. 52] Comparison of conventional R&D and open innovation

Open innovation can be divided into inward open innovation and outward open innovation. In inward open innovation, an enterprise obtains know-how or ideas from an outside company, research center or university during the course of researching, developing, and commercializing a specific item. In outward open innovation, a company sends its knowledge or ideas to the outside world in order to commercialize them through other business models. There are six main forms of inward open innovation: technology purchase, joint research, sub-contracted research, establishment of a joint venture, venture investment, and acquisition. As for outward open innovation, technology sale and spin-off are its two main forms.

With the rapid advances made in IT technology, convergence as a trend is gaining momentum and the pace of development of new products through convergence has become much faster than before, making it difficult for companies to keep up with the pace of market changes simply by dint of their own R&D efforts. Open innovation capability as a means of strengthening innovation capability in the face of structural transformation of technology and business management is expected to have a huge impact on the growth of companies in the coming years.

B) IT business integration and expansion

① Business platform

A platform is a basic structure commonly used to produce or sell various products. Today, as competition among corporate ecosystems in the business market intensifies, the platform is increasingly being viewed as a key strategy for securing a competitive edge using one's enterprise ecosystem.

This signifies that as goods and services become ever more complex and the network effects between suppliers and consumers increase, the pattern of competition is changing from competition between companies to competition between corporate ecosystems. The platform is the foundation for creating and delivering values to the participating companies, and its role as a medium can determine the fate of the enterprise eco-system. The main functions of a business platform are described below.

<Table 64>Major functions of the business platform

Category	Description
Promote exchanges	Promote exchanges between interested stakeholders by providing locations where they can connect with each other.
Reduce costs	Reduce costs by providing time-consuming and costly functions on the platform.
Increase trust	The platform brand can offer a sense of safety and trust to the actual users.
Provide third-party services	Create advertising revenues or develop consumer points of contact by providing services to broadcasters, magazines, newspapers, etc. Provide third-party services to promote exchanges between different groups.

The importance of the platform is clearly illustrated by the examples of Apple and Nokia. Although Nokia entered the smartphone market earlier than Apple, its platform was edged out of the market by competition with Apple.

Symbian, Nokia's operating system, had a very complex development environment because it was geared for the enterprise market and focused on enterprise application. It failed to become a standard because the entry barriers to developers were too high. However, in the case of Apple, it emphasized the entertainment functions of the iOS and built an online contents-centered ecosystem (App Store) which attracted the participation of numerous developers.

In other words, the platform became a medium that connected and complemented the values produced by

stakeholders. As shown in the figure below, the business platforms that companies build to gain a business competitive edge can be classified into three categories: product platforms, customer platforms, and trading platforms.

Type	Product platform	Customer platform	Transaction platform
Definition	Universal component that can be used in the production of a broad range of products	Core customer group targeted by a company	Infrastructure used for doing transaction with outside suppliers
Purpose	Cost savings (reduced cost of developing and producing additional model)	Increased revenues (Increased revenues from diversified product line up)	Industry leadership (Customer solidification, expand market position through partnerships)
Scope	In-house		Outside the company
Potential	Platform potential / Platform utilization		
Examples	NOKIA (Launched around 10 platforms such as Series C, E, N, X, In 2009, the company was producing around 430 million phones (~80 models)	WOONGJIN COWAY (Established a home visit service network with its water purifier rental service in 1998. Expanded items to air purifiers, bidets, etc.)	APPLE (Acquired 14 million songs and 300,000 apps from outside content providers through the iTunes Store)

[Fig. 53] Types of business platform[7]

The product platform is a platform of the common parts used in the production of a final product. The purpose of such a platform is to reduce costs. The customer platform is the core customer group targeted by a company from which more profits can be made. Finally, the trading platform is an infrastructure that supports a trading relationship with external suppliers. Through customer entrenchment and cooperative relationships, an enterprise can become a leading player in the market by leveragingits trading platform.

Many companies try to create various business models and build a stable business ecosystem based on their own platforms. As a result, it is reasonable to predict that the business model will expand and the size of the platform market continue to grow in the future, and that it could in fact see accelerated growth.

② API economy

A company may disclose its internal business assets or services to a third party in the form of an application programming interface or API and create additional business values through the production of new assets and consumptions. The series of activities involved in this effort are collectively called "the API economy".

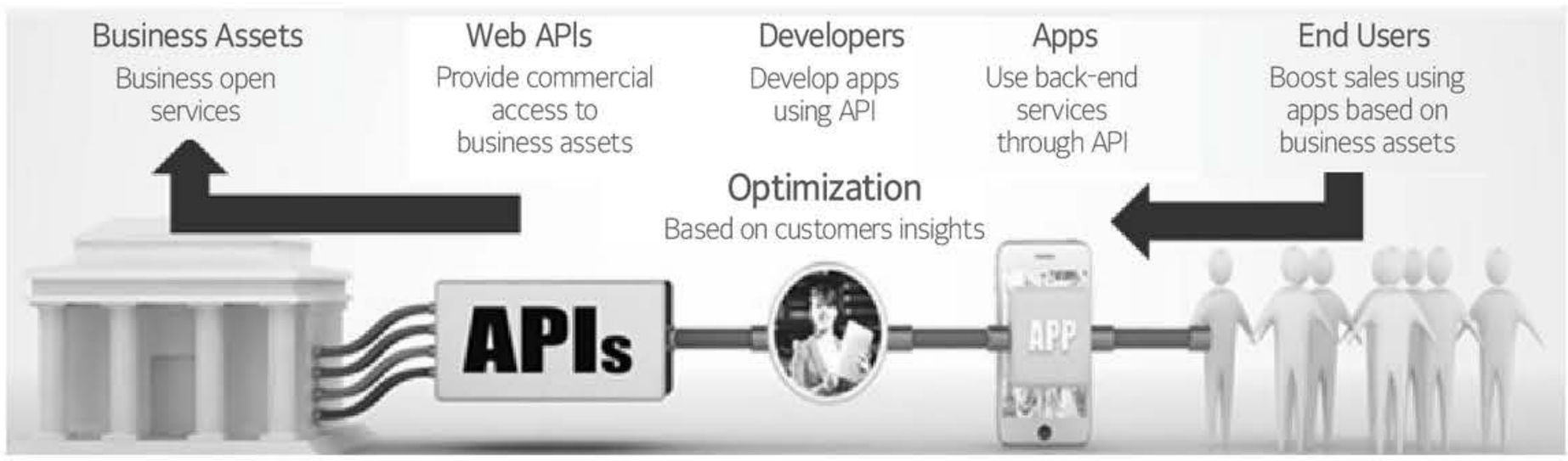
In an age when API open data constitute a new form of business, if companies wish to respond effectively to market demands, they must be able to apply assemblable business models in all channels and improve their operational and business agility. This means that the APIs can provide an environment (platform-neutral environment) where various

7 Source: SERI, "Platform, the topic of growth"

applications can be connected. As the characteristics and purchasing patterns of customers who seek and pay for goods using their smartphones are accumulated, they are released through the API and all the member companies get to jointly use the marketing data collected by each of the other members.

App developers will also be able to utilize the API open data as a business asset to build new applications and provide a variety of customized services to consumers. Since 2010, E*Trade has been providing its stock trading service to partner companies through an API. Its partner companies have been able to sell, order, or view a portfolio on behalf of its customers.

In addition, E*Trade has made it possible for its customers to use the company's service without requiring them to visit its website. Through this strategy, E*Trade has elevated the quality of its service and is providing it very stably.
In the United States, IT companies such as Amazon, Twitter, and Google are also generating revenue by releasing their data and services through APIs. By sharing their APIs (their core assets) through their respective business ecosystems, these companies are able to maximize their internal/external efficiencies and raise expectations of new revenue generation. But the task of developing and managing APIs is not easy and even after APIs are released, essential management tasks such as account management, authentication, and security management have to be taken care of. Since the number and diversity of APIs released by companies are increasing every year, systemized management of APIs is something that companies are being called upon to commit to.



[Fig. 54] API value chain

The API value chain must be understood before API can be used as a business model. In other words, enterprise data and services are released through APIs, and third-party developers create innovative applications by using the open API. Companies that provide APIs must also understand the requirements of third-party developers who use APIs directly and the even the needs of the application users.

Internally, an enterprise must have a system in place for monitoring and managing the released API.An enterprise should also be able to provide formal documents or websites where developers can contact each other so that external developers can easily understand and use the APIs.

In an era when mobile devices ranging from smartphones to tablets and smart watches are deeply embedded in our daily lives, companies should be able to manage different forms of customer contact points through strategic API management.

③ Servitization

The term "servitization" refers to a fundamental transformation of the business model in which a product evolves into a service bundle that continues to deliver value throughout the lifecycle of a customer experience. This means that the system of competition has shifted to around service whose revenue generation potential is intimately tied to the availability, reliability and performance of the company's assets. In particular, this phenomenon is expected to accelerate in the traditional manufacturing sector where revenues are generated from the sales of goods.

As the traditional product sales model gives way to a service model and as companies find it increasingly difficult to differentiate themselves on the merits of their products alone, many are striving to differentiate themselves through servitization, i.e. by combining their products with software. The software model for the servitization of a product can be one of three types, as shown below.

<Table 65>SW convergent model of products

Type of model	Description
Product-centered model	A model which features strengthened service elements without sacrificing the sales-oriented model.
Usage-based model	A model in which the producer retains the ownership but sells the right to use the product to an outside party.
Additional sales-oriented model	A model in which the producer sells diverse value-added services based on a product that has already been sold.

Many companies are strengthening their software convergence capabilities so as to be able to respond flexibly to the changing environment and secure a competitive edge in the market through servitization. Software convergence capabilities are becoming a key factor in determining the value of products and corporate performance.

Many companies are converging their products and software to optimize their business models and respond to the rapidly changing consumer environment.

<Table 66>Examples of convergent products and services of major companies[8]

Industry	Company	Description
Electronics	Apple	Built a service ecosystem using iTunes, App Store.
	Xerox	Transformed itself from a facsimile manufacturer into a supplier of document management systems.
	Philips	Acquired Health Watch in 2006 to venture into the healthcare service market.
Automobile	GM	Acquired 5.5 million customers through OnStar, its subsidiary company which supplies telematics services.
Heavy industry	Caterpillar	Through a GPS-based remote management system, Caterpillar provides a service for analyzing the status and history of excavator equipment, replacing parts, improving fuel efficiency, and monitoring illegal use.
Construction	Vinci	Airport/road/parking operation services account for 56% of operating profits although they only bring in 14% of the total revenues.

8 Source: KIET, New Growth Strategies of Major Industries in Korea through Servitization, 2008.

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IX. Latest IT Business Service

Recent trends and key issues

The rapid development of IT network and IT infrastructure technologies has not only brought about a revolution in the IT industry, but also introduced IT-based innovations across all industries. Existing products are being reborn as products with new values through convergence with IT technology, while technologies that received little or no attention in the early stages of their development are now becoming a reality and attracting renewed interest due to their integration with other technologies. Meanwhile, public services built around smart infrastructures have greatly improved efficiency in managing public services. Diverse industries are constantly turning out new products that feature convergence services. However, it must be understood that these market changes and paradigm shifts would not have occurred without the latest IT business services and technologies.

Learning Objectives:

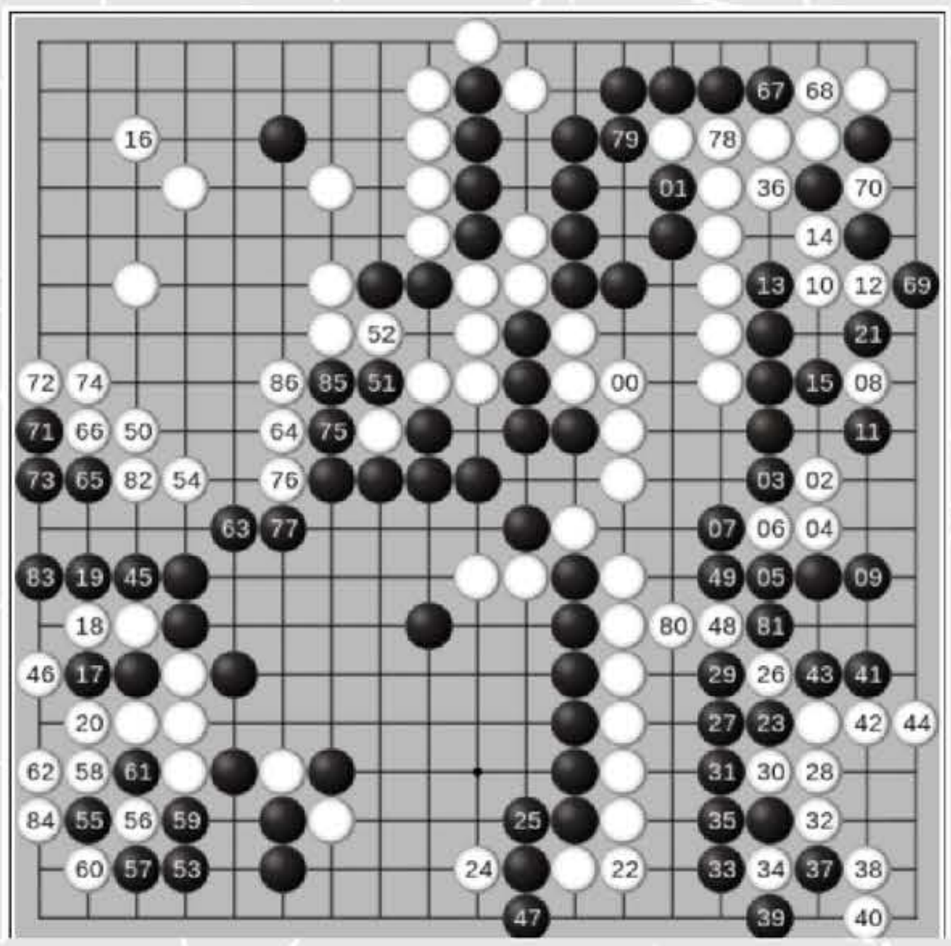
1. To be able to explain the latest web and mobile services.
2. To be able to explain convergent/integrated business services.
3. To be able to explain the smart infrastructure.
4. To be able to explain the latest IT business services

Keywords

① HTML5, SNS, responsive/adaptive web, open API, semantic web, OSS(open source software)
② MEAP(mobile enterprise application platform), MDM(mobile device management system), mobile commerce, LBS(location based service)
③ Internet of Things (IoT), cloud computing service, virtualization service, Block chain, smart city, smart grid, smart education, smart health care
④ Open data, linked data, AI, Fintech, Big Data, O2O, O4O(Online for Offline), virtual currency, 3D printing, self-driving cars, smart machines, wearable devices, drones

✚ Preview for practical business AlphaGo, the AI that beat one thousand years of human learning

The match pitting Lee Sedol (a Go player with the 9 'dan' rank) against AlphaGo's Deep Mind Challenge, held from March 9 to 15, 2016, was a shocking event that showed how artificial intelligence could far surpass human learning ability. The fact that AlphaGo defeated Lee Sedol, the world's No. 1 player for more than a decade and also one of the strongest players in the world of Go since 2014, was a clear sign that artificial intelligence can overcome human learning skills that have evolved over many thousands of years.



<Match between AlphaGo and Lee Se dol - Automatic victory for AlphaGo>

01 Latest Web and Mobile Service

A) Latest web technologies

① HTML5

Typically, a separate program must be installed when a person wants to use a particular service or program on a smartphone or PC. Kakao Talk is a leading messenger program that is widely used in South Korea and exists in different versions for PC, Android and iOS. As such, a separate program must be installed for each type of OS in order to use Kakao Talk. However, if HTML5 is used, there is no need to install a separate program, and Kakao Talk can be accessed directly through the web browser. Furthermore, word processors and games can be used without having to install with the help of HTML5.

The HTML5 standard is a next-generation HTML standard that overcomes the limitations of previous HTML standards, allowing rich web applications such as video, voice, and 2D graphics, without requiring a separate plug-in. Plug-ins and Active X control were very popular as solutions for overcoming the limitations of the previous HTML: However, each came with its own set of problems, which could only be overcome through functional expansion and combination through the advanced CSS3 and JavaScript APIs.

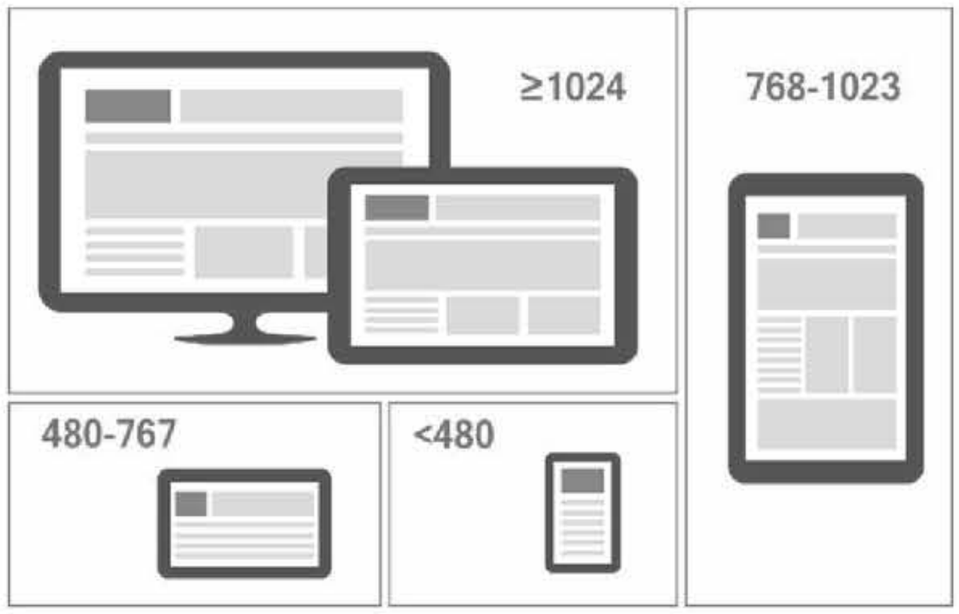
HTML5 was designed around the principles of compatibility, practicality, interoperability, and universal access. The contents of the HTML standard cover the document structure, markup standards, and API standards. When the semantic markup part and the API part of the HTML5 standard are examined separately, 26 new markups have been added to the semantic markup part to enable much clearer semantic representation than conventional HTML4. HTML5 allows various services or applications based on web content, such as search engines, to provide improved functionality. In the case of APIs, new functions such as web form, canvas, and web socket were added to support the development of web-based applications. HTML5 uses much less JavaScript code than HTML4 to support the same functionality, making it easier to use in mobile environments where network speed is a sensitive factor. Recently, a growing number of cases have arisen in which corporate business solutions are transitioning to an HTML5-based environment so as to maximize scalability and efficiency.

② Responsive web/Adaptive web

With the growing use of mobile devices such as tablet PCs and smartphones, interest in the mobile web is also increasing. Users want to enjoy the same web contents at the same level of quality, irrespective of the type of mobile device or PC being used. However, it was not easy to provide the same quality of service for different environments resulting from different mobile phone specifications and the restrictions that come with different mobile phone screen sizes. It is also impossible to develop a web that is optimized for all types of mobile devices. The responsive web emerged as one approach to solving this conundrum.

The responsive web is an approach to web design that results in the most optimal user environment, i.e. one that meets the requirements of many different devices - from desktops through monitors to mobile phones. In other words, it is a web whose size changes to fit any device environment, making it easy for users to read the contents. With the recent trend towards carrying mobile devices as the primary or first device, the number of mobile web users has grown to exceed the number of regular Internet web users. Web designers have responded by minimizing

unnecessary elements of regular web pages for the sake of improving the screen size, network speed and quality, and the user mode of the mobile devices (the common limitations of the mobile environment); that is, they have begun to focus more on the functions that should be provided on the mobile web. While responsive webs typically focus on how changes in layout and style take place from one device to another, there also exist responsive webs that reconfigure web contents strictly from a mobile first perspective.



[Fig. 55] The responsive web can configure the same contents in different ways.

In addition to the responsive web, adaptive web technology is attracting a lot of interest as a technology that enables websites to provide a seamless transition of information for different screen sizes. The adaptive web is a server-based or client-based technology that checks the device that is trying to access the web. By using images tailored for the device of the user, the adaptive web allows website access on a mobile device at high speeds.

③ Semantic web

Web that enables intelligent data processing and the accumulation of knowledge through the defining and building of structured data (ontology) and data linking among the structured data is called semantic web.
The web, which only displays web documents in HTML language, has severe limitations in expressing resources, and the relationship between web documents is defined. Hence computers cannot understand semantic. Since there are problems in recognizing all objects with just URL alone, semantic web was developed as a way to efficiently use information from distributed webs, extract meaningful data from flood of information, and as a means for structuring and interpreting the huge amounts of data produced on the web.

<Table 67>Application areas of semantic web

Area	Descriptions	Examples
e-commerce	Connection to e-commerce frameworks like ebXML	e-Commerce, e-Catalog
Data Mining	Web mining for the entire web	e-CRM, e-MarketPlace
Knowledge processing	Collect and distribute large volumes of knowledge using agent	Subject Map, Taxonomy
Web service	Link with enterprise business service components	UDDI, Registry

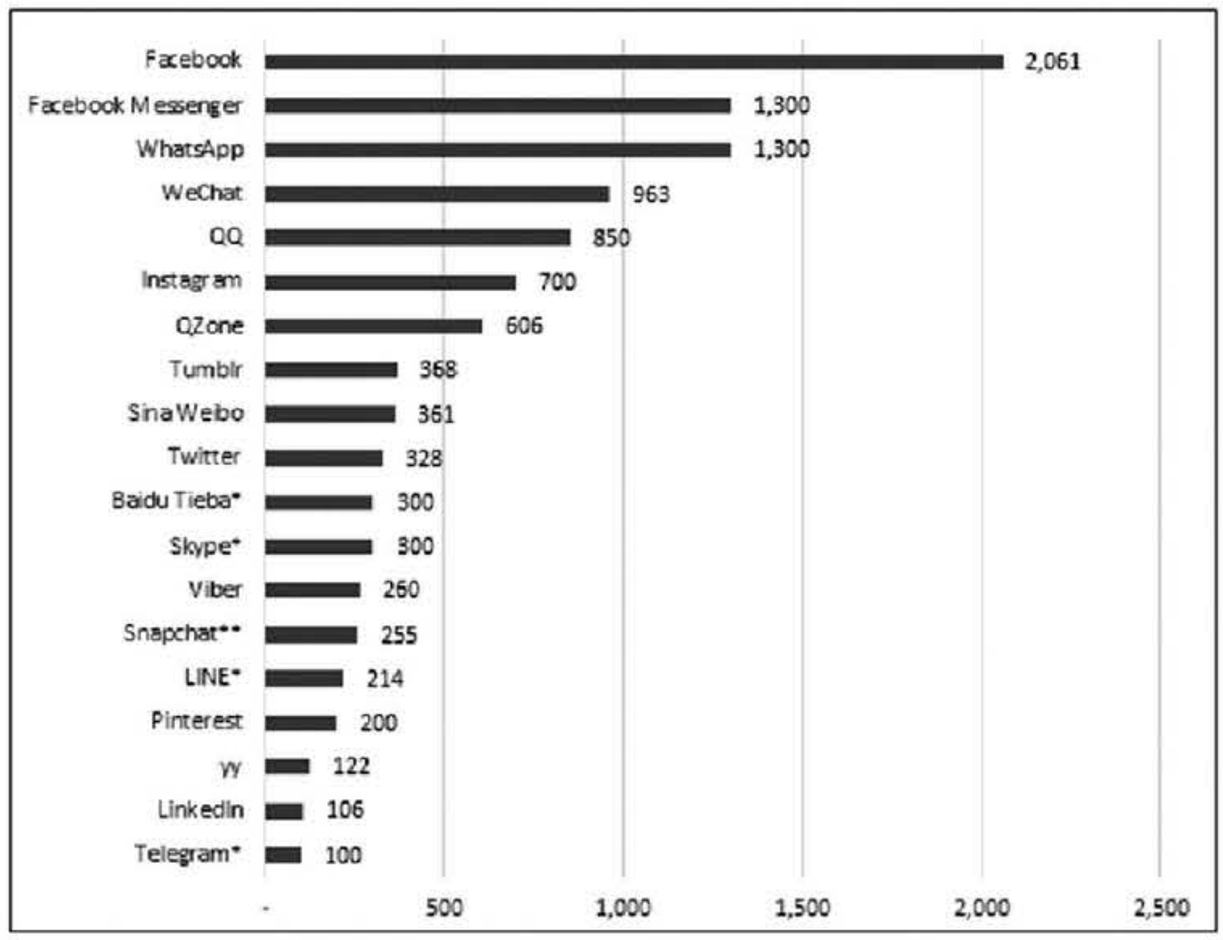
④ SNS(Social Network Service)

Social Network Service (SNS) refers to a service that helps people continue their personal relationships online or to establish new relationships. Early SNSs began in the form of online communities on websites, such as "The Well," which began in 1985, and "Theglob.com," which started in 1994. These are the first examples of SNS that provided services in the form of early communities.

<Table68> Main functions of SNS

Category	Description
Forming relationship	Provides basic function that lets users set their relationships and use functions provided from SNS.
Profile	Function for registering information that characterizes a person such as the home town, alma mater, interests/hobby, occupation, employer, etc.;
Communication	Provides communication functions like chatting, messages, email, video chatting.
Contents production	Provides tools for creating contents using photos, video clips, messages and texts.
Network utilization	Users are permitted to utilize the network, for purposes like recommending/distributing user profiles, user contents to the outside world;

Facebook, the global SNS site with the largest number of users, has about 2 billion (September, 2017) monthly users. WhatsApp, another global SNS site, has acquired about 1.3 billion users.



[Fig.56] Number SNS users each month (as of September 2017, units: 1 million people)

Note: Figures for the sites marked with *were not updated for the past 1 year.
Source: STATISTA (2017.9)

⑤ Open API (Open Application Programming Interface)

Open API is a free public API that is free for use by anyone including users and developers. By using the API provided to the public free of charge by websites, users are no longer confined to receiving and consuming services. They can now develop their own service and use them.

• Characteristics of Open API
- Using the open API, people can gain access to the functions of a website.
- New service can be designed by connecting several APIs.
- Key factor in the emergence of mashup sites[9] .
- People who were just users of a service can become service providers.

<Table69>Component elements of Open API

Category	Description
What could be Open API	Service that an API provides to users (weather, traffic, public information, map, etc.)
How to 'open' an API	Server: XML, SOAP, Blooging API Client: XML, Javascript, DOM, XML Http Request, AJAX, etc.

• REST (Representational State Transfer) API
REST API is currently the most widely used Open API.
REST API is a network-based architecture published in 2000 by Roy Fielding, one of HTTP's leading authors, to properly utilize the superiority of the Web (HTTP). REST is a web service architecture based on the Resource Oriented Architecture (ROA) and it is composed of HTTP URI + HTTP Method. HTTP URI is used to specify the target resource, and the designation of actions for that resource utilizes the HTTP Method.

<Table 70> Examples of REST API Method

Method	Role
POST	Generates the relevant resource.
GET	Search the relevant resource and extracts information.
PUT	Corrects the relevant resource.
DELETE	Deletes the relevant resource.

B) Mobile service

① Location Based Service

Location-based services are growing together with the smartphone market, which has seen exponential growth since 2010, and are evolving into a broad category of services by merging location information, commerce, and entertainment. Due to the mobile Big Bang, the availability of location detection capable devices greatly increased and the location determination platform became open. This led to the rapid evolution of location-based services (LBS) In the case of location detection mechanism used in smartphones, location detection technologies like base stations Cell-ID, GPS, and Wi-Fi were combined with motion sensor-based precision guess navigation. Furthermore, by adopting maps like Google Map and Apple Map, location-based services began to be used for many general purposes.

9 Mashup site -Websites that use APIs for product information, map information, etc. from Microsoft, Google, Yahoo, Amazon, and others and combines them with their own user interfaces to come up with new services.

These technologies in combination with services such as social network services, augmented reality, mobile games, and advertising, are boosting the utilization of the services. Network-based location detection technologies include the following:

<Table71> Network based location determination technology

Category	Description
Cell ID/Sector ID	A method of calculating the location of a device by measuring the location value of the base station and the distance between the base station and the device.
AoA (Angle of Arrival)	A method of calculating location of a device by measuring the angle of arrival of signals sent from each base station to the device and the location values of at least 2 base stations.
TDoA (Time difference of Arrival)	A method of calculating location of a device by measuring the time difference of arrival of signals sent from each base station to the device and the location values of at least 3 base stations.
Fingerprint/ Pattern Matching	A method of calculating the location of a device by using the location information of base station and the intensity of the radio signal sent by the base station.

With the advancements in IT technology and mobile communication technology, the technique of location determination has also evolved. In the 2G era, location determination was based on the principle of simple cell-based positioning. But for 3G location determination, the Global Positioning System (GPS) was adopted. In the 4G era, location determination has become highly precise with very narrow error margins because the technology has greatly improved the high error margins that had been the weakness of base stations and the difficulty of determining positions in indoor areas and areas with many impediments to GPS. And wherever an access point (AP) exists, location determination has become possible with Wi-Fi.

② Mobile Commerce

Mobile technology can be characterized by 3 words: "Anytime", "Anywhere", and "Any Device". It is these characteristics which has made mobile technology the essential backbone of mobile businesses from mobile based commerce to mobile based entertainment, communication, search, and location information.
Mobile commerce is mobile business that utilizes mobile devices like smartphones, tablets, and smart pads for trading goods, services, and information.

<Table72> Comparison of M-Commerce and E-Commerce

Category	E-Commerce	M-Commerce
Network	• Fixed network • High speed line • Rich applications • Stable quality of communication	• Mobile network • Relative low speed line • Provides simplified user experience • Relatively unstable communication quality
Device	• Big screen • A lot of memory • High speed processing • Convenient input/output device	• Relatively small screen • Low memory • Low speed processing • Input/output device are unnecessary
Others	• Conducted at home or office • Personal or public	• Location of the user must be determined • Personal

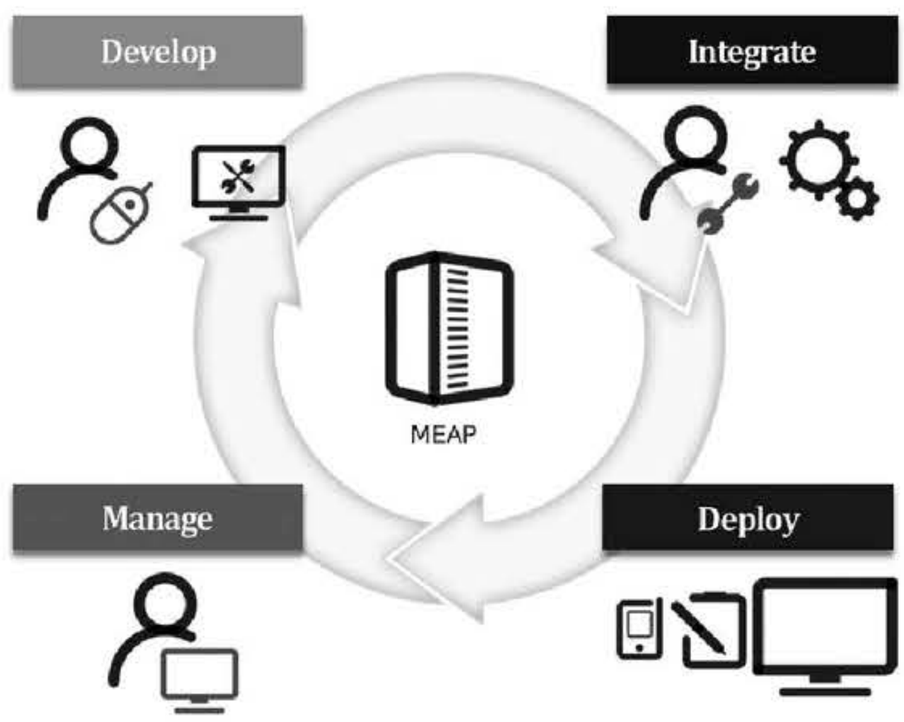
<Table73> Key technologies of mobile commerce

Technology	Description	Subsidiary technologies
Wireless communication	• Wireless service for sending and receiving voice/data/video information.	• GSM, IMT-2000, 3G, 4G(LTE), 5G
Mobile security	• Requirement for core security functions like certification, confidentiality, integrity and denial prevention.	• Encryption-based security • Public key-based security
Mobile payment	• Direct payment between parties • Payment between parties through the banking system. • Payment between parties through an independent 3rd party.	• Simplified payment • Electronic wallet
Mobile application server	• A software platform for easily developing and operating several application services in not just a fixed line communication environment, but also in a wireless communication environment.	

③ MEAP (Mobile Enterprise Application Platform)

Mobile Enterprise Application Platform (MEAP) is a platform that can support a wide range of different device environments and permit the sharing and the reuse of applications.

• The main reasons behind the need for MEAP are reuse and cost savings.
- Allows the same code to be reused for different smartphone OS/smartphone HW/service provider environments.
- Through the sharing of a common platform, companies can save money that would others have to be spent on duplicate infrastructure and middleware required for services.
- Support for developing the mobile screens for different types of devices.
- Support for testing and interworking



[Fig. 57] Concept diagram of MEAP

• Components of MEAP

MEAP covers the entire life cycle from mobile development to execution and operation. It is composed of an integrated development environment (IDE), an execution environment framework that acts a middleware, standard interface for integrating with legacy system, and a mobile device management (MDM) for device management and security.

<Table 74> Component elements of MEAP

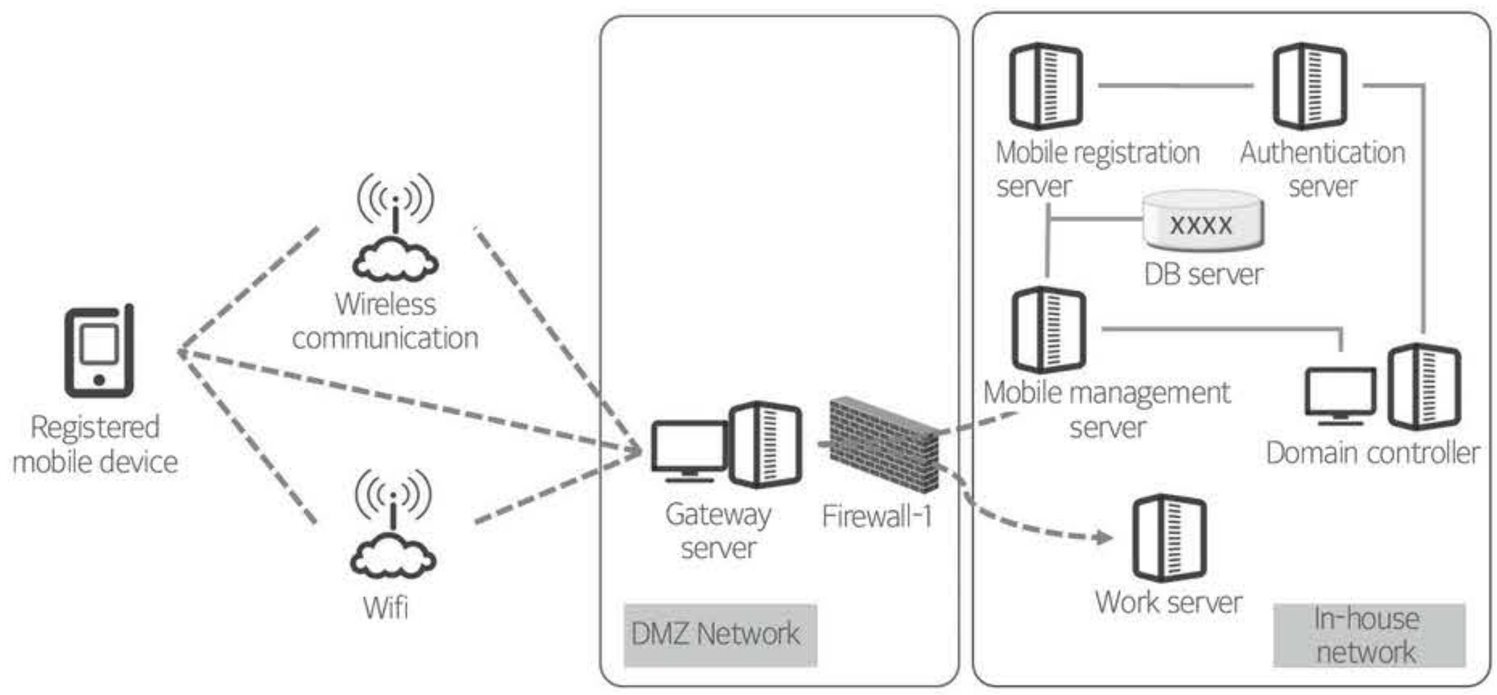
Category	Component elements	Description
Development environment	Integrated development environment	• Project set up, coding, simulator for testing
	Mobile Framework	• Provides meta (abstraction) layer for one source multi use
Execution environment	Distribution management	• Distribution of mobile app and management of versions
	Execution framework	• Function for executing code which is independent of platform and device (a sort of middleware), provides wrapper for device API
	Back end integrated interface	• Standard interfacing with existing application and reuse
Operations environment	MDM (Mobile Device Management)	• Device management, device app management, security management, access control and lost device management
	Service operations and management	• Integrated interface monitoring and management

④ MDM (Mobile Device Management)

MDM is a solution for efficiently managing all the diverse mobile devices and applications used in enterprise operations. It is a system that can be used to manage mobile devices anytime, anywhere through over-the-air (OTA) transmissions (although the device must be in the power on state).

<Table 75> Main functions of MDM

Function	Description
Device management	Collect information related to the mobile device/ manage distribution (identify the mobile device ID)
Registration for use and tracking management	Function for the registration/approval/recall of mobile devices. Function for freezing the use of a mobile device when a loss/theft is reported.
Establish and enforce security policy	Join mobile device to a company's internal active directory. Establish and enforce security policy based on the policies of the group company.
Software distribution	Join mobile device to a company's internal active directory. Establish and enforce security policy based on the policies of the group company.



[Fig. 58] Configuration of MDM

<Table76> Component elements of MDM and roles

Component elements	Roles
MDM Gateway Server	• Located in the DMZ or the screened subnet, the server functions as the authentication connection between the internal network and the mobile device. • Gateway role for communication like direct push update.
MDM Device Management Server	• Role of managing and operating mobile device. • The server plays the role of a functional hub for distributing group policies and software. The server also plays the role of communicating with other enterprise infrastructures.
MDM Enrollment Server	• Assigns authentication to mobile devices that had been recalled or upon receiving a certification request. The device certification is carried out using OTP.
Databases	• Stores the databases for managing, configuring, working, and setting up the mobile device on the MDM Device Management Server and the MDM Enrollment Server

• MDM deployment effects

By deploying MDM, enterprises will gain flexibility and expandability. They will able to connect to diverse services, manage devices at PC level, ensure consistency in security, provide remote support easily, trouble shoot issues and provide OS/language/system support.

02 Smart Business Infrastructure

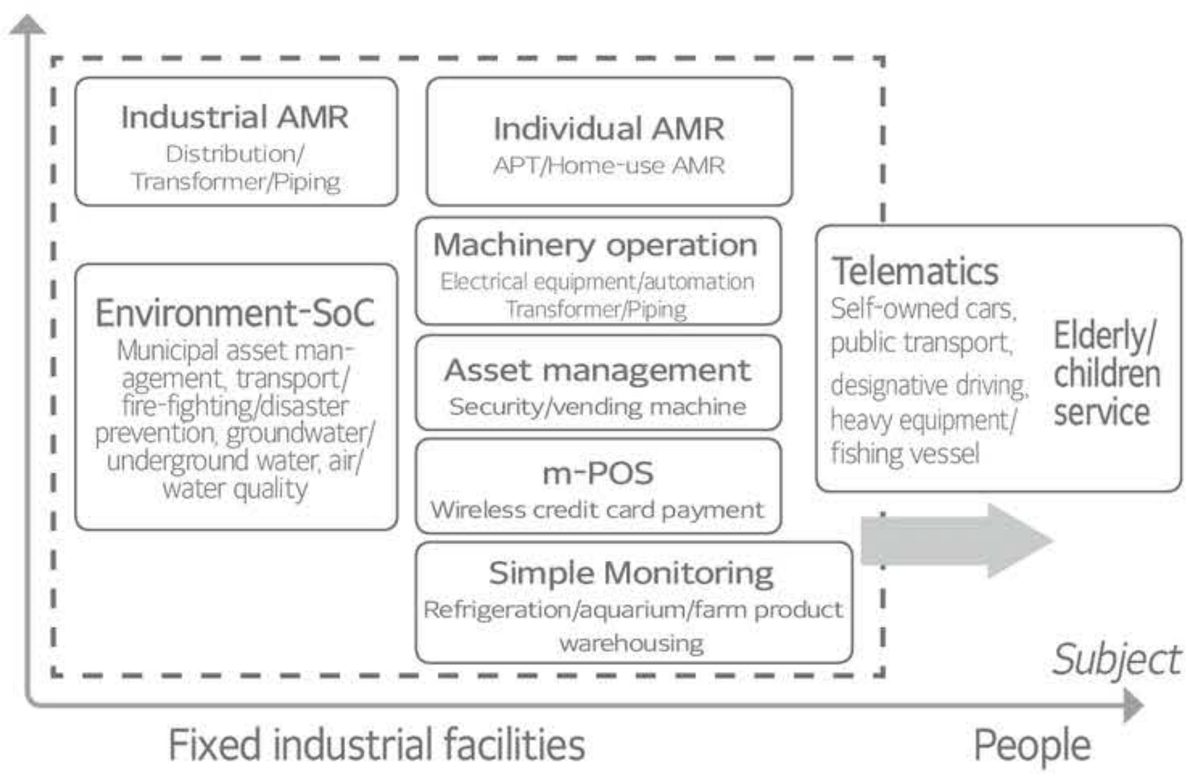
A) Convergent infrastructure

① Machine to Machine (M2M)

Machine-to-Machine (M2M) refers to machine to machine communication. M2M integrates information to network and platform to provide a service that monitors the status of objects, controls the situation and sends information about the status of objects to users. Network communication networks are used to provide people or intelligent devices with information about objects or to let them control the objects. Typical types of M2M services are described below.

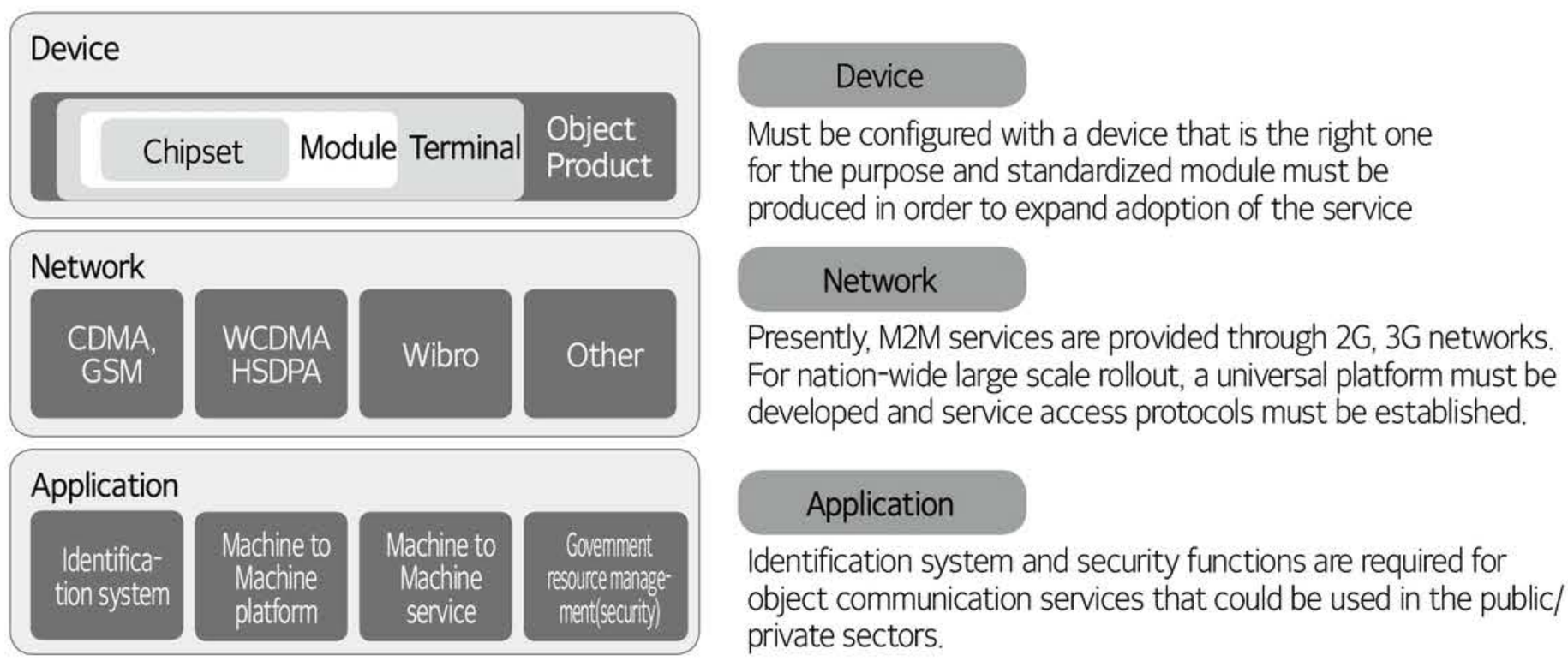
Solutions that use communication and IT technology to connect to devices, people and the environment in remote locations and check up on their status.

Type	Type
Remote metering	Remote metering
Remote Control	Remote Control
Fleet management	Fleet management
Remote monitoring	Remote monitoring
Delivery management	Delivery management



[Fig. 59] Types of machine-to-machine services and market status

There are three reasons driving the spread of the infrastructure for M2M communication. The first reason is the expanding wireless networks. The coverage of wireless networks and the guaranteed service stability greatly facilitated the growth of M2M communication. The second reason is the declining prices and increasing availability of telecommunication modules. The telecommunication module market is growing at more than 30% per year, but prices are gradually decreasing, and market penetration is rapidly increasing. The third reason is the declining price of sensors. As the market expands, sensor technology is getting more sophisticated, but prices are falling, allowing companies that provide sensing-based services at low cost. These sensors are expanding from simple monitoring to fault and accident detection, asset management, and customer usage management information. Furthermore, the applications of these sensors are becoming increasingly diverse. Starting first with simple monitoring, sensors are now being used to detect malfunctions and accidents, manage assets, and extract data about customer usage levels.
Typically, the process of developing an M2M device first begins with developing a module that contains a mobile chipset. Then the device is developed using the module. An M2M device can be roughly designed as an object consisting of a chipset and a module and largely divided into three parts: a sensor/input&output unit, a data processing unit, and a communication module.



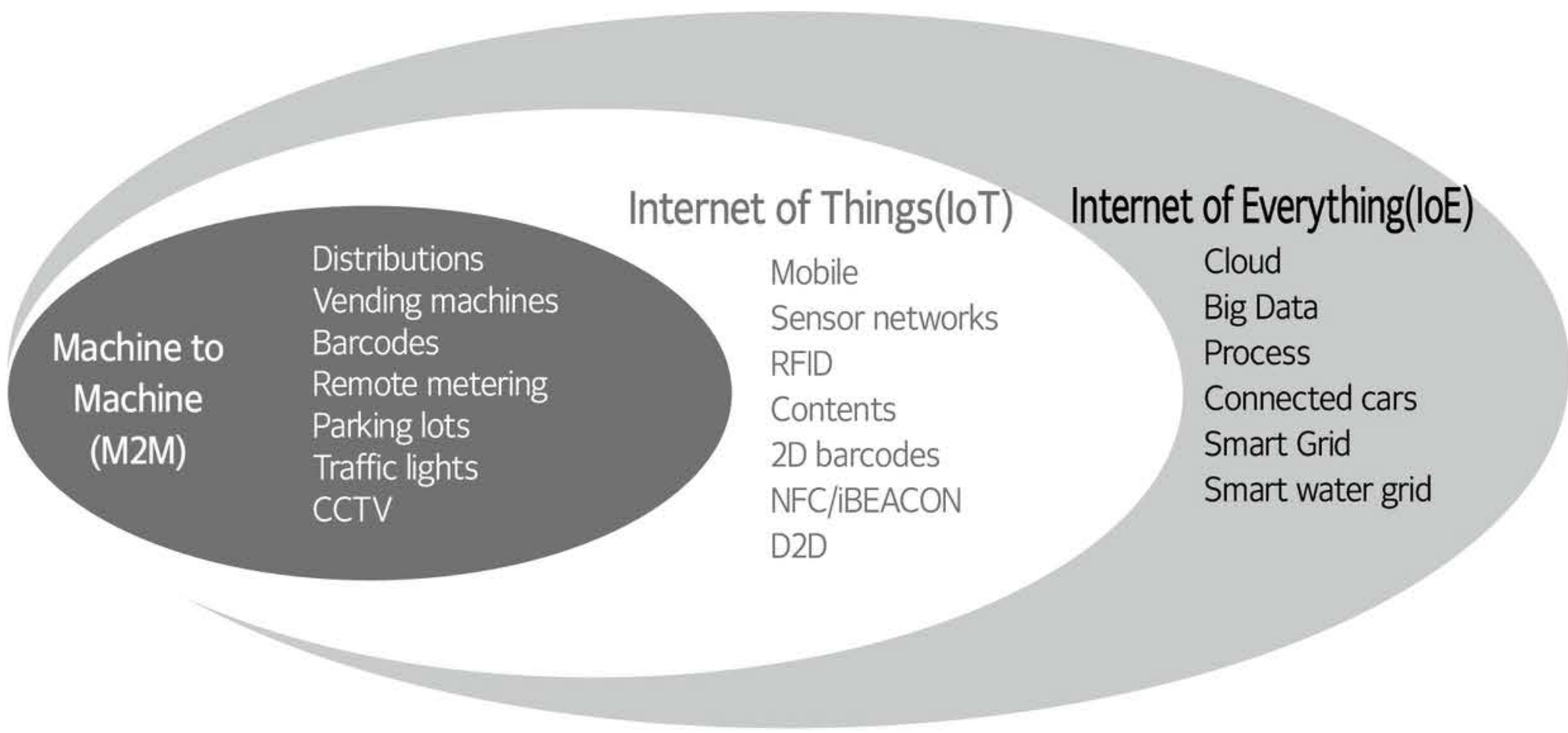
[Fig.60] Component elements of M2M

The data acquired through the input&output uniit is processed by the data processing unit before it is sent to the communication module. RS-232 or USB is used when sending the data from the processing unit to the communication module. The technology used in M2M communication defines the technology needed for services at the service layer and takes a typical top-down approach to design the the lower layer to follow the definition set by the service layer. However, this approach can disrupt the standardization and public sharing of the technology and hinder the growth of the market. Therefore, standardization of the M2M environment is a critical task for stimulating the growth of the market.

② IoT (Internet of Things)

The diffusion of M2M technology has opened wide the era of IoT which creates an environment where communication takes place not only between objects but everything from people to objects, spaces are connected to the Internet to create, collect, share, and utilize information about everything. Unlike the recent explosion of public interest in IoT, the idea of IoT was already commercialized a long time ago.Its just that IoT has been spreading/evolving gradually

due to a combination of factors at play such as the technology development levels and the economic conditions. In recent years, buzzwords describing a completedly connected world (M2M, IoT and Internet of Everything) are being discussed so much that it has become rather diffcult to distinguish the difference between such words.The difference between the approaches taken by M2M and IoT is in how connections are made. As mentioned earlier, as M2M evolved in each industry sector, it became specialized to the particular sector it served. IoT is the effort to connect these disparate M2M technologies under the universal communication network umbrella we call the Internet so that businesses could offer more diverse and dynamic services. There are many different perspectives to M2M, but if they are grouped by different types of services, some of the typical examples can be listed as follows.



[Fig.61] Examples of M2M, IoT and Internet of Everything services

Global IoT is presently in the introduction phase or early growth phase of its technology life cycle. But it is expected to grow more than 20% annually to reach $1.2 trillion by 2022, and it will create new value by reducing the transaction costs between the physical world and the digital world. Ultimately, IoT will eventually improve productivity and give birth to new markets. Due to the market's desire to value connectivity and technological innovation, the market will push IoT to transform itself into a mobile centric network where information can be accessed anytime and anywhere. The increasing speed of network connectivity and the market penetration of different types of mobile devices and connection technologies have triggered the generation and sharing of much more data than before. Consequently, IoT is being applied even to the process and analysis of Big Data. In addition, the accumulation of product knowledge in the market, increased use, and the process of connecting are encouraging the market to change itself from a supplier market to a buyer's market. This trend will have a significant impact on the development direction of future technologies and products.

The functions expected to drive the growth of the IoT industry include optimization function, function for integrating with other social infrastructures that transcends industries, and function for managing social infrastructures. These functions may contribute to greater social benefits, such as improving the efficiency of social infrastructure or responding to echoes, rather than improving personal convenience.

③ Clouding Computing

Cloud computing is a technology that lets people user IT resources (networks, servers, storage, and service applications) through the Internet as a service whenever they need them, without ever having to own them. This implies the IT services could be provided better and cheaper anytime and anywhere. Different organizations each define the concept of cloud computing in their own different ways. Gartner defines cloud computers as a form of computing that leverages Internet technology to provide high-level, scalable resources to many customers as a service. Forest Research defines cloud computing as computing that provides standardized IT based functions through IP, access to computing at any time, computing power that varies based on the level of demand, provides billing model based on the usage level or advertising and provides web or programmable interface.

Cloud computing is not a new technology, but it existed as a concept for a long time in the IT community. But it emerged as a market issue as companies began to show interest in cloud computing to reduce costs in the wake of the global economic recession. Cloud computing can be seen as a form of rental business. With improving virtualization technology, it became possible to integrate the IT resources located in different spaces into a single system for service.
The characteristics of cloud computing are summarized in the table below.

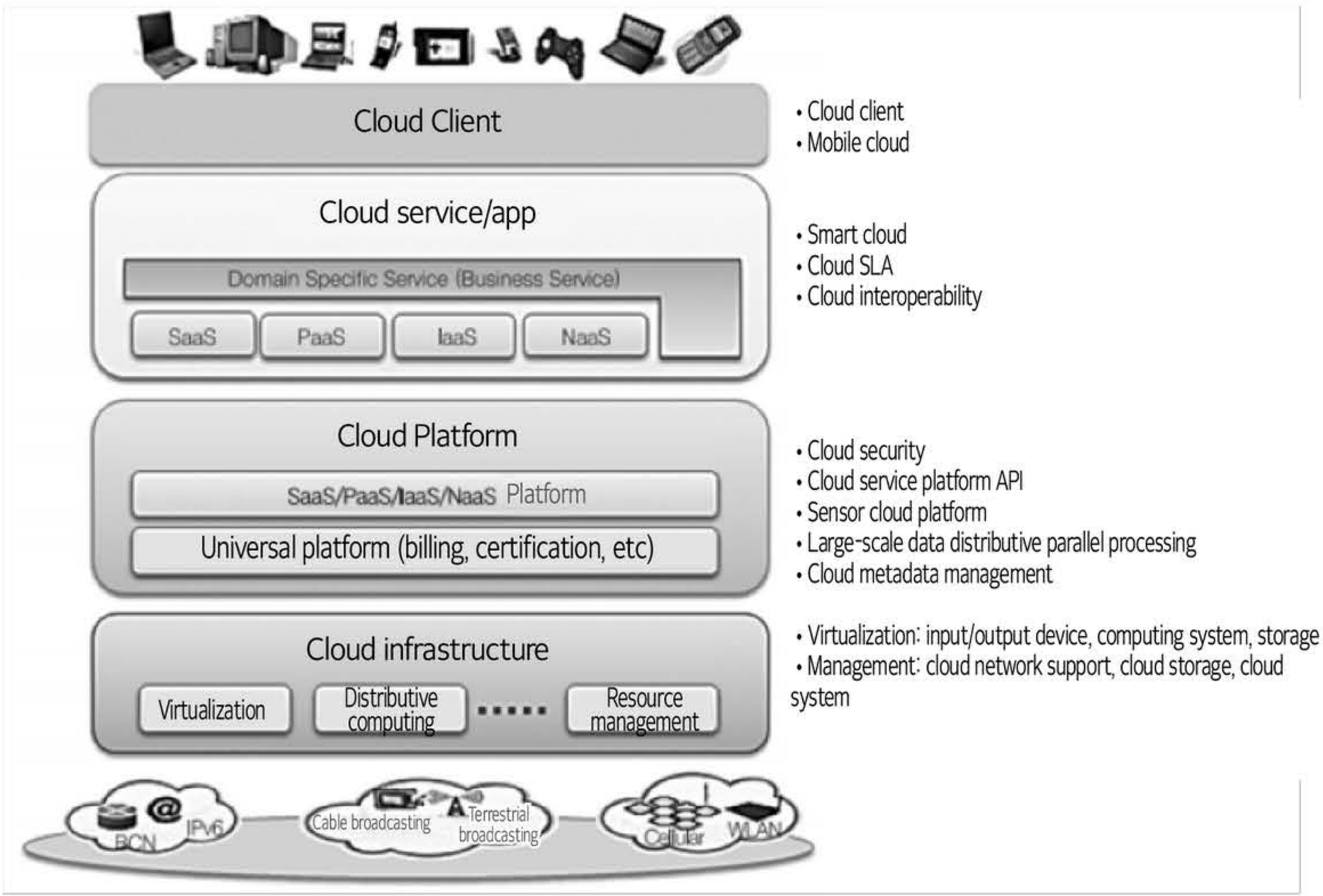
<Table77> Characteristics of cloud computing

Category	Description
On-Demand	Cloud computing can dynamically meet customer requirements, and customers can build infrastructure with minimal infrastructure investment.
Scalability	Cloud computing is scalable and can be used whenever resources are needed and returned when they are not needed.
Broad Network Access	Cloud computing is available through networks and accessed through basic mechanism that stimulate the use of thick or thin client platforms.
Resource Pooling	• The computing resources of the cloud service provider are pooled in multi-ownership structure so that multiple different customers could be supported. • Different physical and virtualized resources are dynamically allocated, disassembled and used to meet the requirements of customers.
Measured Service	• The form of service (storage, processing, bandwidth, active user account) is summarized and resources are automatically adjusted for use. • The amount of resources used is monitored and controlled. The findings are then reported in a transparent process to the service provider and the service users

Cloud computing has a direct and interactive relationship with the IT sector, which encompasses networks, hardware, solutions, and applications. The stakeholders of cloud computing can be divided into three main groups. In the first group are vendors who provide hardware, solutions, and applications to cloud service providers. In the second group are providers that provide cloud services to users and some global leading companies are Amazon, sales force dotcom, and Google. Third, there are various users such as individual users or corporate users, those that actually use cloud services. Users can rent as much services as they need and they can scale up their services in real-time in response to increased service loads, support real-time scalability based on service load. And they only have to pay as much as they use.

Cloud services are made up of the following technologies. [10]

- Cloud client is a technology for utilizing cloud computing services like cloud lightweight terminal platform technology, cloud-mobile technology, and cloud push agents.
- Cloud service and applications are technologies for providing the many types of cloud computing services in SW or application format.
- Cloud platform is a cloud computing technology for providing in service format, the platform of basic functions for easily developing services.
- Cloud infrastructure is a cloud technology that provides resources such as servers, storage, and networks as services to users.



[Fig.62] Hierarchy diagram of cloud service[11]

Cloud computing is sub-category of next-generation computing. It has been standardized around cloud security, cloud clients, and cloud platform virtualization, which means different cloud services are compatible with each other. In addition, guidelines for managing quality indicators needed for service operations have been established and are the focus of a lot of effort because such guidelines are the key to stimulating the growth of the market.

④ Cloud computing service

Cloud service model can be put into 3 classifications, based on the nature of the IT resources.

10 Source: TTA, ICT Standardization Strategy Map, 2011

11 Source: TTA, ICT Standardization Strategy Map, 2011

- SaaS(Software as a Service)
- PaaS(Platform as a Service)
- IaaS(Infrastructure as a Service)

SaaS is a service that lets people use applications through the Internet and web browser. Saas is one of the top tier services that cloud service companies can provide and leading services include Google's Gmail and MS Office 365. PaaS is a service that lets companies provide as a service, an environment for developing and running web applications. In order to provide this kind of service, the technologies for app development must be modularized and standardized. Leading Paa include Salesforce.com's Force.com and Google's Google App Engine. IaaS is principally an enterprise service that provides a virtualized environment of resources like servers, storages, and networks to companies who are permitted to use the resources whenever needed. IaaS service requires the ability to build and operate servers for large data centers, capital, and a very good electrical grid environment. Examples of IaaS include Amazon EC2 and S3, as well as Gabia's cloud hosting service.

Cloud service can be divided into one of the following categories, depending on how it is configured.

- Public Cloud
- Private Cloud
- Hybrid Cloud

A public cloud is a service shared by multiple users over the Internet, and a cloud service provider provides the services and has management responsibilities. A private cloud is an IT environment that is exclusively deployed on a company's or an organization's intranet. It is controlled by the company or organization. Hybrid cloud is a form of cloud service that has scalability and combines the best of public cloud services and private cloud services. It can be used in parallel for special purpose applications.

With cloud computing, users can directly purchase, design and install without the need for intervention by an IT manager. By sharing IT resources that could be used by everybody, cloud computing improves efficiency and the cost associated with owning IT resources could be avoided. Due to these advantages, cloud computing can be merged with different types of services and evolve into new business models.

⑤ Virtualization

Virtualization is the abstraction of computer resources on a computer and it could be defined as "a technique for hiding the characteristics of physical computer resources from the method other systems, applications, and end users use when they interact with the resources". It is a technology that can create multiple logical resources from a single physical resource or create a single logical resource from multiple physical resources.

- Application virtualization
- Through the virtualization of applications installed in individual PCs, users gain immediate access to needed applications without having to install them on their PCs every time.
- Desktop virtualization

  Server-side desktop virtualization allows users to virtually own another heterogeneous desktop, such as Windows Vista and Windows 7.

  Client-side desktop virtualization enables heterogeneous virtual desktops in PCs.

  Desktop virtualization allows the separation of personal and corporate workspaces.

- Server virtualization
  By consolidating dozens of physical server workloads within the data center on to several virtual servers, the utilization of server resources can be improved (physical rack costs, administrative costs, and green IT).
- Storage virtualization
  In place of the physical storage space required, a technology called Thin-Provisioning virtually allocates only the initial minimum required space to enable service implementation. It also provides an environment where heterogeneous storage systems can be integrated and used.
- Network virtualization
  L2, L3, L7 switches, network firewalls, and security equipment that had existed in the form of hardware appliances are implemented as virtual machines. This allows network resources to operate internally through virtualization, even in a single shared physical environment.
- Functions of virtualization
  Virtualization includes four basic functions: sharing, aggregation, emulation, and insulation.

<Table78>Virtualization functions

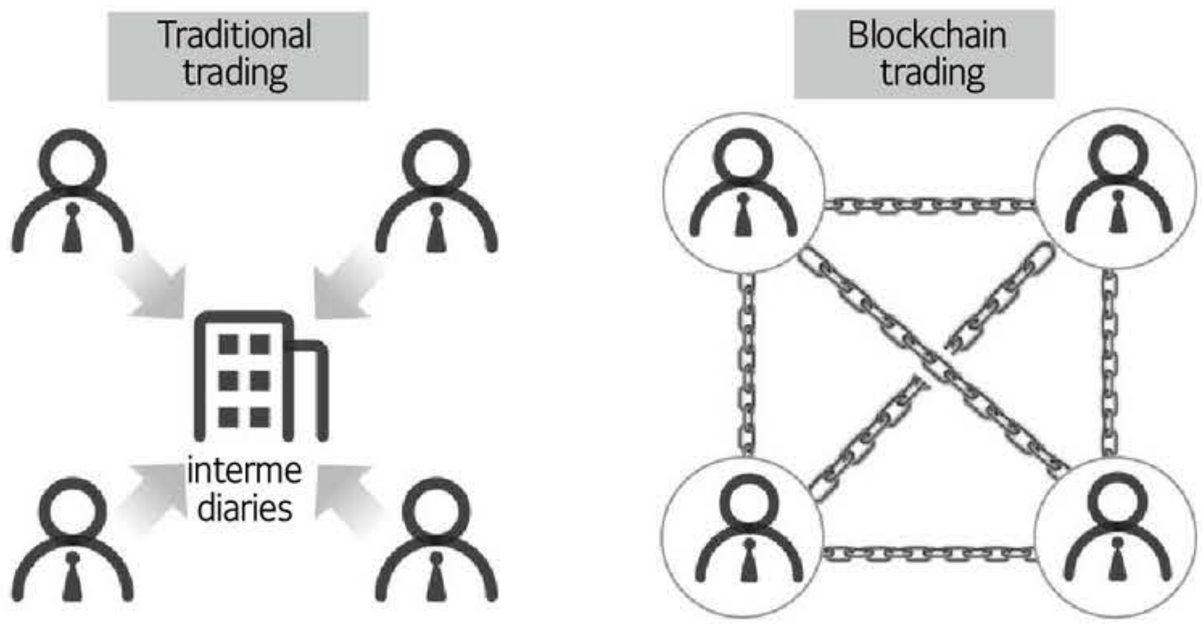
Function	Description	Examples
Sharing	• A function in which many virtual resources are used in one identical physical resource. • It is used to allocate a portion of physical resources to each virtualized resource. Or use a physical resource by sharing through time sharing method.	• Logical partitioning (LPARs), • Virtual machine (VM), • Virtual disk • Virtual LAN(VLANs)
Aggregation	• The virtualization concept that is the opposite of sharing. Virtual resources exist across multiple physical resources. Outward appearance wise, it can increase the overall capacity. From a holistic perspective, it can simplify utilization and management.	• Storage virtualization
Emulation	• A function that can make some function or characteristics in a virtual resource appear to have existed from the very beginning although they do not exist in physical resources.	• iSCSI • virtual tape storage
Insulation	• Intermapping between virtualized and physical resources is a feature that allows physical resources to be replaced without affecting virtualized resources or users who use them. This function is also called transparent change and has the effect of preventing failure (Failure Proof).	• RAID storage controller which uses multi disks

⑥ Blockchain service

The surge in the use of cryptocurrency Bitcoin in recent years has led to growing interest in blockchain, the core technology behind Bitcoin. Using the concept of distributive network-based decentralization, Blockchain is a distributed ledger network technology in which P2P data blocks that are stored on a distributive network form chains with each other.

• Characteristics of blockchain

Unlike traditional trading methods, transaction ledger data are recorded and managed and verified in block units on all nodes in the network.



[Fig.63] Blockchain trading

• Decentralized

A system that by itself proves and guarantees the integrity of data by having all the nodes on the network working together without the presence of a central server (a central aggregator).

• Improved security

Security is greatly improved because a transaction is accepted only after the consent of more than half of all nodes on the network is obtained.

• Transparency of transactions

The details of transaction record are disclosed because all nodes participating in a network share their ledgers.

• Enhanced safety

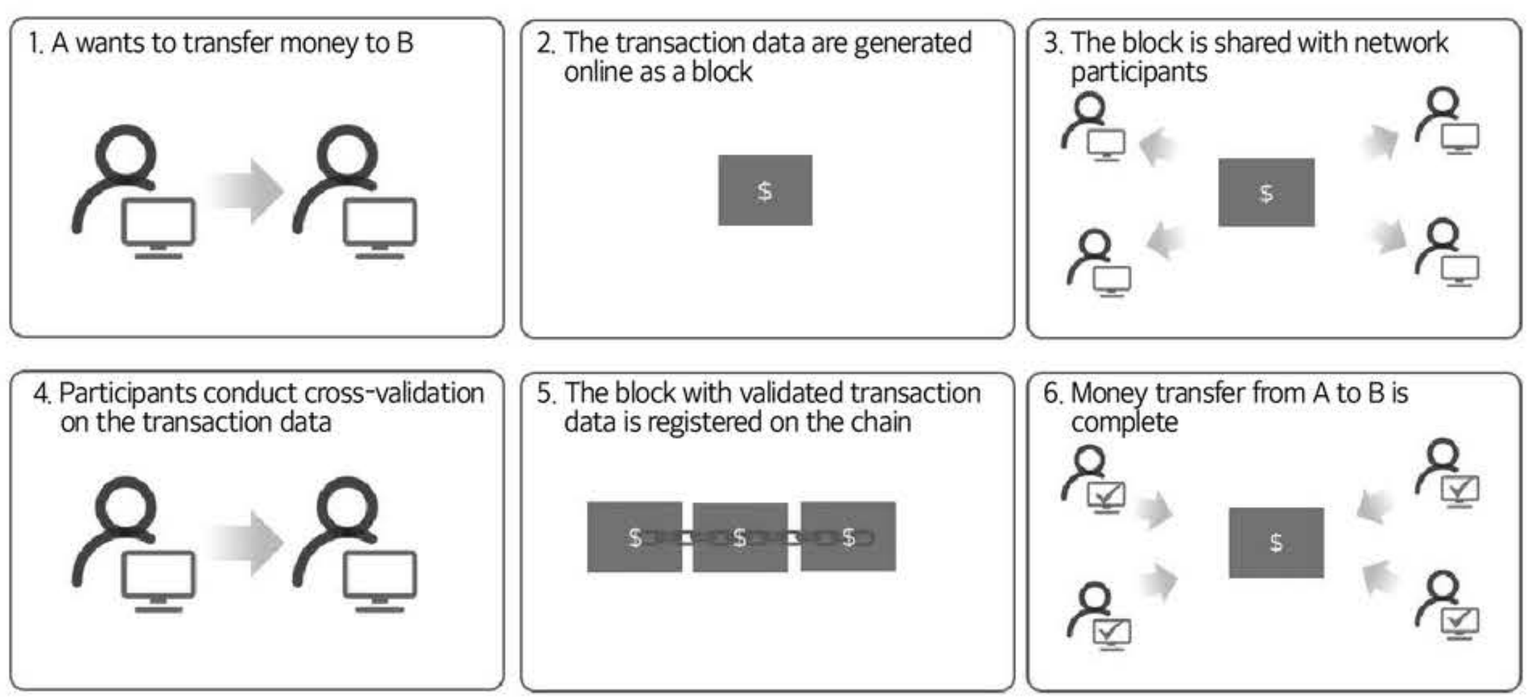
Because of the distributive nature of the network, even if an error or abnormality appears on some participating nodes, the network can easily recover itself.

• Improved economics

Because there is no central server, centralized management costs and financial transaction costs can be reduced.

• Protection of personal data

The burden of collecting, security and leaking of development related data caused by system error or hacking of the central system is reduced.



[Fig.64] Concept diagram of Blockchain transactions

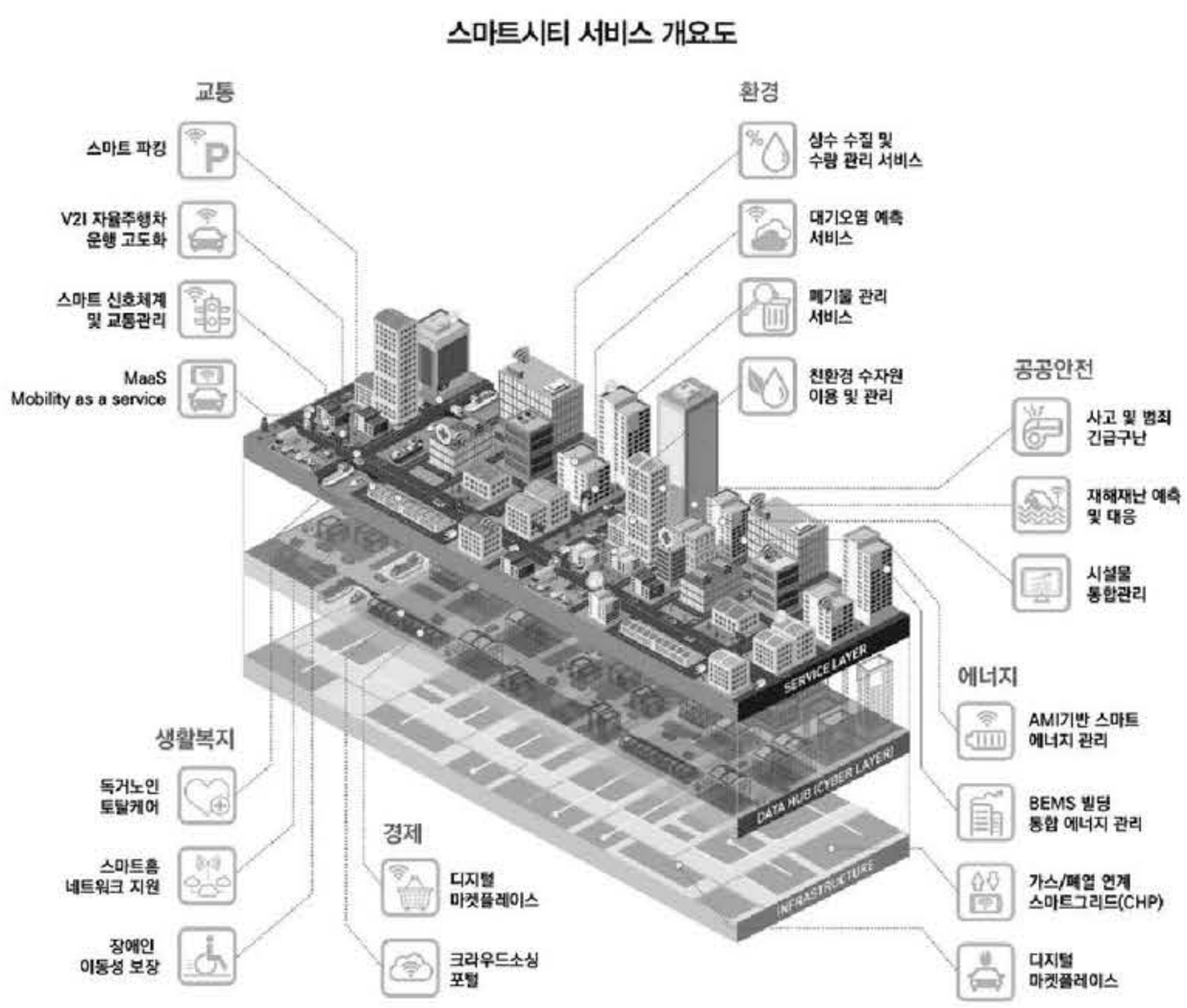
Since all nodes in the blockchain network are responsible for block creation and verification, and a transactions is accepted only when more than half of the nodes approve the transaction, it is impossible to modify or manipulate the transaction arbitrarily.

B) Smart infrastructure

① Smart city

There is much news and interest around the concept of smart cities. A smart city can be defined as an "urban model that can solve various urban problems and improve the quality of life in a city through the adoption of new technologies like ICT and Big Data."[12]

Smart cities are seen as an answer to the problems of aging infrastructures, energy shortages, environmental pollution and crime faced by cities around the world. To build such a smart city, the latest technologies like AI, Big Data, 5G mobile technologies are employed in the development of "smart traffic", "smart environment", "public safety", "public welfare" and "smart energy" services. Smart city concept is the leading example of smart infrastructure.



출처 : 4차산업혁명위원회, 도시혁신 및 미래성장동력 창출을 위한 스마트시티 추진전략, 2018.1

② Smart grid

Smart grid refers to a next-generation power system that combines IT technologies with existing power grids to monitor and control the supply & demand of power supplies in real time to match the production and consumption of electric power. In traditional power systems the generation of power is centralized which means power producers unilaterally supply power to consumers. Power plants are built to meet the estimated maximum consumption level,

12 Reference, Ministry of Land, Infrastructure and Transport.

but they are less efficient because they cannot flexibly handle fluctuations in demand. However, in a smart grid, power suppliers are able to flexible set the power prices and control the supply and consumers can check their cumulative power usage levels and the power prices. These two aspects result in efficient consumptions of power. A smart grid can also benefit producers of renewable energy sources whose supply of power can often be unpredictable because power from renewable energy sources can be sold at high prices when the demand for power is at its peak.
A comparison of traditional electric power grid and the Smart Grid reveals the following differences.

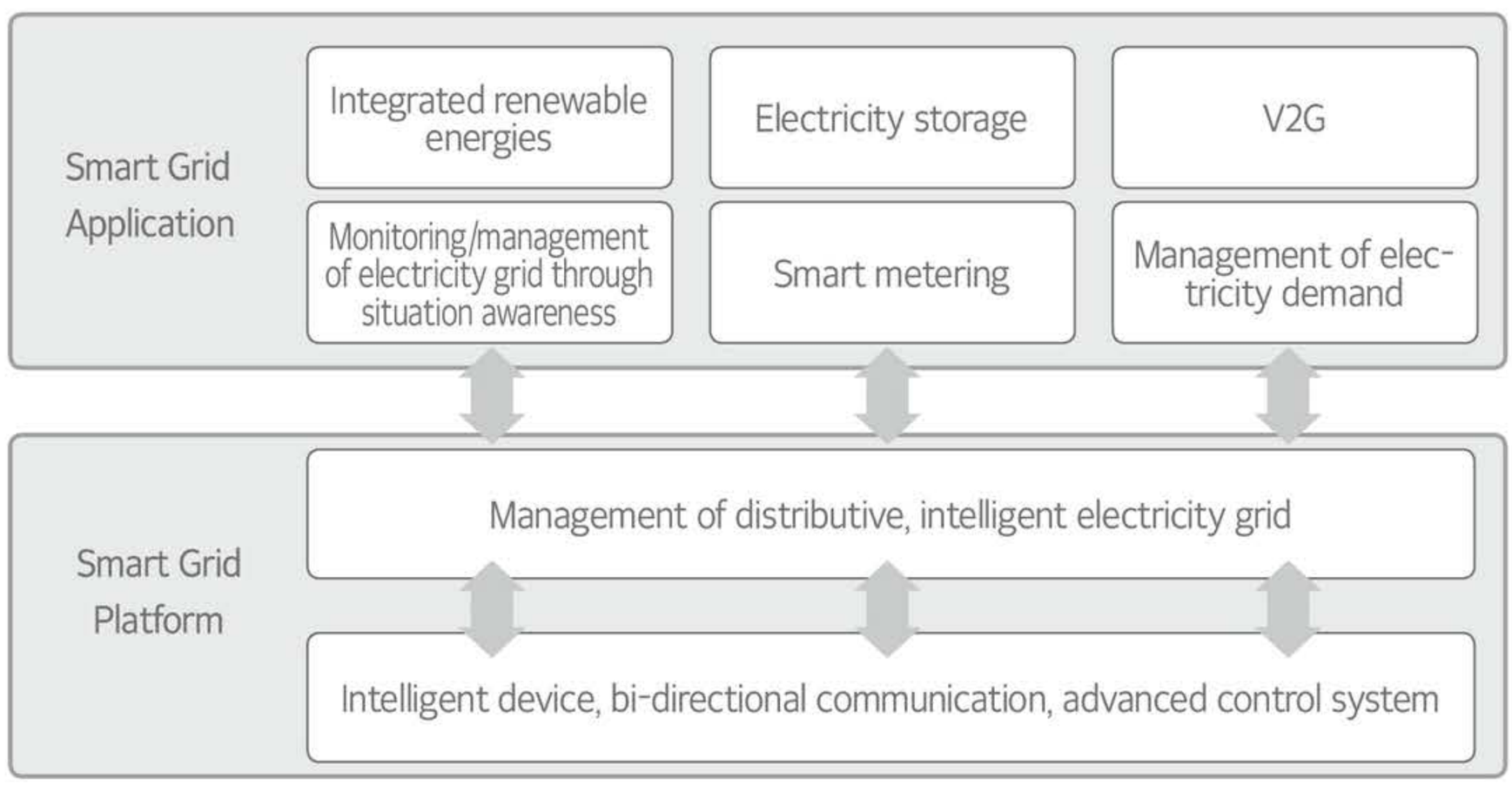
<Table 79> Comparison of traditional electric power grid and the Smart Grid[13]

Area	Traditional Electric Power Grid	Smart Grid
Generation	Centralized power generation	Distributive power generation
Control System	Analog	Digital
Blackout diagnosis	Impossible	Self-diagnosis
Blackout recovery	Manual recovery	Semi-automated recovery and automatic repair
Facility inspection	Manual	Remote
Communication	One way	Bi-directional
Power source	Centralized source (fossil fuel, nuclear power)	Distributed source (renewable energyexpansion)
Control system	Local area control	Wide area control
Pricing information	Limited (monthly total cost)	Information can be viewed in real-time
Pricing system	De facto fixed price	Real-time varying price
Demand for electricity	Fluctuating (demand dependent)	Almost uniform (price dependent)

Smart grids reduce greenhouse gases, induce voluntary energy savings, and improve the quality and reliability of electricity through improved energy efficiency and expanded installation of distributed energy sources such as new renewable energy sources.
The characteristics of smart grids are as follows.
- Consumers can actively participate.
- Supports many ways of generating and storing electric power.
- Leads to the creation of new products, services and markets.
- Provides high quality electricity.

In a smart grid, consumers receive information about their energy usage pattern so they could change their energy consumption habits. In this way smart grid enables people to realize energy reductions and gives them options when they consume electricity. Furthermore, smart grids can be connected to distributed power generation sources through renewable energy while being connected to centralized large-scale power generation sources.

13 Source: Directions and Challenging Tasks of Smart Grid, Park Chan-guk, NIPA, 2009



[Fig.65] Smart Grid configuration[14]

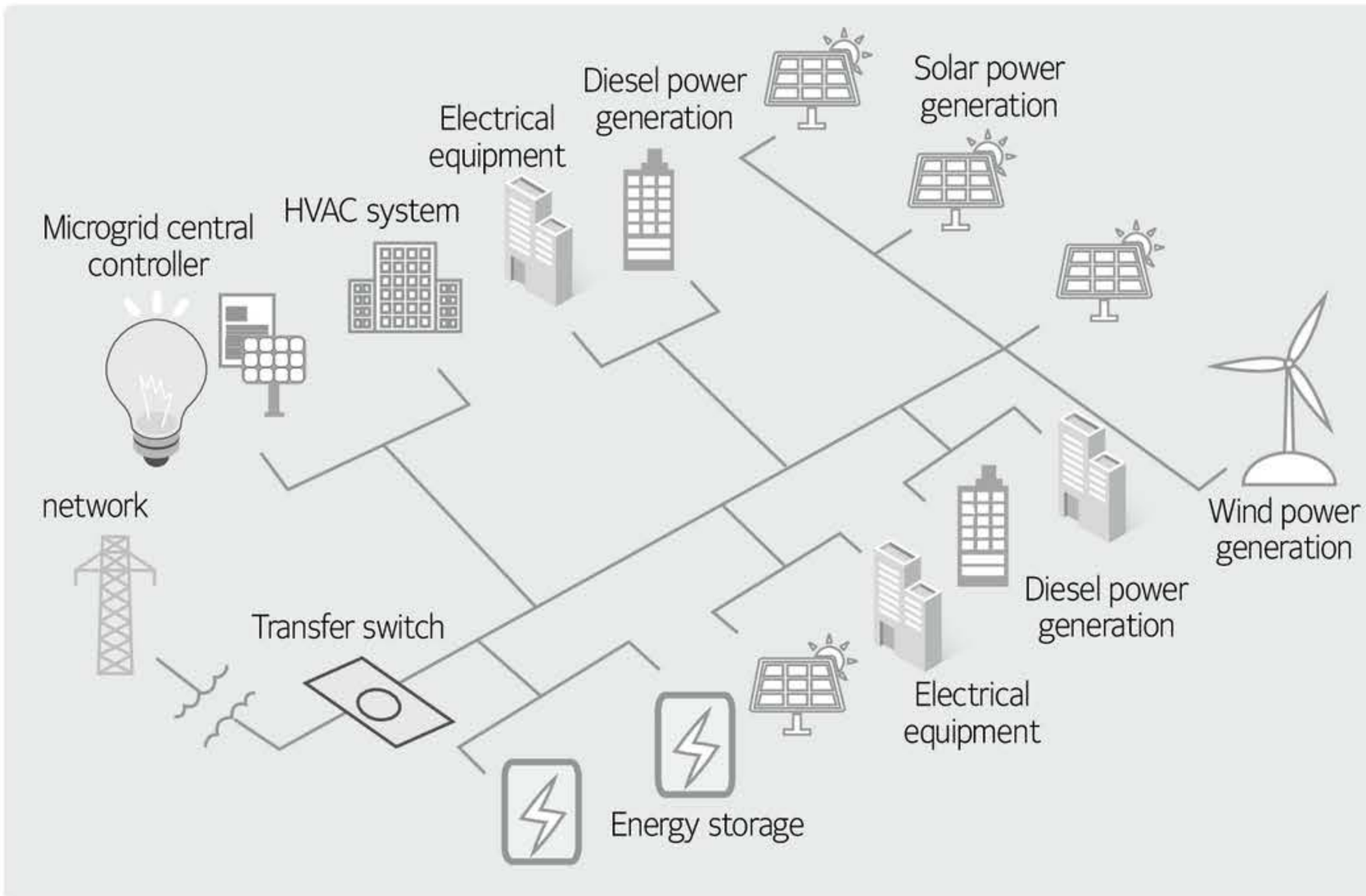
Technologies that make up smart grids can be largely grouped under smart grid platforms and smart grid applications. The platform has intelligent devices, bi-directional communication and sophisticated control system for managing distributed and intelligent power grid. The platform is configured to operate renewable energy applications, intelligent electric vehicle charging stations, smart metering applications, power grid monitoring applications, demand response applications. Intelligent storage devices have electronic sensor and meters that monitor the current state of the smart grid and has digital intelligent devices that can make basic decisions on their own.

The IT infrastructure attached to the power grid act as the IT elements that are critical to the operation of the smart grid. It optimizes energy efficiency and gets people to consume energy through bi-directional exchange of real time information (about the supply and demand for electricity). Therefore, the smart grid must be equipped with open system networks and protocols so that its value-added services could create new products, services, and markets and not limited to just providing power. The communication infrastructure should provide end-to-end services between intelligent devices and maintain a reliable and steady supply of electric power. Furthermore, development must abide by standards to support interoperability for various interfaces.

③ Micro Grid

Microgrid is an extension of a smart grid. The US Department of Energy (DOE) defines a microgrid as "a group of interconnected consumers and distributed energy resources (DERs) under a clearly defined electrical specifications that can be controlled by the system as a single entity and that could be connected to the system or made independent." An easy way to understand micro grid is to view it as a power grid constructed for a local area that connects electricity users with distributed energy resources such as wind and solar power. It is a power grid that can make a grid owner become self-sufficient in power by operating independently of existing electric grid and still connect to the regular grid when necessary. In South Korea, microgrid pilot testings are underway in Jeju Island's smart grid complex, Gapado, Marado, and Ulleungdo.

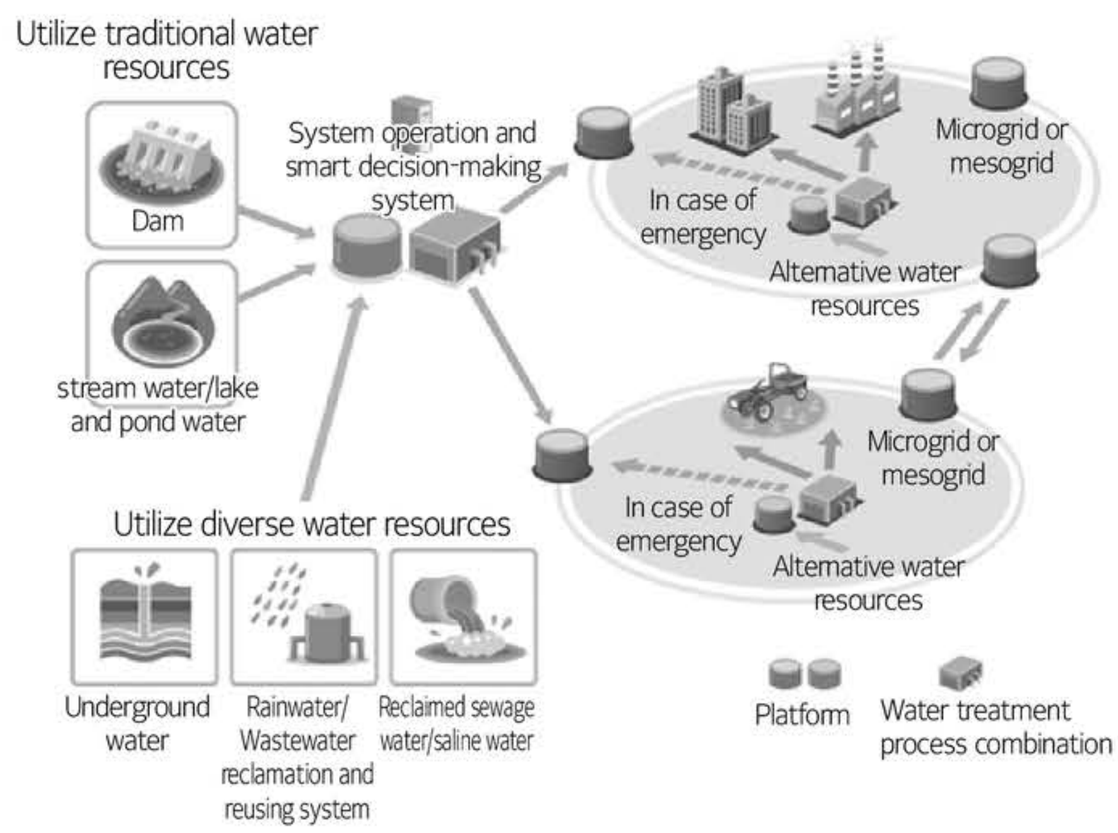
14 Source: TTA, ICT Standardization Strategy Map, 2011



[Fig. 66] Concept diagram of Korea Electrical Safety Corporation's micro grid system[15]

④ Smart water grid

Due to climate changes that affect the management of water, there is growing interest in smart water grid, the technology for managing water with ICT technology. Smart water grid is a smart technology that leverages ICT technology for the management of water, that essential substance for humanity as well as the water supply and sewage water. ICT is used for informatizing the entire process of handling water from the production of drinkable water, the transportation of water, the processing and reuse of water.



[Fig.67] Concept diagram of a smart water grid[16]

15 Reference: Korea Electrical Safety Corporation website

16 Reference: Smart Water Grid Research Group website

• Reasons behind the emergence of smart water grid[17]

The smart water grid emerged as a result of the spread of cloud computing, the increased supply of intelligent meter infrastructure, the impact of climate change, and the growing interest in the global water industry.

<Table 80> Reasons behind the emergence of smart water grid

Category	Explanation
Spread of cloud computing	A system can be developed that automatically detects information, stores them in the cloud. When a problem occurs, it can be resolved automatically because of the stored information. Based on a bi-directional network, operations can be handled efficiently because suppliers and consumers share information.
Intelligent inspections infrastructure supply	Using the automated detection technology activated by remote monitoring technology, the usage data of the water supply can be acquired in real time. This makes it easier for suppliers and consumers to calculate fares and reduce water usage.
Impact of climate change	Due to rapid climate change, agricultural water shortages in the water resources sector and changes in river flow rates, increased uncertainties are expected in the development and operation of water resources. Increased damage from drought/flood is also predicted.
Impact of climate change	The increasing world population, the industrialization of developing countries has led to increased demand for water. This has in turn increased interest in the supply of water resources.

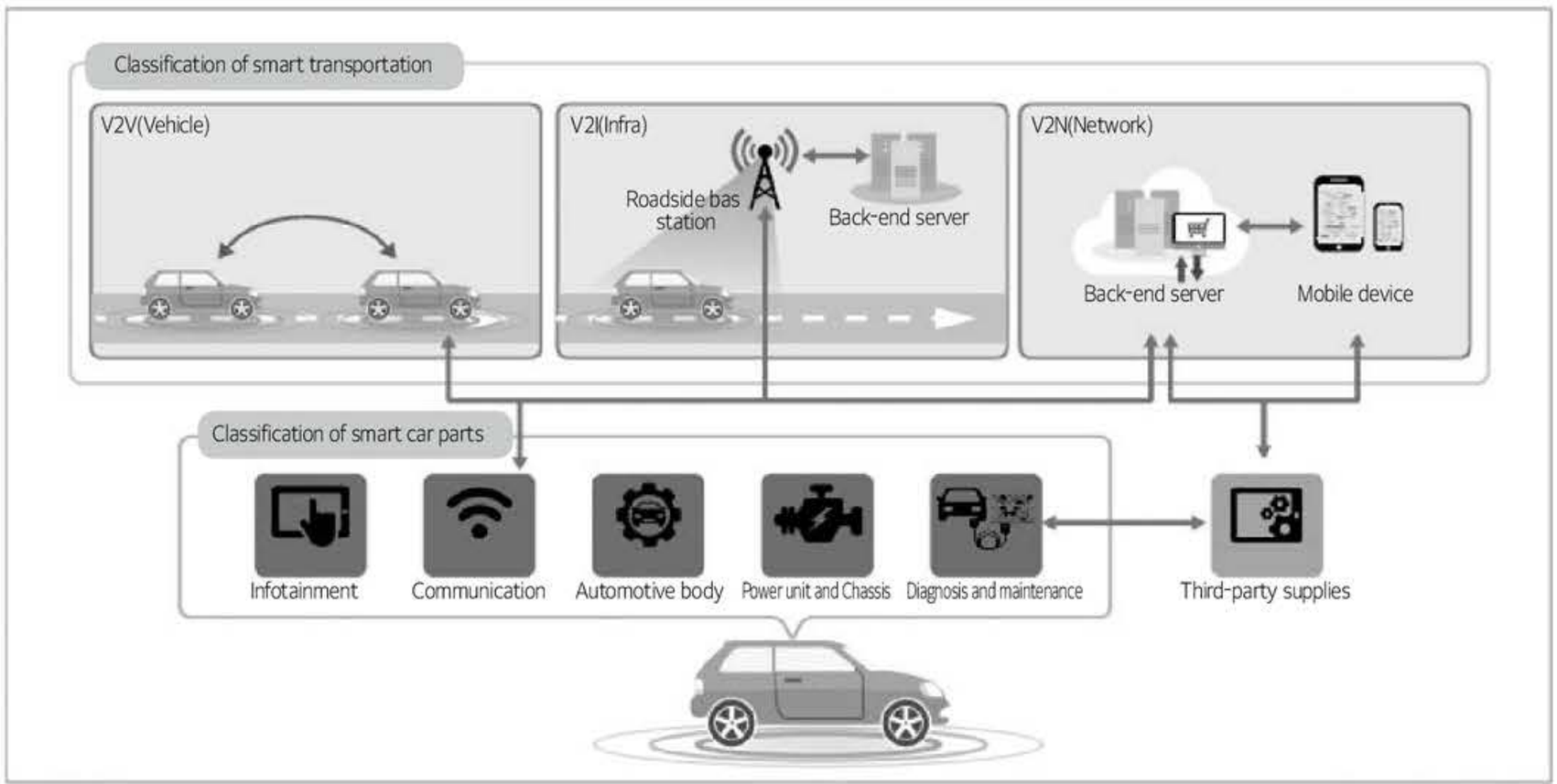
• Key technologies of smart water grid

The technologies that are critical to the smart water grid are water resource acquisition/distribution technology, real-time and automated water supply and demand management technology, and advanced ICT convergent water management technology.

⑤ Smart traffic

Smart transportation is an intelligent transportation service that improves traffic safety, improves the efficiency of traffic flow, and provides user convenience through the exchange of information among different vehicles, among vehicles, base stations and infrastructure, and among vehicles and traffic control servers.

17 Source: Trends and Prospects of Smart Water Grid Technology for Water Resources Management, National Environment Information Center, 2016.11

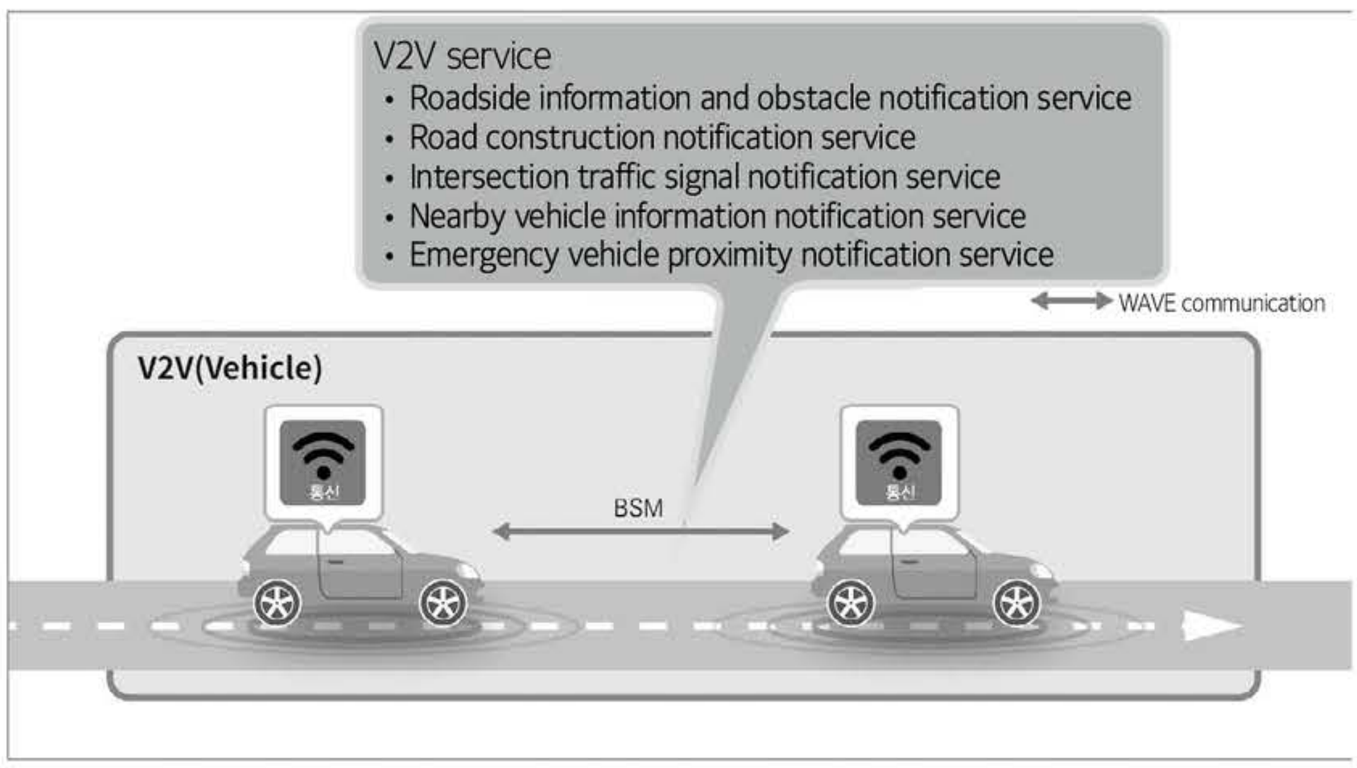


<Source: Smart traffic cyber security guide, Ministry of Science and ICT, 2018.5>

[Fig.68] Smart traffic service classification

• V2V service

The V2V service is a service in which vehicles, the main agents of the traffic system, exchange information via wireless communication with their surrounding vehicles. The service allows vehicles to send/receive messages about their positions, traffic flow information, and road traffic information. Major V2V services include roadside information and obstacle notification services, road construction notification services, intersection traffic signal notification services, nearby vehicle information notification services, and emergency vehicle access notification services.

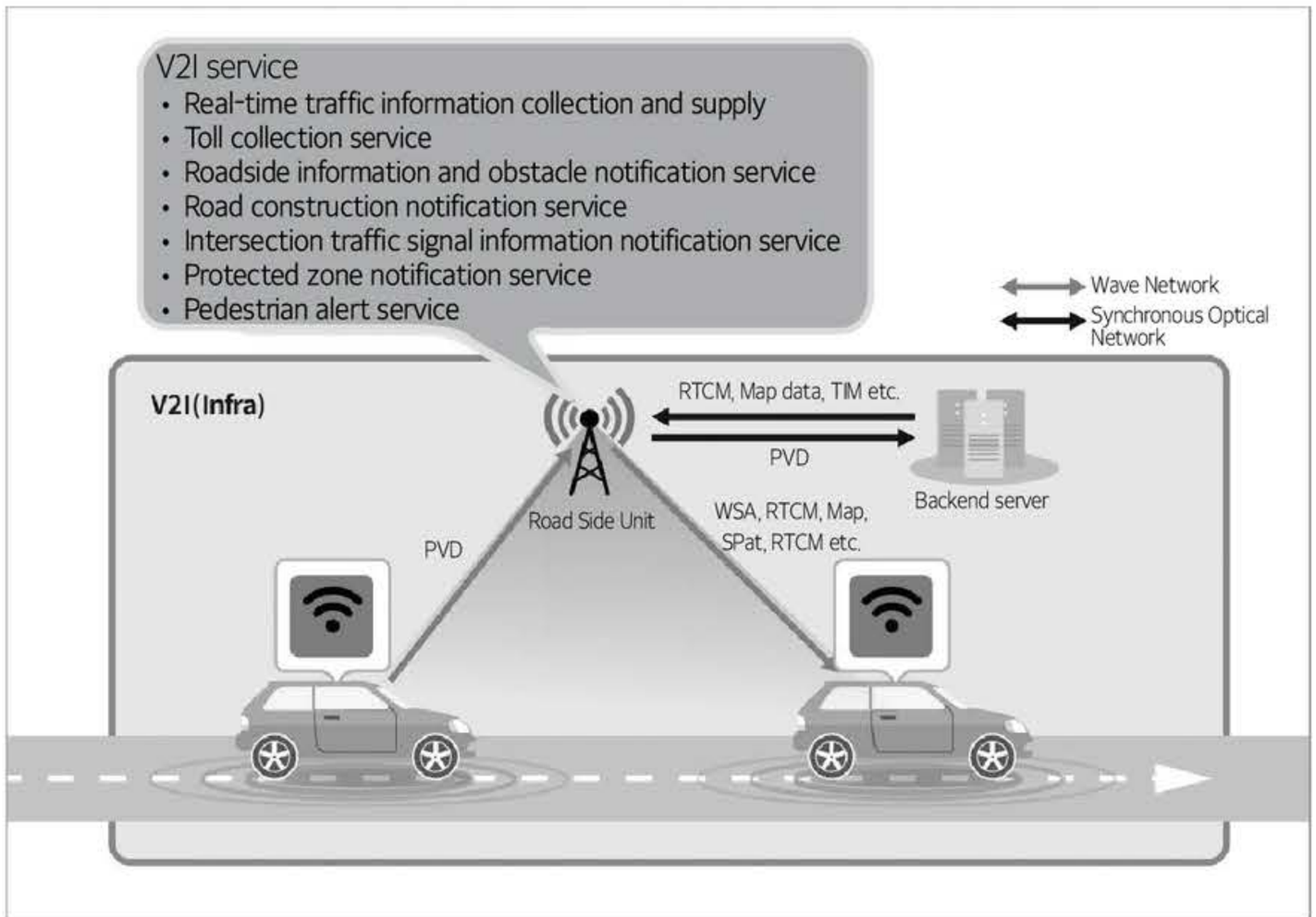


[Fig.69] V2V service

• V2I service

V2I service refers to communication between vehicles, the main agents of the traffic system, and the traffic support infrastructure. Vehicles equipped with an on board unit (OBU) transmit and receive messages with roadside base stations via Wireless Access in Vehicle Environments (WAVE) or 4G LTE/5G communication. The base station on the roadside shall be connected to the back-end server of the traffic control center and transmit and receive

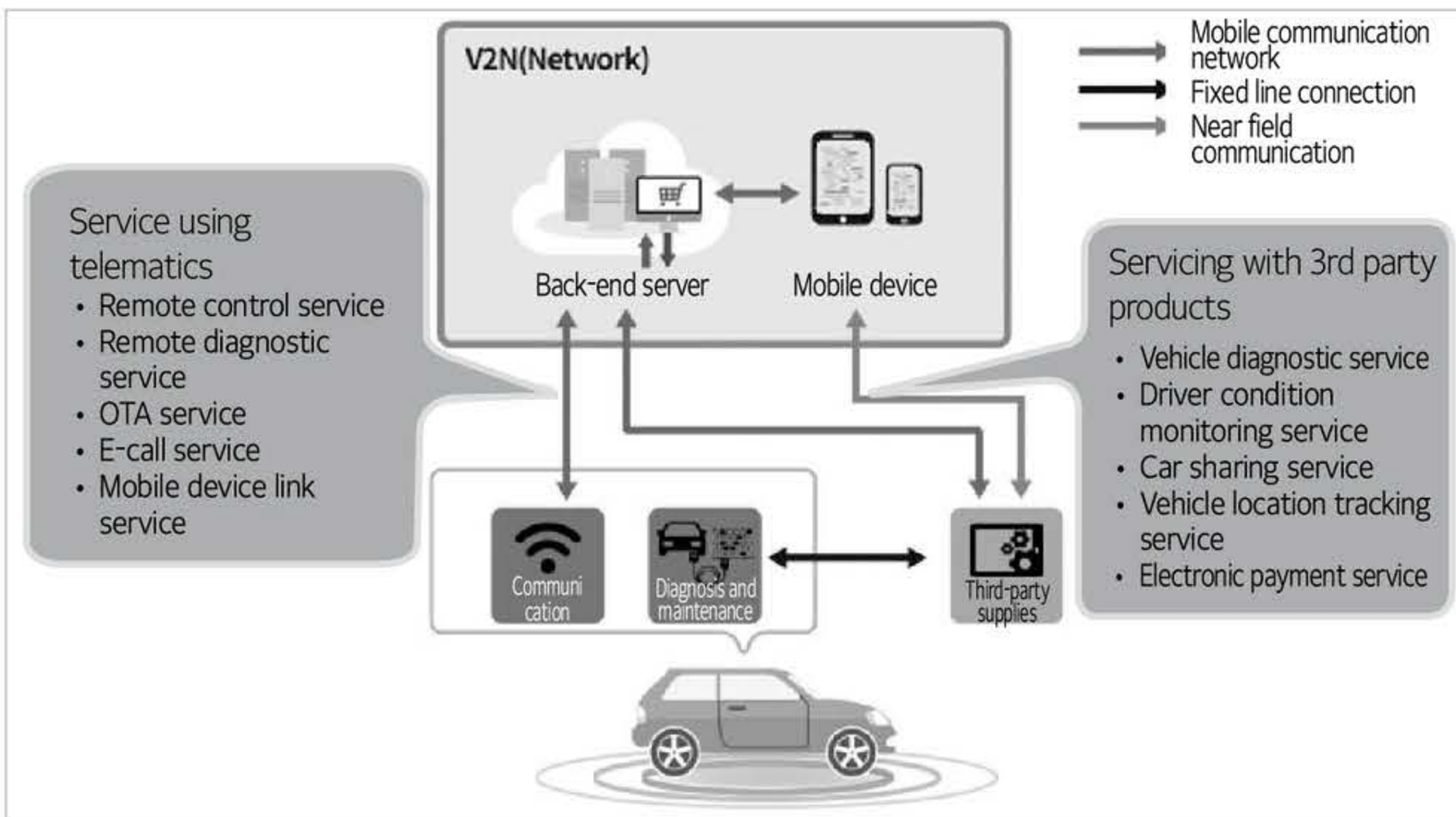
status, location, and operation information that it receives from vehicles. The center system collects and analyzes information received from a multitude of vehicles and base stations, and then sends information about the traffic, road traffic conditions, and others to the base stations, and the base stations will relay them to vehicles. Examples of V2I services include real-time traffic information collection and provision services, toll collection service, roadside information and obstacle notification service, and road construction notification service and protected zone notification service.



[Fig. 70] V2Iservice

• V2N service

A V2N service is a service that lets a vehicle communicate through a network with a server or mobile device in the cloud or on the Internet. The TCU (Telecommunication Control Unit) is installed in the vehicle and communicates with the backend server, which communicates with the mobile device to provide information to the user and controls the vehicle.



[Fig.71] V2N service

• Connected car service

Connected car is a core technology of self-driving cars whose development has been driven by advances made in telematics technology made possible by the development of mobile communication and cloud services. Connected cars can provide services like transportation information services, music services in cars, and information services to car riders based on their connectivity to other cars, surroundings, and infrastructure.

Examples of services that connected cars can provide include information services using augmented reality, services that help drivers by recognizing and notifying them about road conditions ahead, and fully autonomous driving and automatic parking that do not require any driver response.

⑥ Smart education

Among the social changes brought about by advanced digital environment, the changes that could affect the education environment are the increased number of couples who decide to live together without tying the knot, the continuously declining birth rate, the arrival of an age when individual choices are respected, and the rapid aging of the population. To respond to these societal changes, the government established a national strategy on smart education along with a basic plan on informatization of education in the country.

[Fig.72] Concept of smart education

The government's smart education program produced a digital textbook prototype in 2006, based on basic research that began in 1997. In 2007, the Ministry of Education developed digital textbooks for the teaching of Korean, English, and mathematics and discussed the commercial rollout. After that the ministry announced the "Smart Education Promotion Strategy" in 2011 and is presently pursuing a smart education program under a new set of policies.

• Smart classroom

Together with the digital textbook, smart classroom is the other important pillar of smart education. Smart classroom is a new way of teaching students in a class room fitted with a projector, TV, large smart liquid crystal displays, electronic blackboards and wireless Internet devices. Teachers who are people held responsible for the quality of education can conduct classes using various programs using digital devices in digital classrooms.

<Table81> Teaching method and tools for smart education

Teaching method	Explanation
Production	Power point, Hangul, Google Apps, teacher maker, Lectora, e-textbook authoring tool, movie maker (video editing), PDF document production, SNS, Evernote, Prezi, traditional CD
Search	Naver, Google, IP-TV, Fastel, YouTube
Analysis	Fastel, Google document tool
Presentation	Class-ting, twitter, mirroring, LMS solution, Google document tool, SNS, messenger, electronic blackboard
Evaluation	Fastel, Google document tool, quizzes
Sharing	Fastel, class-ting, Google document tool
Communication	SNS, LMS messaging function, twitter, Facebook, Google Driver, Classting, school website bulletin board

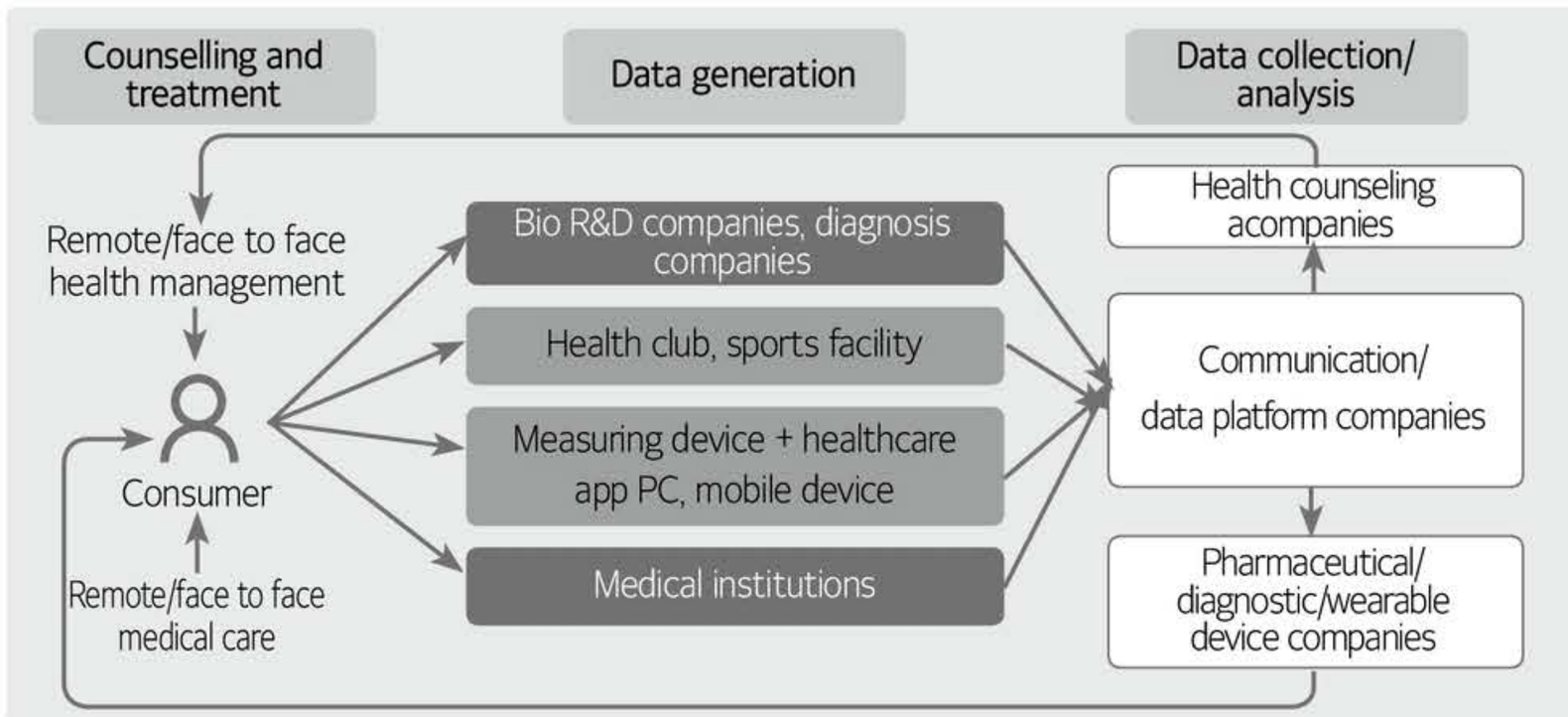
Source: Survey of Technology Based Research University, 2013, Korea Education and Research Information Service

• Digital textbooks

Digital textbooks contains the digital versions of the contents in existing paper textbooks and adds videos, interactive functions, and automatic scoring functions. For example, a digital textbook could show moving images of molecular action between liquids, solids, and gases, or an image of the Earth from outer space that zooms out by moving scrolling key.

⑦ Smart health care

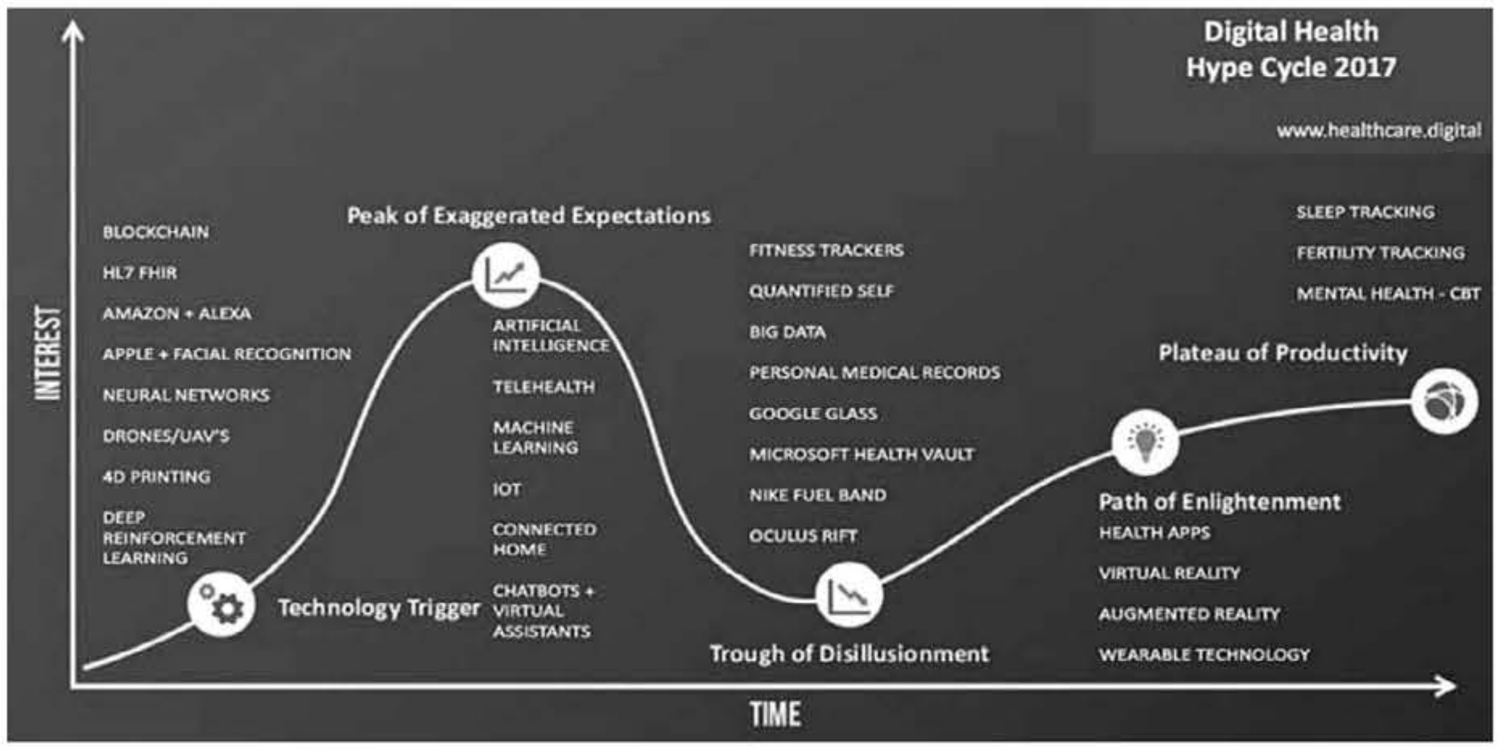
Smart healthcare is a field that combines digital devices and IT devices that connote 'smart' and 'healthcare' which refers to medical services. Smart healthcare is anticipated to make a great leap forward when it gets combined with IoT, cloud computing, Big Data, and AI, the so called core technologies of the 4th Industrial Revolution. Therefore, if interpreted another way, in smart health care, there is a set of data that are produced by or measured from consumers or patients. Collecting this data and analyzing them using techniques like Big Data are the specialized firms. Then, based on the findings, medical institutions provide services to consumers.



[Fig.73] Smart healthcare structure[18]

18 Source: ETRI Future Research Strategy Research Center

• Growth factors in the smart healthcare industry
- User growth and technological advances in wireless mobile communications and mobile devices.
- The importance of analysis using Big Data and entry into a hyper connected society.
- Decreased birth rates, rapid entry into an aging society, and continuous increase in new and chronic diseases.
- Increased demand for healthcare due to the development of culture and economy.



<자료> The Digital Health Hype Cycle 2017 November 15, 2017.

[Fig.74] Digital healthcare hype cycle 2017

• Key areas of smart healthcare
In order to secure technological superiority and cooperation in the smart healthcare sector, it is necessary to create an open ecosystem for each major sector that will play a major role in smart healthcare. The major areas of smart healthcare are medical devices, wearable devices, telemedicine, Big Data, and contract management.

<Table82>Key areas of healthcare

Area	Description
Digital medical devices	Product for diagnosing, treating and preventing diseases. Concept includes digital diagnosis.
Digital therapy	A product for obtaining specific clinical results in treatment. (Ex:SW for managing diabetes, asthma)
Wearable	Biometric measuring device developed for the consumer market.
Remote health care	Healthcare service that is provided remotely Concept included monitoring remote patients.
Analysis &Big Data	Integrate and analyze a diverse range of data
Others	Consumer healthcare contract

Source:'Digital Healthcare', A Global Contest, iPnomics, March, 2016

• Core technologies behind smart heath care
The key technologies for smart healthcare can be divided into "health information measurement technology", "customized diagnosis and field diagnosis technology", "open health care platform technology", and "remote health care service technology", each of which is listed in the table below.

03 Latest IT Business Services

A) Latest SW centered IT business services

① Artificial Intelligence (AI)

Recently, services using artificial intelligence are proliferating. Translation services such as Google Translator, Baidu, and NAVER translator, based on artificial neural network algorithms, were launched to help the general public translate languages they do not understand. Kakao's flower search, Naver's smart lens, and Google lens are services that utilize the AI image classification function commonly referred to as "machine vision." Furthermore, there other AI-based services that could be used in everyday life. For example, there is a music service that recognizes the music users are listening to and tells them the title of the song. Watermark erase service removes the watermark imprinted on images, and there is an auto draw service which turns one's painting into an emoticon.

The very first definition of artificial intelligence was announced by John McCarthy and others at the 1956 Dartmouth Conference in the U.S. and he defined AI to be about "making a machine behave in ways that would be called intelligent if a human were so behaving." Today, artificial intelligence is understood to be the method of making computers or machines mimic human intelligence (cognition, inference, or learning) or the technology for researching the feasibility of doing so.

• Artificial intelligence technology

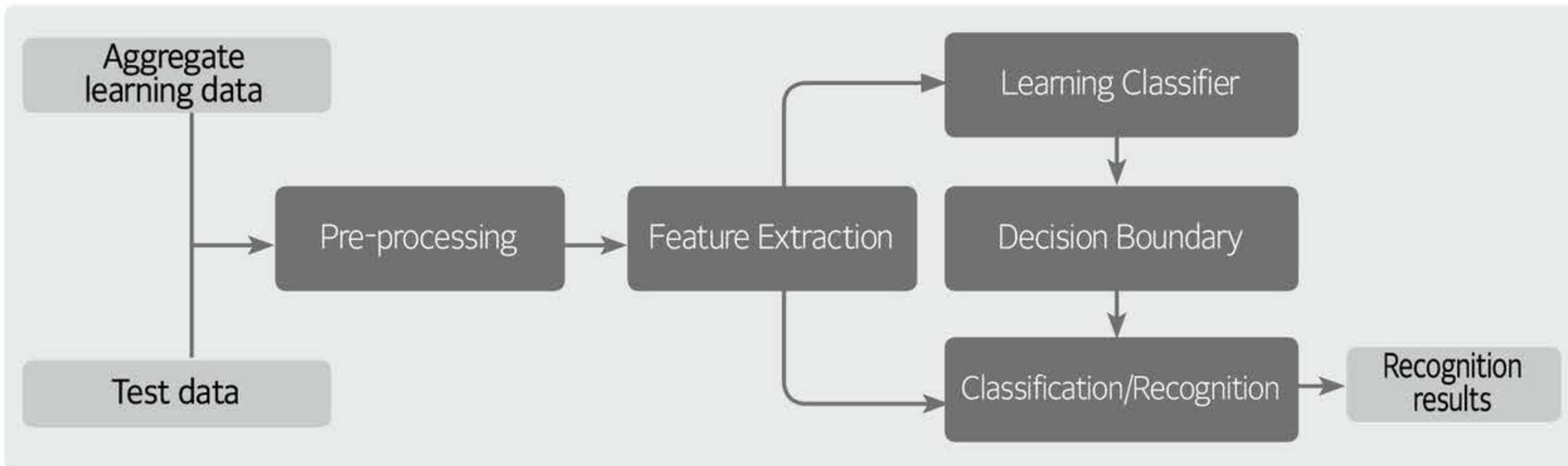
A key characteristic of artificial intelligence technology is its ability to reason, along with other characteristics like generality, vastness, inaccuracy, and knowledge use. In recent years, the AI technology receiving most interest has been "pattern recognition," "machine learning," and "deep learning."

• Pattern recognition

In artificial intelligence, pattern recognition is the process of separating a set of learned data into a multitude groups based on a criteria of the entered values. Pattern recognition has two stages: learning and recognition.

In the learning stage, key information for distinguishing patterns is extracted. For this purpose, people analyze the characteristics of patterns using a given dataset.

Using the core information of the patterns found in the learning stage, in the recognition stage, the given data is classified and recognized using the previously recognized pattern.



[Fig.75] Pattern recognition process[19]

• Machine learning

Machine learning is the field of developing algorithms that machines use for learning. It could be defined as "science and technology of studying systems that autonomously improve their performance using empirical data gathered through interaction with the environment."

Machine learning can be generally divided into ① supervised learning ② unsupervised learning ③ semi-supervised learning.

<Table 83> Machine learning algorithm classification

Category	Algorithm	Description
Supervised learning	Regression analysis	Regression analysis carries out the repeat process of minimizing the margin of error between given data and the estimated values and models the relationship between the data.
	Decision making tree	Generates a tree-shaped decision learning model based on the properties of the data and derives final decisions on a given problem through iterations.
	Artificial neural network	Algorithms that mimic the structure and function of a living entity's neural network Consisting of an input layer, an intermediate connecting layer, and result output layer, the artificial neural network updates the weighted value of the interconnecting nodes in each layer and outputs the results.
	Bayes Theorem	An algorithm that extends/applies Bayes theorem assuming independence between characteristics to solve clusters and prediction problems.
	Support Vector Machine	Using margin, support vector machine defines the object function of learning to find the best decision boundary.
Unsupervised learning	Clustering	Clustering is a method of classifying data by creating clusters that maximize the similarity between given data.
	Dimensionality reduction	While identifying the eigen structure of the data is similar to clustering, the objective of dimensionality reduction is to summarize or represent data in a dimension lower than the original information.
Semi-supervised learning	Prediction and classification	Semi-supervised learning, supervised learning algorithm are sometimes combined with clustering algorithm. (See clustering algorithm)
	Expected value maximization	An iterative algorithm for finding parameters with maximum possible or maximum post-probability in probability models that rely on unobserved latent variables.

19 Source:"Pattern Recognition and Machine Learning", Park Hye-young, Lee Gwan-yong.

• Deep Learning

Deep learning is the reason for the recent rapid development of artificial intelligence. Deep learning is a branch of machine learning, and a method of solving problems similarly to how humans solve problems using an artificial neural network which performs the transfer and processing of information with multiple nodes. This method is based on human neural network theory.

<Table 84> Characteristics of Deep Learning

Characteristics	Description
Pre-processing for feature extraction	The two processes that were separated into the pre-processing and feature extraction processes are consolidated into the entire learning process as pre-processing for feature extraction.
Automatic extraction of complex data information	For data with large dimensions and high complexity, such as image data, there was a high possibility of loss of information in the preprocessing process.
Efficient for high level abstractions	If the size of a high efficiency simulation is increased for an abstraction process that summarizes key content or functions in a large amount of data or complex data, the ability to absorb large amount of data is improved.

Source: Overview of Artificial Intelligence (AI) and Technology Trends, Financial Security Institute, August, 2016

② Use of Big Data

"Flu Trends" is a quintessential Big Data service that was launched by Google for the general public. In 2008, Google hit upon the idea that people search for cold or flu on the Internet if they suspect that they have the flu. The company released a service that predicts cold and flu trends by analyzing the search information and the location of the people searching with keywords like “flu” and “cold”. Credit card companies are another group that rely big time on Big Data. They analyze consumption and behavioral data of their customers and use it for marketing, product development, and product recommendation.

Big Data refers to data that is so large that it is difficult to handle them with traditional data storage, management, and analysis methods; they are data whose size has exceeded the limits of what could be managed as a general database. Big Data is difficult to quantify through conventional methods because the 3Vs of volume, variety, and velocity are all large, and also include unstructured or non-metrical variables, making it difficult to analyze population trends or characteristics through statistical analysis. Big Data is often represented using visualization tools.

<Table85>Characteristics of Big Data

Category	Characteristics
Data size	• Data greater than peta byte • Millions and billions of users • Trillions and tens of billions of data records
Data structure	• Unstructured, non-formal data • Large volume of distributed data • Simple data correlation with plain schema structure
Type of data	• Many data that are related to time • Mission Critical data • Example)system/event logs, sensor data, SNS data, web mining data, etc.

③ FinTech

FinTech is a composite word created from "Financial" and "Technology" and refers to services like payments, remittances, asset management, cloud funding, and loans, where traditional financial services are integrated with IT technologies.

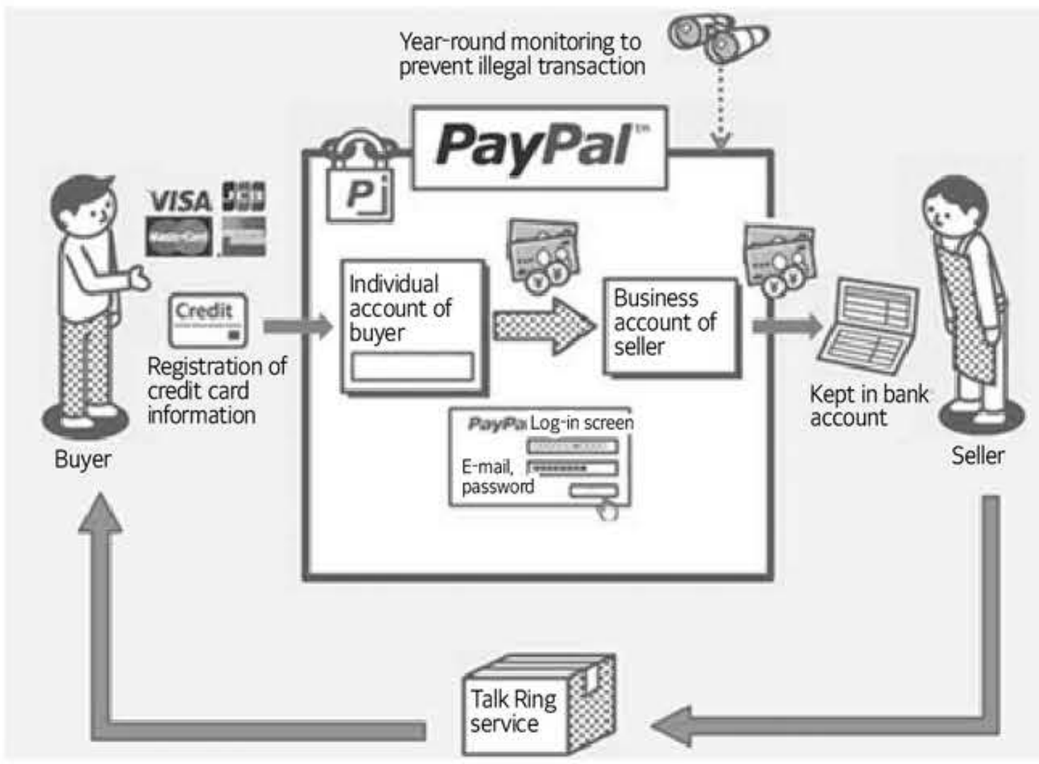
Originally, it was the term used for describing a large vendor who develops services exclusively for financial institutions, but it is now used to refer to the various services offered by financial startups.

Traditional financial institutions (usually the offline sales branches) have been able to secure security and reliability through powerful security system and database link to traditional institutions. In payment services, credit card companies have led the market by dominating the market early. However, some of the newer fintech firmsare able to provide services based on smartphone-based mobile devices, financial management through Big Data analysis, and credit risk assessment at significantly lower costs than existing financial institutions. In payment services too, fintech companies are able to provide smart-phone services that are convenient and has great security of accessibility.

The growth of fintech services can be attributable to the following factors.

- The popularization of mobile services, open source codes that can be developed and applied freely, the emergence of cloud technology and the demand for new financial services from financial consumers have resulted in the growth of the startup scene.
- Because fintech are Internet-based services, this means initial investment costs and labor costs can be very low. So people feel little burden when investing in fintech development.
- As consumers flock to mobile financial transactions that are faster and cheaper than the financial services offered by existing banks, many companies are showing interest in fintech development.

Fintech services could become a serious threat to traditional financial companies. In payment and remittance, the ease of customer acquisition and accessibility of services provided by the scalable platform will pose a threat. In lending and investments, the high predictability provided by social data and Big Data will pose a threat. In particular, payment and remittance services are services that are frequently used and have strong platform characteristics. For this reason, new companies like to use it as a stepping stone when starting other financial services. In fact, Alibaba provides various financial services based on Alipay, a payment service.



[Fig. 76] Examples of fintech business

The main attributes of fintech are convenience, ease, and simplicity. Fintech is proof that the paradigm of financial industry has changed and now we are in an era where non-financial companies armed with IT technologies are providing IT services. The types of fintech services provided by companies are described in the table below.

<Table86>Types of Fintech services

Category	Description
Payment service	Payment service provides a function for transferring money or making payments easily, and generally provides remittance services in conjunction with credit cards and bank accounts.
Digital currency	Like Bitcoin, this is a virtual currency that could be exchanged with the real currency used in a country and as a universal currency accepted across the world, it can be used for payment of goods and services.
Loan service	As a service that connects investors with people looking for loans, this service was developed to compensate for the limitations of bank loans.
Financial software	A service that increases the convenience of finance through Big Data analysis and its own algorithm and AI.

In overseas, the fintech industry is growing by leaps and bounds. But the domestic fintech industry has failed to fully blossom, although a market around mobile payment settlement services and P2P loan services has been formed. There are many difficulties to the growth of the domestic fintech industry because there are only a few kinds of businesses that could be started independently without a partnership between financial institutions and many financial-related regulations. There are also too many regulations.The government needs to strengthen regulations and enforce them in an impartial manner so that the fintech industry could be energized and generate added values.

④ O2O(online to offline) andO4O(Online for Offline)

O2O is the counterpart to the showrooming phenomenon where customers would first check the goods in offline stores such as marts and department stores and then pay for the same product in online space. In other words, it describes the behavior of paying for goods online and receiving the good or service in offline space.

<Table87>Examples of O2O services

Example	Description
Baedal People	• A service for ordering and paying for food online and receiving the food offline.The most representative O2O service.
Kakao Taxi	• Service for booking a taxi through the mobile app and take a real taxi offline.
Wahome	• Users pay online for room and house cleaning services.

• O4O(Online for Offline)

[Fig. 77] Amazon GO, an example of O4Obusiness model

O4O means "Online for Offline".It means expanding the scope of business operations from online to offline. An O4O service provider drives market innovation by operating an offline business by leveraging the value provided to its customers online.

Amazon Go is a shocking example that illustrates the value and meaning of O4O. Why did Amazon Go, an offline mart that sells simple groceries and miscellaneous goods send such shockwaves to the offline mart market?

To use Amazon Go, customers must activate a mobile app and then log in. And then they just have to bring their purchases out of the store. Amazon Go automatically settles the bill through the customer's account information and delivers the receipts to the customer. Of course, customers must be registered with Amazon Prime before using Amazon Go.

Customers don't have to wait in line at the counter to pay and don't have to go through the process of putting the goods on the counter and packing them in a grocery bag. This is a very clear-cut case O4O where an online company leverages their strengths for customer convenience.

⑤ Virtual currency or virtual money

In recent years, interest in cryptocurrency has been hot due to the surge in the adoption of crypto currencies like Bitcoin and Ethereum. While under the strict definition, it is correct to call Bitcoin and Ethereum cryptocurrencies, the term virtual currency is often used instead.

<Table88>Concept of digital currency, virtual currency and crypto currency[20]

Digital Currency	Virtual Currency	Crypto Currency
Digital Currency All currency shown represented in electronic form (regardless of whether or not legal currency is issued)	Virtual Currency Digital currency that is not represented in legal currency (mileage points for instance)	Crypto Currency A method of authenticating the validity using distributed virtual currency and encryption

20 Source:Daeshin Securities

Virtual currency or virtual money is defined as a digital currency or electronic currency used in electronic form in a virtual space on a network without any physical bill or coins.
According to the definition given by the European Central Bank (ECB), the U.S. Treasury Department, and the European Bank Oversight Office, virtual currency is a type of digital currency that is issued and managed by developers and is not controlled by the government. It used only in certain virtual communities as a form of payment and most crypto currencies can be seen as a digital currency and a virtual currency.

<Comparison of virtual currency, cash and digital currency>

Category	Cash	Digital Currency	Virtual Currency (Digital Currency)
Issuing Body	Central bank	Financial institutions, electronic financial companies	None
Amount Issued	At the discretion of the central bank	1:1 conversion with legal currency	Determined in advance through an algorithm
Transaction record and approval	Unnecessary	Issuing body and clearing houses	P2P network that uses distributive ledgers
Currency unit	Legal currency	Same as legal currency	Independent currency unit
Convertibility with legal currency	-	Issuing body guarantees convertibility	Allowed but not guaranteed
Price in legal currency when converted	-	Fixed	Changes according to supply and demand
Place of use	All transactions	Franchise	Participants

Source: Kim Dong-seup, 2016, "Current Status and Implications of Distributed Ledger Technology and Digital Currency", Bank of Korea, results of payment survey.

• Reasons for the rise in the value of virtual currencies
Most virtual currencies such as Bitcoin have fixed amount of final issuance, and if the method of block production through large scale calculations is maintained, scarcity is created by the consumption of physical resources for mining. In addition, virtual currencies produce a network effect that increases their value because they are held simultaneously by multiple people. The value of virtual currency increases due to scarcity and network effects. However, the value of virtual currency cannot be explained just with its scarcity and network effect.

• Can it be said that the currency is the essence of virtual currency?
The 3 important functions of currency are "storage of value", "exchangeable", and "scale of value". In the case of virtual currencies such as Bitcoin, the price volatility is so severe that it cannot perform the "scale of value" function and thus it cannot be recognized as a true currency. The opinion of most experts is that virtual currency can never displace a nation's legal currency. However, it has been verified by Ethereumthat a virtual currency can provide services beyond its use as a mode of payment. It should be noted that the increasing value of payments and other services of virtual currency can increase the price of virtual currency itself.

• Major virtual currencies
More than 1,100 types of virtual currencies are currently listed and in use worldwide. However, Bitcoin and Ethereum account for more than 70% of the value of virtual currency based on market capitalization.

<Table 89> Current status of virtual currencies

Virtual Currency	Date of introduction	Description
Bitcoin	2009	• First distributed ledger-based virtual currency. • Bitcoin can only be used as transaction book because of closed structure in which blocks are woven in a row. • 10 minutes required for a transaction.
Ethereum	2014	• Closed blockchain structure is improved to an organic structure. • In addition to virtual currency, this currency can also be expanded to smart contracts and services. • 10 seconds required for a transaction.
Ripple	2009	• Developed mainly for handling bank transfers. • Provides a low cost payment service and risk is lowered thanks to its immediate settlement system. • When converting currency, it uses the best currency conversion rate it can find, reducing fees. Used by many banks and companies that do a lot of foreign trades.
Litecoin	2011	• Technically similar to Bitcoins • Improves the slow computing speed of Bitcoins (its major disadvantage) to achieve maximum mining volume and increase transaction speed by up to 4 times.

⑥ Linked data

Linked data is structured data model that supports an interconnected Web by identifying data existing on the Web as individual URI (Uniform Resource Identifier) and assigning linked information to each URI.

<Table 90> 4 rules of linked data

Rule	Description
Use of URI	• Linked data avoids a URL centered identification system for showing the location of a web document. • In other words, each individual object present in an individual document has its own URI.
Use of HTTP URI	• Proposes URI that could be accessed through HTTP protocol. • The objective is to enhance access to linked data.
Use of RDF	• Uses data that is structured in a triple model, as in RDF. • The objective is to represent and link up web data in a formalized structure
Assignment of linke information	• The objective is to make the job of linking data existing on the Web a lot easier by assigning link information.

• Usefulness of linked data

Linked data can be reused, reduce redundancy, and maximize interoperability to achieve data integration. Furthermore, added value can be created through linked data and network effects will result in data expansion.

<Table 91> Usefulness of linked data

Usefulness	Description
Reusable data	• Data can be used with URI, even if the data is not one's own.
Reduced data redundancy	• The existence of data sought by a user can be checked. The problem of redundant data can be eliminated.

Maximize data interoperability and consolidate data	• Issued as a semantic web standard. It can be queried and used like a database.
Creation of added value for data	• Because data can be accessed and used freely, mesh-up using data is possible.
Network effects	• Network effects and network acceleration can be expected since data can be expanded through data linking.

• Open Data

Open data refers to data that anyone can freely use, reuse, and redistribute, and shall meet the following conditions:

<Table 92> Description of open data

Category	Description
Availability and Access	• Data should be downloadable over the Internet. • Transformation of original data/production of new works should be possible at reasonable cost. • Data should be provided in a convenient, modifiable form
Reuse and Redistribution	• Data should be reusable and redistributable, including those used in combination with other datasets.
Universal Participation	• Everyone must be able to use, reuse, and redistribute the data. • For example, there should be no restrictions on "commercial" or "non-commercial" use or restrictions on use for specific purposes (such as education).

Source: Open Knowledge Foundation, 2012

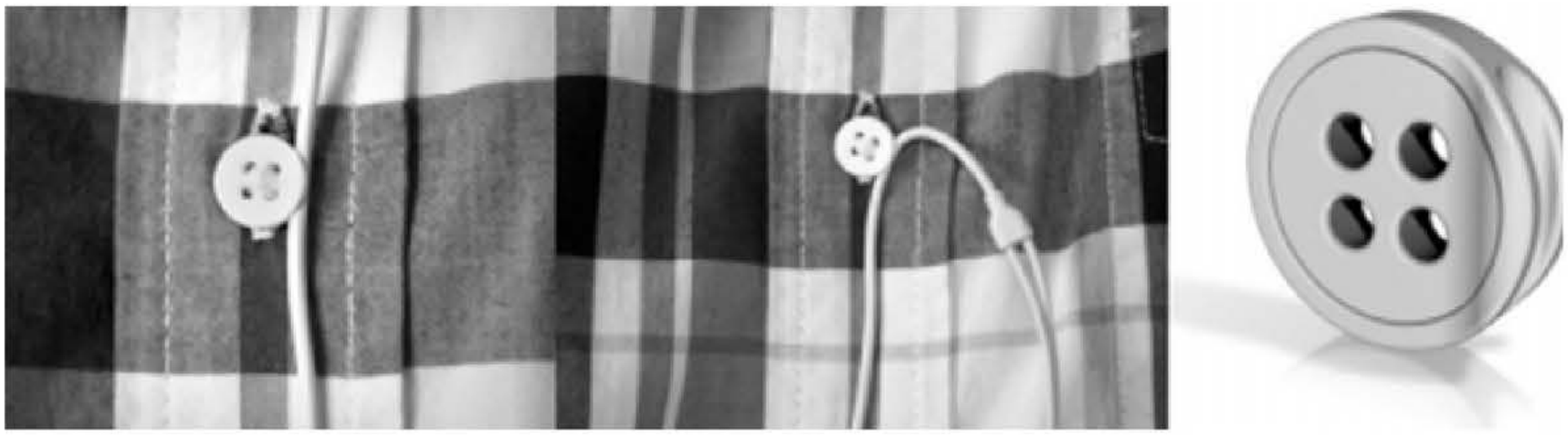
B) Latest IT business services that are H/W centered

① 3D Printing

A 3D printing is a way of printing 3-dimensional objects using 3D data. The 3D data that is used as input is generated from a digital drawing. It is also known as additive manufacturing, since it builds three-dimensional structures by stacking layers of materials that could be in powder, liquid, or solid (threads, wires, pellets) state.

The reason why manufacturers are paying attention to 3D printing is that 3D printing is suitable for customized production of small batches of diverse range of products. 3D printing improves the manufacturing environment to satisfy consumers' diverse needs, making it easy to customize the product quickly and easily to the needs of consumers, and providing a one-person manufacturing environment where consumers can make their own products In addition, as the principal of product manufacturing becomes diverse and the share of the manufacturing/distribution businesses generated by individuals and small manufacturers increases, the reprocessing industry for product commercialization will also develop. Until now, manufacturing and consumption were separate domains, but 3D printing has allowed the boundaries between consumption and manufacturing to collapse and meet the small needs for manufacturing in everyday life. The next example case is a product called Button 2.0, which is an improved button that can be printed with a 3D printer. It has grooves on the side for clamping earphone wires and was an idea borne from the inventor's frustrating experience of getting his earphones frequently tangled with the buttons on his shirt.[21]

21 Source: "How does 3D printing change the consumption culture?". KIDP, 2014



Consumers who are living in an era where they can easily access 3D printing products will exhibit a different consumption behavior than the previous generation. Instead of simply purchasing products made by companies, they will actively demand their own requirements and sometimes they will resort to marking the product themselves, expanding their involvement in the production process.

As mentioned earlier, 3D printing is an industry for producing small quantities of a wide variety of products and is also suited for personalized manufacturing.3D printing is creating a new form of production/distribution/consumption that is markedly different from traditional manufacturing with its strengths in economies of scale and low labor costs. While existing manufacturing processes are advantageous for mass production and is perfected suited for especially simple-shaped products, 3D printing manufacturing processes are advantageous for small-volume, large variety production. A single equipment can produce many different types of products.
The 3D printing process consists of the following steps:

- The process of modeling the product.
- The process of printing the stereoscopic shape by stack printing the layers that makes up the digitized model.
- Post-processing process for polishing or dyeing the surface of the printed object.

The 3D model data required for 3D printing can be generated by a 3D scanner when it scans the shape of objects or the developer can create the 3D model using a 3D modeling program. Prior to printing, the 3D model data is converted to thin layers of data by a program called slicer. When the data converted by the slicer is sent to a 3D printer, a solid output is created through the process of stacking thin layers of material by stacking or hardening. The final product is produced through post-processing processes, such as removing the temporary supports that had been inserted to support the 3D output, shaking off the hot powder on the surface, or dipping it in an adhesive solution to solidify the output.

Various technologies are needed at each process of 3D printing, and the critical component technologies for each process are as follows: the modeling process requires a technology for scanning or designing objects and for converting the design into data. The printing process requires the highly complex technology for spraying the raw material in the right location and controlling the energy source needed for hardening the raw material. In materials, work must be done on developing a material that is compatible with the technology used in the printing process while also meeting the product requirements dictated by the customer. Today, materials research for 3d printing is focused on alloys and bio-materials due to the fact that they are materials that create high values.

Currently, the 3D printing technology is showing limited performance on several technological fronts. But rapid development is expected in the years to come because of positive factors like the effort being put into developing new technologies, advancements being made in new materials, and critical patents whose rights are scheduled to expire.

② Wearable device

The smartphone market, which was on an explosive growth trajectory since the introduction of the iPhone in 2009, is now in its maturing stage. At this point in time, the next-generation mobile technology that is expected to replace the smartphone is the wearable device. Wearable devices are devices of various form factors that are designed to be attached to the human body to improve the convenience of use. Wearable devices are electronic devices that are just worn on the body like an accessory, but they are electronic devices that can communicate with users from the closest location to the user's body. They provide functions that are clearly differentiable from existing devices in terms of portability, ease of use, and environmental adaptability. From fitness and well-being to healthcare, medical care, manufacturing, military, and infotainment, wearable devices are being used in increasing number of applications.
Wearable devices began as an accessory type device. But today, they are evolving into many different forms, including body attachment type which is attached to the human body, apparel-integrated type which is integrated into textiles, and body transplants, which are devices that are actually inserted into the human body.
The different types of wearable devices are summarized in the table below.

<Table 93> Types of wearable devices[22]

Category	Definition and Characteristics	Core Technology
Accessory	• Wearable devices like watches. • Utilize ultra-small/low power system. • Overcome discomfort issue through ergonomic design.	• Ultra-small sensors and high-capacity battery • Low power, high performance SoC • Flexible, thin, transparent display and interaction technology
Apparel	• Use system that is merged with fabric • Application of circuits printed on flexible fabric. • Integration with clothing/textile products.	• Conductive thread, textile, fabric technology • Fabric circuit board and packaging technology • Adhesive battery component
Body Attachment	• Use systems that attach to the skin • Use circuits made from flexible polymers • Integration with human skin	• Polymer circuit board and electronic component packaging technology • Antenna and communication technology • Material and attach/detach technology
Body Transplant	• Transplantation of electronic device into the human body. • Use biocompatible circuit boards • Integration with human body	• Biometric sensor technology • Development of electronic tattoo, capsule form • Low power/miniaturization technology

In recent years, the growth of IoT has greatly expanded the scope and the range of objects (people, objects, devices, etc.) that could be interconnected. This development has led to the growing importance of wearable devices because such devices are always connected to the user's network. Because they can free up the 2 hands of users and are always located close to the user's view and the user's position, the role of wearables will become increasingly more

22 Source: Directions and Challenging Tasks of Smart Grid, Park Chan-guk, NIPA, 2009

important and the collection of data that was previously difficult to collect will become possible. Consequently, the production of customized personal contents will become possible, opening the floodgates to new types of services. The problems facing wearable devices are short battery life which severely restricts the user's ability to appreciate the value of always wearing the device, limited content that can be implemented in a small screen, and the lack of killer content or services and the lack of a game changing function. However, wearable devices will be able to create core values if they converge with IoT, cloud computing, Big Data, and mobile devices. The sensing functions in wearable devices can be used for gathering Big Data, Big Data (cloud) analysis can be carried out on the gathered data, the implications from the analysis results could be used in customized services for users. Also, new business models like smart home service based on IoT, O2O commerce, and smart car service will create new markets and expand existing markets.

③ Self-Driving Cars

Self-driving cars are defined as "automobiles that can drive safely on their own by recognizing the surrounding environment on their own without the driver's intervention, and can drive safely by recognizing risks." To be more precise, self-driving cars incorporate ICT technologies like software, AI, communication and sensor technologies to minimize human control while it is being driven safely.

The emergence of self-driving cars is due to the following developments:

- IT companies and car makers are accelerating their cooperation to bring latest ICT technologies to cars.
- The rapid growth of the electrical parts and telematics market in response to demand for better safety and convenience
- Improvements in network and Internet technology allow cars to be recognized as new mobile space and offer new UXs to drivers

<Table 94>Levels of Autonomous Driving

Levels	Description	Sub Functions
No Automation	• Driver always monitors the situation and controls safety-sensitive functions such as brakes, speed control, and steering.	• Traditional car in which the driver has to be fully aware, judge and control the driving.
Function-Specific Automation	• Driver has control of the vehicle except for some functions during normal driving or when collision is imminent.	• A driving assistant system that provides information needed for driving and supports safe driving and parking by giving warnings and control.
Combined-Specific Automation	• Two or more controls operate harmoniously in a driving environment. But the driver still has the right to control the vehicle, taking responsibility for monitoring and safety.	
Limited Self-Driving Automation	• Under specific traffic environment, the vehicle controls all safety functions. • The vehicle has monitoring authority but whendriver control is required, an alarm is sounded the driver takes over the control intermittently.	• Infrastructure-linked autonomous driving where cars can be autonomously driven on roads equipped with infrastructure such as automatic driving roads.

Full Self-Driving Automation	• The vehicle controls all safety functions and monitors the condition of the vehicle. • Driver enters destination and the driving settings. • Autonomous driving system is responsible for the safe driving of the vehicle.	• Smart car that functions like a robot. Autonomously drives itself to a specific destination through a specific course.

Source: SAE(Society of Automotive Engineers)

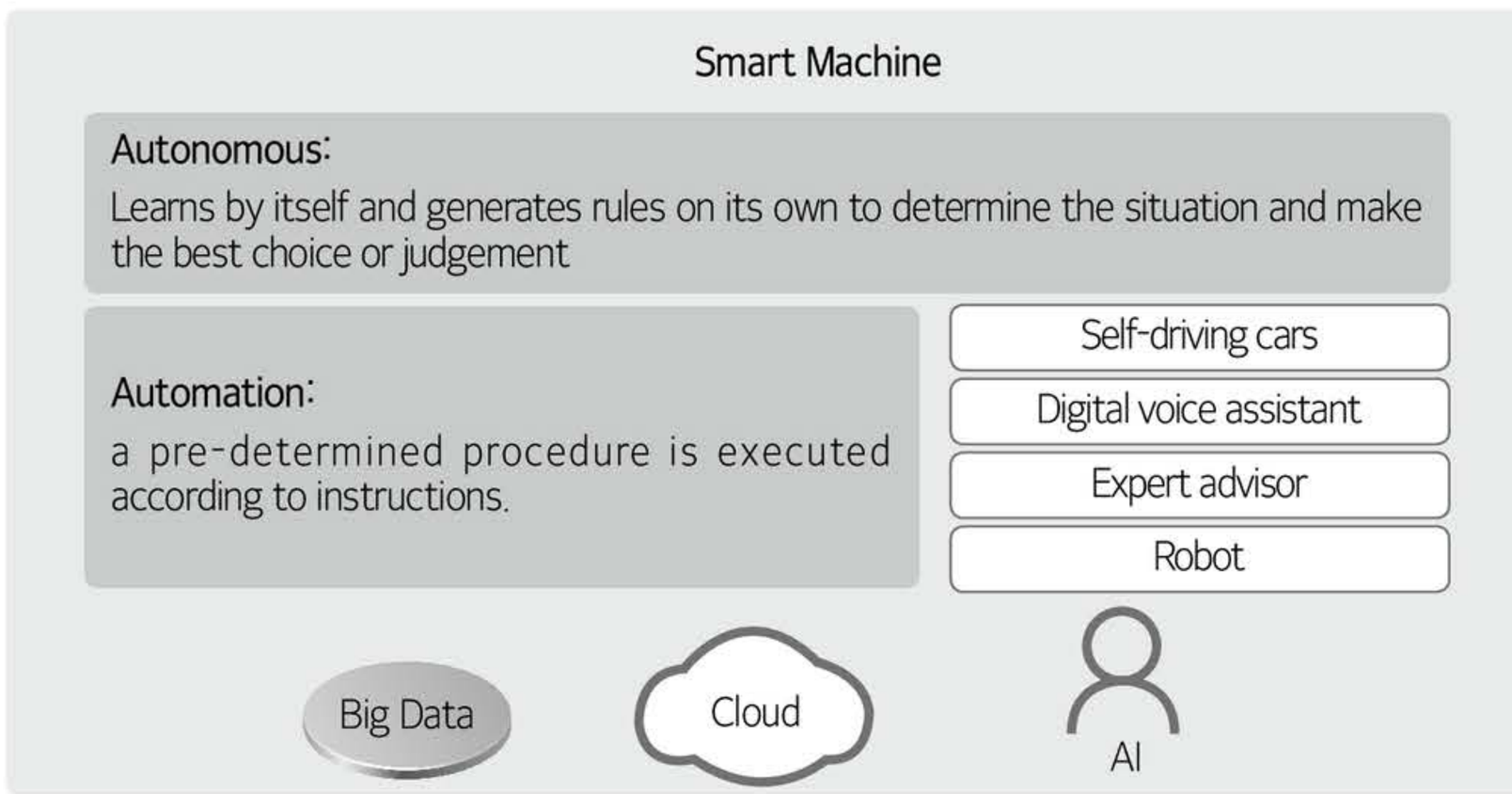
• Key technologies of self-driving cars

The job of a self-driving car is acquiring information and using this information to drive the car safely. It requires technologies of recognition, judgement, and manipulation. These technologies become integrated with other technologies like AUTOSAR, RTOS, and functional safety technologies.

④ Smart Machine

Smart machines that can be found in our surroundings today are machines that recognize human voice and provide answers to questions posed by users, e.g. Apple Siri or Google Home. Medical advisors that provide guidance on medical diagnosis or drug use, and robots that assemble things on behalf of people in factories are also example of smart machines.

Smart machines are defined as "a machine that acts autonomously, has intelligence and self-learning abilities, and is able to judge and adapt itself to different situations, and performs tasks that have been thought to be impossible except for humans." [23]



[Fig. 78] Concept diagram of smart machine

• Direction of developments in smart machines

Smart machines are evolving in a direction where it can learn by itself and make its own rules, create and validate hypothesis and become situational aware and discover the optimal solution, in tandem with advances being made in cloud computing, Big Data and artificial intelligence (AI). In other words, it is approaching the real concept of a smart machine.

23 Source: Gartner

In other words, the age is dawning when machines could do things that could not be accomplished by humans because of the lack of human ability. Machines will be able to study vast medical records or judicial records to come up with the best interpretation of the data and recommend the best decision to make. It will be able to perform the role of improving our daily lives, for instance by supplementing the muscles or cognitive abilities of the elderly and the weak.

⑤ Drone

A drone is defined as an aircraft or helicopter-shaped unmanned aerial vehicle that is flown by the radio signals. Drones were first developed for military purposes. After the Second World War, drones were developed to be reused as target aircrafts during military exercises. Drones are gradually beginning to be used in the private sector. Once they are equipped with GPS or video devices, drones can be used in many applications.

• Advantages of drone

Drones can go to places that are impossible for humans to reach, such as the underworld or used for exploring the deepest parts of the oceans. They can approach places that are too hazardous for humans to go, such as places where hazardous gases or radioactivity may be present.

Drones can also be operated in autonomous mode without a human operator, in which it can recognize its surrounding environment and fly by itself. Because there are no restrictions to where drones can go, they can be used in various sectors.

<Table 95> Applications of drones

Key technologies	Description
Distribution	• Amazon is scheduled to rollout a delivery service that can make deliveries to any locations within a radius of 16km in 30 minutes. • Domino Pizza succeeded in delivering 2 large sized pizzas with a single drone.
ICT	• Facebook has developed the concept of using drone hovering in the air like a Wifi router for delivering Internet access in remote places.
Disaster relief	• 'Global Hawk' was used to gather data from inside Fukushima nuclear reactor. • 'Global Hawk' was used for recovery efforts after the earthquake in Haiti, typhoon disaster sites in the Philippines.
Crime	• Seattle police force uses drones for tracking stolen vehicles and investigates drug related crimes.
Traffic information	• Renault introduced a car with a drone that gathers traffic congestion information and road obstacle information.
Movies & broadcasting	• Multicopters are used in movie production, sports broadcasts.

X. Professional Ethics of IT Business

▶▶▶ Recent Trends and Major Issues

The development of IT technology is causing rapid fluctuations in all industries in the modern society, maximizing the convenience and efficiency of modern life. In particular, the services created by IT technology are being developed to operate prioritizing the user's convenience and interests, but as the enhanced software intelligence and increases the side effects and risks of misuse, abuse, and malicious use. The importance of ethical responsibility is also increasing. Against this backdrop, it is necessary to understand the professional ethics of IT business-related developers.

▶▶▶ Learning Objectives:

1. To be able to describe the professional ethics of IT business workers.
2. To be able to explain the principles and codes of professional ethics related to IT business.

▶▶▶ Keywords:

Professional Ethics, Ethics, Work Ethics, Community Ethics, Ethics and Law

✚ Preview for practical business

In March 2018, a group of people who leaked the design drawings of a domestic front-load washing machine motor to China was caught by the police. It turned out that they handed over the motor drawings for the front-load washing machine developed by a domestic company through tens of billions of won in investment over 10 years, in return for KRW 60 million in cash, housing, and vehicles.

According to the Gyeongnam Provincial Police Agency's International Crime Investigation Unit, two people were arrested on charges of violating the law on the prevention of unfair competition and protection of trade secrets, and three other people who assisted them with the leakage were arrested.

Among them, Mr. A, is alleged to have moved to a Chinese company with a laptop in which the design drawings and key technical data related to manufacturing of the entire product line are stored, while serving as the research head of a Chinese local subsidiary of a medium-sized company in Gwangju that manufactures and produces high-efficiency motors for front-load washing machines in January 2015. Moreover, Mr. B, who served as a researcher in the production technology department of the same company, secretly took away 5918 related files such as design drawings and inspection data for production facilities when he resigned in February 2015. In addition, three other people who worked for the same company are also suspected of stealing design drawings of production facilities and transferring them to Mr. A and B.

In response, Tae-hee Lee, Sergeant of the GimhaeJungbu Police Station's investigation department, said, "While technology and systems have been highly developed and improved over time, there are still some things that remain outdated. It is professional ethics," explaining that the fundamental cause of safety accidents is, in the end, an individual without a proper sense of professional ethics.

[Source] Etoday, Yonhap News, SBS, Maeil Business News Korea, Gyeongnam Daily Newspaper, 2018-03-06

01 Understanding the Concept of Professional Ethics

A) Concept of Professional Ethics

① Definition of Professional Ethics

Professional ethics refers to a code of conduct that people with a job should follow in the process of engaging in the job.

Many people in modern society engage in vocational activities while belonging to a specific organization called the workplace, not only attaining self-realization but also forming relationships and interacting with others while participating in the common life of society. At this time, the norms and standards that can be applied to individuals' mindsets, attitudes and related behaviors toward jobs and work, and mutual relations required in a specific setting of a job can be called professional ethics.

In the normative aspect, professional ethics consists of ethical norms that must be observed among people in their professional life, norms made up of rules of common behavior, and norms that limit harmful behaviors that should not be performed, that is, unethical behaviors.

The sub-elements of professional ethics are divided into work ethics and community ethics.[24]

Classification		Content
Work Ethics	Diligence	• Do you maintain a diligent and steady attitude in your work life?
	Honesty	• Do you act true and right in your work life without deceiving or hiding anything?
	Sincerity	• Do you handle your job with all your heart?
Community Ethics	Spirit of service	• Do you have an attitude of working hard for the country, business, or others rather than your own interests?
	Responsibility	• Do you have an attitude to do whichever task you are given or the task you decide to do?
	Compliance	• Do you obey and follow the rules or norms set at work?
	Workplace etiquette	• Do you show appropriate and polite language and behavior that are appropriate for your work life and personal relationships?

② Importance of professional ethics

Professional ethics is necessary for fulfilling responsibilities and duties as a professional while realizing one's self based on moral values, and is a requirement that must be met for cooperation in a community life pursuing common interests.

The reason professional ethics is important is that the vocational activities have a significant influence on the order and development of companies and society as a whole, beyond the individual level. Like the saying, "Ethics rather than profit makes a company of 200 years," ethics is an important factor that ensures reliability and leads to competitiveness in economic activities.

If the level of professional ethics is low, individuals will only prioritize their own interests and not be considerate of others. In addition, cooperation and interaction necessary for professional life may not be achieved well, and

24 Human Resources Development Service of Korea, NCS National Competency Standard Occupational Ethics Workbook, 2016

furthermore, the credibility of the organization related to the profession may be lacking and the order of society may be destroyed. This may be directly linked the matter of national competitiveness and economic development. Therefore, professional ethics is necessary for the individual as a professional and also for the reliability of the company, the order and development of society, and the development of the profession itself.
The following is a checklist for self-identification of the level of professional ethics generally required of all professionals. Think about your usual behavior, check what matches your behavior.

<Table 96> Checklist for Professional Ethics[25]

Question	Disagree	Neutral	Agree
1. I keep the virtue ethics in human relations	1	2	3
2. I know the code of ethics demanded by the times and social situations and respond appropriately.	1	2	3
3. I think a job has great significance in my life.	1	2	3
4. I place more importance on the role I have to keep as a professional, not as an individual while performing my job.	1	2	3
5. I maintain a regular and diligent lifestyle to achieve the goals I have set.	1	2	3
6. I observe the set schedule in my work life.	1	2	3
7. I try to do what is right and beneficial rather than what is profitable.	1	2	3
8. I tend to point out things that violate the code of ethics even if they are beneficial to work.	1	2	3
9. I try to act true and right in my work life without deceiving or hiding anything.	1	2	3
10. I try to make only the promises I can keep, take notes, and keep them.	1	2	3
11. I respect my job, take pride in, and take care of it with all my heart.	1	2	3
12. I tend to maintain a modest lifestyle and train my mind and body for a healthy working life.	1	2	3
13. When other people's work is more important than my own, I tend to actively help other people's work.	1	2	3
14. I usually think that my own interests are important, but the interests of the country, society and companies are also important.	1	2	3
15. Whenever there is a difficult problem in my organization, I tend to voluntarily resolve it even before being instructed to do so.	1	2	3
16. I tend to try to handle the tasks given to my organization for a limited time.	1	2	3
17. I fulfill my responsibilities and roles in the organization I belong to, and I strive to protect my rights.	1	2	3

25 Human Resources Development Service of Korea, NCS National Competency Standard Occupational Ethics Workbook, 2016

18. I tend to do my job according to the rules and norms of the organization while performing my work.	1	2	3
19. I tend to separate work and life and maintain restrained manners in my organizational life.	1	2	3
20. I tend to use positive words and actions such as praise or encouragement rather than reprimand	1	2	3

Count and write down the number of each item using the table below, and take note of the items checked with "Disagree".

<Table 97> Answer Checklist

Question	Answer	Number	Classification
1~4	Disagree		Professional Ethics
	Neutral		
	Agree		
5~12	Disagree		Work Ethics
	Neutral		
	Agree		
13~20	Disagree		Community Ethics
	Neutral		
	Agree		

B) Professional Ethics of IT Business

① Professional Ethics of IT Business Workers

Professional ethics can be divided into two. One is general ethics required of any professional, and the other is special ethics of a specific profession.

IT business is developing rapidly as various technologies compete with each other and form a huge ecosystem, and are directly affecting the quality of life of everyone throughout the world. However, safety accidents, information security accidents, and cyber-crimes frequently appear due to the lack of professional ethics of ICT industry workers and software developers. As the negative impact of such accidents expands and social losses increase, the need and importance of professional ethics of IT business workers is being emphasized.

There is no global standard of professional ethics encompassing the entire IT business. However, you can look up the norms that are considered important in IT business in the internal code of conduct of individual professional organizations or companies.

Examples are the ACM (Association for Computing Machinery) Code of Ethics and Professional Conduct, IEEE-CS(Institute of Electrical and Electronics Engineers - Computer Science)Software Engineering Code, and NSPE(National Society of Professional Engineers) Code of Ethics for Engineers.

Codes of ethics commonly found in these codes are required more as the intelligent information society's dependence on IT technology increases. They include moral responsibility for public safety and the implementation of technology

as a developer, privacy protection and information protection consciousness.

② Professional Ethics for Software Developers

Programmer and software development columnist Pete Goodliffe presents the following "Becoming a Better Programmer"[26], emphasizing the ethical consciousness of programmers.

<Pledge to do no harm as an ethical programmer>

- I swear I will not harm the code of ethics or business for personal and professional gain.
- I will do my best to perform my assigned tasks faithfully, and will build team harmony.
- I will be honest with others and work towards making projects and teams as efficient and valuable as possible.

Also, it asks you as a programmer to check the following questions to check whether you have professional ethics.

1. Do you consider yourself an ethical programmer?
   Is there a difference between an ethical programmer and an ethical person?
2. Is it ethical to create software that generates enormous wealth for bankers at the expense of those who don't know how to create software? Does it make any difference depending on whether the trade practice is legal or not?
3. What if you are using GPL code that requires additional disclosure obligations for your products, but you do not fulfill the obligations of the license terms by withholding the disclosure of your own code?
   Do you have to disclose your company's code to meet the license terms? Or should you ask for an alternative replacement of closed source for the GPL code? Should you become a whistleblower and report a license violation if the product has already been shipped? What if your employment security depends on being silent about it?
4. What if you recognize other programmers' unethical behavior? If the programmer is a co-worker, a friend, someone who has been asked for a referral, or a coder whom you have met but haven't worked with, how does your answer change?
5. How do software patents fit into the world of ethical programming?
6. Does your passion for software development affect how much you care about ethical issues? Will a passionate programmer behave more ethically than a professional coder?

It is difficult for software developers to fully understand how their code will be used and what the potential risks may be. In addition, it is difficult to figure out what is right and what is wrong in a rushing work environment. In such an environment, a sense of professional ethics gives a sense of duty and responsibility for a job and can provide guidance for judgment in the context of moral dilemmas.

02 Ethical Principles and Code of IT Business

A) Code of Ethics Related to ICT Technology

① ACM(Association for Computing Machinery) Code of Ethics and Professional Conduct

26 Pete Goodliffe, "Becoming a Better Programmer", p.243-252, O'Reilly Media, 2014

- ACM's Code of Ethics and Professional Practice, which largely consists of general principles (7), professional responsibilities (9), professional leadership principles (7), and compliance with the code(2), and emphasizes social responsibility and professional leadership.

Article 1: General Ethical Principles

1.1 Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

1.2 Avoid harm.

In the event of accidental or unintentional damage, those responsible for the damage must try to reverse or recover it as much as possible.

Any signs of systemic risk that could lead to damage should be reported immediately.

1.3 Be honest and trustworthy.

1.4 Be fair and take action not to discriminate.

1.5 Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. (◀ More general descriptions by incorporating Nos. 6 and 7 of the previous code of ethics)

Copyright, trade secret, patent right, license, job invention, open source (commercial, personal)

1.6 Respect privacy.

1.7 Honor confidentiality.

Article 2: Professional Responsibilities

2.1 Strive to achieve high quality in both the processes and products of professional work.

2.2 Maintain high standards of professional competence, conduct, and ethical practice.

2.3 Know and respect existing rules pertaining to professional work.

2.4 Accept and provide appropriate professional review.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

2.6 Perform work only in areas of competence. (◀Added)

2.7 Foster public awareness and understanding of computing, related technologies, and their consequences.

2.8 Access computing and communication resources only when authorized or when compelled by the public good.

2.9 Design and implement systems that are robustly and usably secure. (◀Added)

Prepare in advance for accidents or abuse, manipulation, and paralysis caused by malicious intent

Article 3: Principles of Professional Leadership (◀Added)

3.1 Ensure that the public good is the central concern during all professional computing work.

3.2 Articulate, encourage acceptance of, and evaluate fulfillment of social responsibilities by members of the organization or group.

3.3 Manage personnel and resources to enhance the quality of working life.

3.4 Articulate, apply, and support policies and processes that reflect the principles of the Code.

3.5 Create opportunities for members of the organization or group to grow as professionals.

3.6 Use care when modifying or retiring systems.

3.7 Recognize and take special care of systems that become integrated into the infrastructure of society.

[Example] Social Media, Cloud.

Article 4: Compliance with the Code

4.1 Uphold, promote, and respect the principles of the Code.

4.2 Treat violations of the Code as inconsistent with membership in the ACM.

② NSPE(National Society of Professional Engineers) Code of Ethics for Engineers

NSPE's Code of Ethics for Engineers is ethical standards that engineers must keep, presenting the standards for acting ethically for the public, customers and employers in performing the engineer's job.

In addition, it explains that the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare.

The Code consists of the full text, Fundamental Canons, Rules of Practice, Professional Obligations, and Statement by NSPE Executive Committee.[27]

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.

③ ACM/IEEE-CS Code of Ethics and Professional Conduct

The Code of Ethics for Software Engineers is a code recommended by a joint task force by ACM (Association for Computing Machinery) and IEEE-CS (Institute of Electrical and Electronics Engineers - Computer Science) and jointly approved as a standard for software education and practice.

Software engineers participate in education, analysis, specification, design, development, certification, maintenance and testing of software systems using computers that play a central and growing role in commerce, industry, government, medicine, education, entertainment and society. do. A software engineer is a profession that can do good or do harm, or influence others to do or do good.

The Code of Ethics for Software Engineers emphasizes the commitment to making software engineering a beneficial and respected profession, and to the health, safety and well-being of the public, for those in the software engineering profession.

Software Engineering Code of Ethics and Professional Practice presents eight ethical principles in its summary version.[28]

1. Public: Software engineers shall act consistently with the public interest.
2. Client and Employer: Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
3. Product: Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
4. Judgement: Software engineers shall maintain integrity and independence in their professional judgment.

27 NSPE, Code of Ethics for Engineers, https://www.nspe.org/resources/ethics/code-ethics

28 ACM/IEEE-CS, Software Engineering Code, https://ethics.acm.org/code-of-ethics/software-engineering-code

5. Management: Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
6. Profession: Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. Colleagues: Software engineers shall be fair to and supportive of their colleagues.
8. Self: Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

④ ISACA(Information Systems Audit and Control Association) Code of Professional Ethics

ISACA provides guidance on professional and personal conduct in relation to the information systems audit job, through its Code of Professional Ethics.[29]

1. Support the implementation of, and encourage compliance with, appropriate standards and procedures for the effective governance and management of enterprise information systems and technology, including: audit, control, security and risk management.
2. Perform their duties with objectivity, due diligence and professional care, in accordance with professional standards.
3. Serve in the interest of stakeholders in a lawful manner, while maintaining high standards of conduct and character, and not discrediting their profession or the Association.
4. Maintain the privacy and confidentiality of information obtained in the course of their activities unless disclosure is required by legal authority. Such information shall not be used for personal benefit or released to inappropriate parties.
5. Maintain competency in their respective fields and agree to undertake only those activities they can reasonably expect to complete with the necessary skills, knowledge and competence.
6. Inform appropriate parties of the results of work performed including the disclosure of all significant facts known to them that, if not disclosed, may distort the reporting of the results.
7. Support the professional education of stakeholders in enhancing their understanding of the governance and management of enterprise information systems and technology, including: audit, control, security and risk management.

⑤ The Korean Institute of Electrical Engineers (KIEE)'s Code of Professional Ethics[30]

The Korean Institute of Electrical Engineers is an institution that promotes and develops academics and technologies related to electrical engineering, and present a code of ethics for professionals in the electrical engineering technology field.

[Full Text]

Members of the Korean Institute of Electrical Engineers believe that electrical engineering technology improves the quality of life and greatly affects the living environment and value Korean cultural traditions that place importance on a harmonious life with our neighbors and nature. As a professional, with a high sense of ethics, we act honestly and fairly in order to uphold authority, honor and dignity, and treat the public with good faith. To this end, we pledge as follows.

29 ISACA, Code of Professional Ethics, https://www.isaca.org/Certification/Code-of-Professional-Ethics/Pages/default.aspx

30 http://www.kiee.or.kr/board/?_0000_method=view&ncode=a004&num=84&page=1

1. Social Responsibility
   We contribute to social development and world peace with our professional knowledge, make decisions in accordance with public safety and well-being, and take social responsibility for these decisions.
2. Principles of Faith
   As long as it does not harm the public interest, we will keep the confidentiality of information obtained in business or occupation and protect the trust of our organization or employer.
3. Responding to Conflicts of Interest
   When a conflict of interest arises in conducting business, all interests that may affect business judgment are disclosed and dealt with objectively.
4. Material Honesty
   We honestly and faithfully draw conclusions or make arguments based on engineering data, and do not use false data or plagiarize.
5. Compliance with laws
   We strictly abide by laws, regulations, contracts, and standards related to business, and refuse any form of bribery.
6. Respect for intellectual property rights
   We respect the intellectual property rights of others, such as copyrights and patents, and disclose the achievements of others fairly.
7. Principle of Fairness
   We accept a fair assessment of one's technical performance and corrects any errors as soon as they are discovered. We fairly evaluate the technical performance of others.
8. The principle of fairness
   We reject prejudice and discrimination against gender, race, age, geography and educational background, physical or mental disability in the performance of the job.
9. Contributing to the development of specialized fields
   We develop our own professional knowledge, skills and expertise to contribute to the development of our specialty.
10. Efforts to spread eco-friendly and sustainable technologies
    We fully recognize the need for eco-friendly and sustainable technologies, and make the necessary efforts to preserve and restore the earth's productive capacity.

XI. Privacy

▶▶▶ Recent trends and major issues

As various personal information such as network information, biometric information, and location information has appeared from the IT business and been distributed in various industrial fields, the importance of handling and management of personal information is increasing. Now, personal information is not just information, but is becoming an asset of companies and countries, but leakage accidents occur due to unauthorized use, careless management, internal leakage, and hacking. These problems can lead to the degradation of the corporate image and loss of corporate management, which may even undermine national branding. Therefore, let's learn about the concept and importance of personal information that you must know as an IT business worker.

▶▶▶ Learning Objectives

1. To be able to explain the concept and type of personal information.
2. To be able to explain policies related to personal information.

▶▶▶ Keywords

Personal information, De-identified personal information, GDPR,

✚ Preview for practical business

A hacker who infiltrated into an accommodation app last year was found to have leaked personal information of 2.9 million people from eight other companies during the same period. The leaked personal information included website ID as well as name, date of birth, e-mail, mobile phone number, address, passport number, etc. The information about 3,239,000 cases of accommodation reservation and 178,625 members, as well as personal information about 971,877 members (excluding duplicative cases) were found to have been leaked from several companies. In addition, 4,817 menacing and obscene texts were sent by abusing the leaked accommodation details.

The Korea Communications Commission found that the act amounts to a "severe act of violation" and imposed the penalty, as it violates a number of personal information protection measures such as access control, access record preservation, encryption, and expiration date set forth in the "Act on Promotion of Information and Communication. Network Utilization and Information Protection, Etc." (the "Network Act").

The following are examples of personal information leaks in domestic companies.

Date of Occurrence	Type of Violation	Number of Leaked cases (damage)	Number of Victims (damage)	Administrative Sanctions
March 2017	Personal information leakage due to hacking attacks	3.41 million cases in total ※ 3.24 million cases of accommodation data ※ 170,000 cases of member information	970,000 people	• KRW 310 million in penalty • KRW 25 million in fine • Order of correction and disclosure • Recommended disciplinary actions for executives
August 2016	Violation of provision of personal information to a third party	180,000 cases in total ※ Personal information provided to 3 property insurance companies including Lotte	29,000 people	• KRW 180 million in penalty • KRW 20 million in fine • Corrective order
May 2016	Personal information leakage due to hack attacks	25.4 million cases in total ※ 14.16 million individual members ※ 11.2 million dormant members	20.51 million people in total ※ 10.33 million individual members ※ 10.18 million dormant members	• 4.KRW 48 billion in penalty • KRW 25 million in fine • Order of correction and disclosure

01 Understanding of Personal Information

A) Concept of Personal Information

① Definition of Personal Information

The term "personal information" means any information relating to a ⓐliving ⓑindividual: ⓒInformation that identifies a particular ⓓindividual by his or her full name, resident registration number, image, etc. (including information which, even if it by itself does not identify a particular individual, may ⓔbe easily combined with other information to identify a particular individual.)

> Article 2 of Personal Information Protection Act
>
> The term "personal information" means any information relating to a living individual: Information that identifies a particular individual by his or her full name, resident registration number, image, etc. (including information which, even if it by itself does not identify a particular individual, may be easily combined with other information to identify a particular individual.)
>
> According to Article 2 of Act on Promotion of Information and Communication. Network Utilization and Information Protection, Etc., the term "personal information" means the information pertaining to an individual alive, which contains information identifying a specific person with a name, a national identification number, or similar in the form of a code, letters, voice, sound, motion picture, or any other form (including information that makes it impracticable to identify a specific person by itself, but that enables to identify such person easily if combined with another information)

<Table 98> shows the types of personal information and specific examples.

<Table 98> Examples of personal information

Type	Example of personal information
Identification information	• Name, resident registration number, address, hometown, contact information such as phone number, date of birth, place of birth, e-mail address, family relations and family member information, etc.
Physical information	• (Biometrics information) Face, fingerprint, iris, voice, genetic information, height, weight, etc. • (Medical and health) Health status, medical record, physical disability, disability level, medical history, etc
Mental information	• (Preferences and propensity information) Rental records such as books and videos, magazine subscription information, product purchase details, website search details, etc. • (Inner secrets, etc.) Thoughts, creeds, religion, values, political parties and real estate holdings, savings, etc. • (Credit information) Credit rating information, loan or collateral details, credit card record details, etc.
Property Information	• (Personal financial information) Income, credit card number, passbook account number, movable and immovable property holdings, savings details, etc. • (Credit information) Credit rating information, loan or collateral record, credit card record, etc
Social information	• (Educational information) Education, grades, attendance status, certificate holdings, reward and punishment records, school records, etc. • (Legal information) criminal record, trial record, details of penalty payment, etc. • (Labor Information) Workplace, employer, place of work, work experience, reward and punishment records, job evaluation records, etc. • (Military service information) Military service status, military service number, rank, service unit, etc.

Others	• Phone call history, website access history, email or phone message, other location information by GPS, etc.

The following cases do not correspond to personal information.

ⓐ Information on deceased persons, corporations, groups or objects does not correspond to personal information

ⓑ The statistics of the group achieved by gathering together do not correspond to personal information.

ⓒ There are no special restrictions on the type, form, nature, and format of information.

ⓓ Information that is difficult to identify a specific individual is not personal information

ⓔ "Easily combined with other information" means that the possibility of obtaining other information to be combined must be possible and the possibility of combining with other information must be high.

② Key terms of Personal Information Processing

The key terms related to the processing of personal information are as follows.

<Table 99> Key terms of Personal Information Processing

Information Subject	Refers to a person who can be identified by the information collected and processed and who is the subject of the information
Processing	Collection, creation, recording, storage, retention, processing, editing, search, printing, correction, recovery, use, provision, disclosure, destruction, and all other similar acts of processing personal information
Personal Information File	Collection of personal information systematically arranged or organized according to certain rules so that personal information can be easily searched
Personal Information Processor	Refers to public institutions, corporations, organizations, businesses, individuals, etc. that process personal information by themselves or through other people to operate personal information files for business purposes.
Privacy Policy	Refers to a documentary disclosure of the personal information processing standards and protection measures of the business entity/organization that processes personal information. The purpose of processing personal information, the period of processing and retention of personal information, items of personal information to be processed, and provision of third parties, matters related to consignment, personal information protection officer, etc. must be described.
Personal Information Leakage	Personal information leakage refers to cases in the following situations: ① In case of loss or theft of documents containing personal information, portable storage devices, portable computers, etc. ② When a person without normal authority accesses the personal information processing system such as a database where personal information is stored ③ When a file, paper document, or other storage medium containing personal information is incorrectly transmitted to unauthorized persons due to the intention or negligence of the personal information controller ④ In case personal information is transferred to other unauthorized persons or access to the personal information processing system is permitted
Personal Information Exposure	It refers to a case where general Internet users can obtain personal information of others while using the Internet normally without using special methods such as hack attacks.
Permission to Access Personal Information	It refers to the right of the personal information controller to access the personal information processing system and to view, record, correct, and delete personal information.

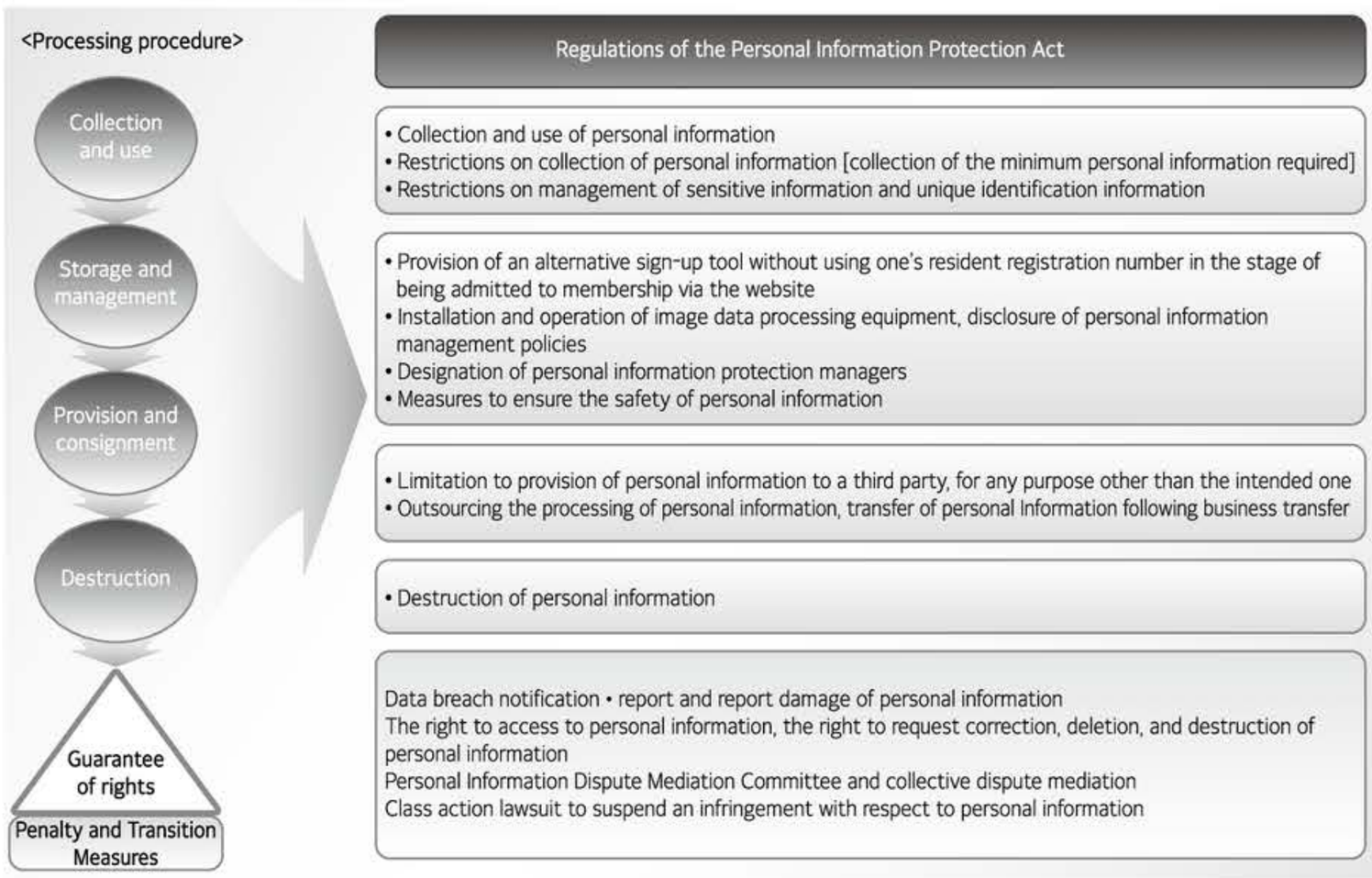
The basic matters of personal information protection specified in the Personal Information Protection Act are as follows.

<Table 100> Basic matters of personal information protection

Subject to the Personal Information Protection Act	All personal information processors in the public and private sector
Protection range	Include handwritten documents recorded on paper documents as well as information processed by computers, etc.
Processing of unique identification information, such as resident registration number, etc.	In principle, processing is prohibited (except when there is the consent of the information subject or the basis of laws and regulations) However, in the case of processing unique identification information, measures necessary to ensure safety such as encryption, as prescribed by Presidential Decree, must be taken so that the unique identification information is not lost, stolen, leaked, forged, altered, or damaged.
Leakage notification	Mandatory notification of personal information leakage
Dispute resolution	Introduction of a group dispute mediation system, a group lawsuit
Committee	Presidential Personal Information Protection Committee

③ Personal information processing procedure

The obligations for each stage of personal information processing stipulated in the Personal Information Protection Act are shown in [Figure 79].



[Figure 79] Personal information processing procedure

In case of planning, developing and building a personal information processing system, it should be established in accordance with the following personal information protection rules.

The government provides guidelines for consents received from customers when companies or public institutions

collect personal information or provide it to third parties.[31]

The company shall provide the items and purposes of the personal information to be collected, the retention period, the details of processing sensitive information, the details of the third party's provisions, the contents of the right to refuse consent, etc., based on the guidelines, in a way that users can recognize at a glance.

Privacy Policy Guidelines	
Policy Development Procedures and Notes	Related Provisions
[1]Preparation Stage	
① Identification of personal information required for task processing	
○ Identify the minimum personal information required for the task to be processed ※ When processing Task A (example): name, phone number, email, address, gender, age	Article 16 (1) of the Personal Information Protection Act(hereinafter referred to as the "Act")
○ Check whether there is unique identification information or sensitive information among personal information to be processed as it has to be processed separately from general personal information ※ Unique identification information: Resident registration number, driver's license number, passport number, alien registration number ※ Sensitive information: ideology, belief, admission to or withdrawal from a trade union or political party, political opinions, health, sex life, genetic information, criminal history data, etc.	Articles 23 and 24 of the Act
② Identification of period for retention of personal information	
○ Confirm the retention period of personal information to be collected and used through privacy policy guidelines or related laws. ○ Set the minimum retention period necessary in consideration of the characteristics of the task, unless the retention period is not specified separately such as in case of temporary collection and use of personal information	Article 21 and 30 of the Act
③ Confirmation of whether the consent of the information subject is required for collection and use	
○ In order to collect and use personal information, you must obtain the consent of the information subject except for any of the following. <Where it is possible to collect and use personal information without consent> 1. Where it is inevitable for a public institution's performance of its duties under its jurisdiction as prescribed by statutes, etc. 2. Where special provisions exist in laws or it is inevitable to observe legal obligations 3. Where it is inevitably necessary to execute and perform a contract with a data subject 4. Where it is deemed manifestly necessary for the protection of life, bodily or property interests of the data subject or third party from imminent danger where the data subject or his or her legal representative is not in a position to express intention, or prior consent cannot be obtained owing to unknown addresse ※ In this case, when the cause is resolved, the processing of personal information is immediately stopped, and the information subject is notified of the fact of collection and use of personal information, the cause and details of use. 5. Where it is necessary to attain the justifiable interest of a personal information controller, which such interest is manifestly superior to the rights of the data subject	Article 15 (1) of the Act
○ In order to process sensitive information or unique identification information, separate consent of the data subject is required. However, if other statutes require or permit the processing of sensitive information or unique identification information, it is possible to collect and use personal information without obtaining consent. ※ A personal information controller shall not process any resident registration number, except in any of the following cases: Where any Act, Presidential Decree, National Assembly Regulations, Supreme Court Regulations, Constitutional Court Regulations, National Election Commission Regulations or Board of Audit and Inspection Regulations specifically requires or permits the processing of resident registration numbers; Where it is deemed manifestly necessary for the protection, from imminent danger, of life, bodily and property interests of a data subject or a third party	Article 23, 24, and 24-2 of the Act
○ Under Article 2 (2) of Act on Promotion of Information and Communication. Network Utilization and Information Protection, Etc., a provider of information and communications services may collect and use personal information of a user without the consent in any of the following cases <Where personal information can be collected and used without consent> 1. If the personal information is necessary in fulfilling the contract for provision of information and communications services, but it is obviously difficult to get consent in an ordinary way due to any economic or technical reason 2. If it is necessary in paying charges on the information and communication services rendered 3. If a specific provision exists in this Act or any other Act otherwise.	Article 22 of Act on Promotion of Information and Communication. Network Utilization and Information Protection, Etc
○ When it is required to obtain consent pursuant to this Act to process personal information of a child under 14 years of age, a personal information controller shall obtain the consent of his/her legal representative.	Article 22 (6) of the Act
④ Identify whether personal information is provided to a third party	
○ Check if there is any personal information to be provided to a third party ○ In this case, you should check the following <Checklist for provision of personal information to a third party> 1. The recipient of personal information 2. The purpose for which the recipient of personal information uses such information 3. Particulars of personal information to be provided 4. The period during which the recipient retains and uses personal information 5. The fact that the data subject is entitled to deny consent, and disadvantages, if any, resulting from the denial of consent.	Article 17 (1) of the Act
○ In order to provide personal information to a third party, separate consent of the information subject is required. However, it is possible without the consent of the information subject if it is provided within the scope of purposes for which it is collected pursuant to any of the following.	Article 17 (1) of the Act

[Figure 80] Guidelines for Personal Information Agreement

④ Diagnosis of Personal Information Protection Management Levels of Public Institutions

In order to improve the level of personal information protection, there is "Diagnosis of Personal Information Protection

31 Personal Information Protection Comprehensive Support Portal (http://privacy.go.kr), "Personal Information Collection and Provision Agreement Guidelines"

Management Levels of Public Institutions" for domestic public institutions such as central ministries, regional governments, and local public enterprises. The government provides a manual in relation to this, and diagnoses the personal information protection management system and infringement prevention activities of public institutions at the national level, reflects them in the institutional evaluation to induce the improvement of the level of personal information protection.

If you look at the "Checklist for Diagnosis of Personal Information Protection Management Levels of Public Institutions" presented in the manual published in 2018, you can see what the most important factors in personal information protection are.

Checklist for Diagnosis of Personal Information Protection Management Levels of Public Institutions in 2018

I. Diagnostic indicators and weightings (3 areas, 12 indicators, 24 items)

Area	Indicator	Weighting		Item
Total		100		
Establishment and operation of management system (25)	1. Laying the foundation for personal information protection	4	6	1.1. Do you have a dedicated organization and manpower to protect personal information?
				1.2. Do you reflect and document the budget required to carry out personal information protection activities?
	2. Protection of personal information in case of processing consignment	10	-	2.1. Do you understand the status of personal information processing consignment and document legal obligations?
				2.2 Do you conduct education and supervision for the trustee who is entrusted with personal information processing?
	3. Promotion of personal information protection training	4	8	3.1. Do you have an annual personal information protection training plan for each training subject (personal information protection officer, person in charge of personal information protection, personal information handler/general staff)?
				3.2. Is annual personal information protection training implemented for each training subject(personal information protection officer, person in charge of personal information protection, personal information handler/general staff)?
	4. Role of personal information protection officer	7	11	4.1. Does the personal information protection officer perform the roles such as management and supervision?
				4.2. Does the personal information protection officer have a track record of leading to improve the level of personal information protection?
Establishment and implementation of protection measures (30)	5. Collection of personal information	7	12	5.1. Do you collect the minimum necessary personal information?
			9	17	5.2. Do you properly conduct the consent procedures for collection and provision of personal information?
	6. Operation of procedures for use and provision of personal information other than the intended purpose	5	9	7	13	6.1. Do you have procedures for personal information used and provided for other than the intended purpose?
						6.2. Do you disseminate to personal information handlers and comply with the procedures for use and provision of personal information for other than the intended purpose?

Establishment and implementation of protection measures (30)	7. Conducting personal information impact assessment	13	-	-	-	7.1. Are you aware of whether the information is subject to personal information impact assessment?
						7.2. Has the personal information impact assessment plan been established and implemented?
	8. Installation and operation of image information processing device	5	9	-	-	8.1. Have you established and disclosed policies for image information processing device operation and management, and have all legal obligations been reflected?
						8.2. Do you record and manage the use, provision, access, and destruction of personal image information in the ledger?
Establishment and implementation of infringement conntermeasures (45)	9. Measures to prevent leakage and exposure of personal information	10	16	15	25	9.1. Do you establish and operate a system to prevent leakage and exposure of personal information on the webpage and personal information processing system?
						9.2. Do you establish and operate a system to prevent the leakage and exposure of personal information on business computers and mobile devices?
	10. Establishment of procedures on privacy information infringement and emergency response	7	13	10	20	10.1. Do you establish and disseminate procedures to respond to personal information infringement incidents?
						10.2. Have you established and disseminated procedures for emergency response?
	11. Safe use and management of personal information processing system	18	-	20	-	11.1. Do you establish and implement a policy for managing access rights of the personal information processing system?
						11.2. Do you perform checks and follow-up measures for the access records of the personal information processing system?
	12. Restrictions on the processing of unique identification information	10	16	-	-	12.1. Do you understand the processing status of unique identification information?
						12.2. Has encryption of unique identification information been implemented?

[Figure 81] Checklist for Diagnosis of Personal Information Protection Management Levels of Public Institutions

- Sensitive information: a wider range of personal information such as ideas, beliefs, membership or withdrawal of trade unions and political parties, political opinions, health information, genetic information, criminal history, etc.
- Unique identification information: Identification information that enables the subject of information to be identified by means of resident registration number, passport number, driver's license number, alien registration number, etc.
- Personal information impact assessment: An evaluation system conducted to analyze risk factors and derive improvements in cases where there is concern about personal information infringement due to new introduction or modification of personal information files.
- Image information processing device: It refers to a device as specified by Presidential Decree that stays installed in a certain space to shoot images of people or objects or transmit them through wired or wireless networks. The image information processing device operator must prepare and disclose a policy for image information processing device operation and management that includes the following contents (Article 25 of the Act, Article 25 of the Enforcement Decree).

<Required items for personal image information management register>
①Classification of use, provision, reading, destruction ② Date and time ③ Name/type of file ④ Person in charge ⑤ Purpose/reason ⑥ Third party for data use, provision/ reading ⑦ Grounds for use and provision ⑧ Type of use and provision ⑨ Period

B) Relevant domestic laws and regulations related to personal information protection

In relation to personal information protection, the comparison of personal information processing by laws and regulations is as follows.

<Table 101> Related laws related to personal information protection in Korea

Classification	Information Communications	General Personal Information Protection
Governing laws	• Act on Promotion of Information and Communication. Network Utilization and Information Protection, Etc.,	• Personal Information Protection Act
Scope	• When the information communications service provider collects user personal information	• When the personal information controller collects personal information of the data subject
Subject	• Information and communication service providers, etc. • Broadcasting service provider • -rustee	• Offline business owners/workers, non-profit organizations (associations, etc.), all personal information controllers, etc.
Collection	• Collection after notification of the purpose of collection and obtaining prior consent • Restrictions on collecting	• Collection after notification of the purpose of collection and obtaining prior consent • Restrictions on collecting resident registration numbers
Use/Provision	• Prohibition of use for other purposes and provision to third parties without consent	• Prohibition of use for other purposes and provision to third parties without consent

C) Foreign policy related to personal information protection

① OECD Privacy Guidelines[32]

The OECD Privacy Guidelines is named the Recommendation Concerning Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data, which were established in 1980 as guidelines for the cross-border transfer of personal data in 1980. Since then, it has been revised to reflect the opinions of the international community on the collection and management of personal information, and is currently used as basic data for the development of laws and guidelines related to personal information in countries around the world.

Collection Limitation Principle	• There should be limits to the collection of personal data and any such data should be obtained by lawful and fair means and, where appropriate, with the consent of the data subject.
Data Quality Principle	• Personal data should be relevant to the purposes for which they are to be used, and, to the extent necessary for those purposes, should be accurate, complete and kept up to date.

32 Officially named "Recommendation Concerning Guidelines Governing the Protection of Privacy and Transborder Flows of Personal Data"

Purpose Specification Principle	• The purposes for which personal data are collected should be specified. • The subsequent use should be limited to the fulfilment of those purposes.
Use Limitation Principle	• Personal data should not be disclosed, made available or otherwise used for purposes other than those specified except with the consent of the data subject or by the authority of law.
Security Safeguards Principle	• Personal data should be protected by reasonable security safeguards against such risks as unauthorized access, destruction, modification, etc. of data.
Openness Principle	• There should be a general policy of openness with respect to personal data. • Means should be readily available of the identity and usual residence of the data controller.
Individual Participation Principle	• Individuals should have the right to confirmation of the data relating to them, and to have the data erased, rectified, or amended.
Accountability Principle	• A data controller should be accountable for complying with measures which give effect to the principles stated above.

② The EU General Data Protection Regulation (GDPR)

The GDPR is a unified rule created by the European Parliament to strengthen the privacy of European citizens. It was promulgated by the European Parliament in 2016 (Regulation (EU) 2016/679), and after a grace period of about two years, it took effect in each EU member state from May 25, 2018. When using data of EU citizens, you must comply with the GDPR. For example, even if there is no business establishment in Europe, any company that provides goods and services to residents of the European Union (EU) must comply with the regulations of the GDPR. In addition, when a company violates the right of personal information, it is required to notify the supervisory authority within 72 hours.

The main contents of the GDPR are the expansion of the application of personal information processing (for all companies that process personal information), enhancing the rights of data subjects, strengthening the responsibility of data controllers, prohibiting the transfer of personal information abroad in principle, and taking measures to protect information from the processing design stage when processing personal information.

In GDPR, the three entities involved in the process of processing personal information are defined as the data subject, the controller and the processor.

- Data Subject: Refers to a "living natural person" who creates personal information and has the right to the personal information created by him/her.
- Controller: As a subject responsible for processing personal information, it controls personal information according to the type thereof, determines the purpose of processing, and is in charge of processing means. Even if the data is the same, the controllers can be differentiated if the purpose of processing is different.
- Processor: Refers to an individual, corporation, or public institution entrusted with processing personal information on behalf of the controller, and processes personal information as directed by the controller.

173 Recitals	
11 Chapters 99 Articles	• Chapter 1. General Provisions
	• Chapter 2. Principles
	• Chapter 3. Rights of the Data Subject
	• Chapter 4. Controller and Processor
	• Chapter 5. Transfer of Personal Data to Third Counties or International Organizations
	• Chapter 6. Independent Supervisory Authorities
	• Chapter 7. Co-operation and Consistency
	• Chapter 8. Remedies, Liability and Sanctions
	• Chapter 9. Provisions Relating to Specific Data Processing Situations
	• Chapter 10. Delegated Acts and Implementing Acts
	• Chapter 11. Final Provisions

[Figure 82] GDPR system diagram [33]

The EU's GDPR reinforces the rights of data subjects compared to existing data protection guidelines by newly guaranteeing the right to be forgotten and the right to transfer data, and strictly restricts the transfer of data of EU citizens abroad.

The main items to guarantee the rights of data subjects in GDPR are as follows.
- the right to be informed
- the right of access
- the right to rectification
- the right to erasure
- the right to restrict processing
- the right to data portability
- the right to object
- rights in relation to automated decision making and profiling

The right to erasure (right to request erasure) has been renamed from the right to forgotten in the previous GDPR draft, and the right to erasure and the right to data portability are items that reinforce the rights of data subjects. The rights in relation to automated decision making and profiling refer to the right to notify the user who is the data subject and to let them decide whether their information will be used or not, when an individual's occupation, hobbies, and location are automatically collected and used as part of marketing.

33 Korea Internet & Security Agency, Guidance on "General Data Protection Regulation" for Korean Enterprises, 2017

GDPR penalty calculation criteria <GDPR: The EU General Data Protection Regulation>
-The nature, gravity and duration of the infringement
-The intentional or negligent character of the infringement
-Any action taken by the controller or processor to mitigate the damage suffered by data subjects
-The degree of responsibility of the controller or processor taking into account technical and organizational measures
-Any relevant previous infringements by the controller or processor
-The degree of cooperation with the supervisory authority, in order to remedy the infringement
-The categories of personal data affected by the infringement
-Whether the controller or processor notified the infringement
-Whether measures by supervisory authority have been ordered with regard to the same subject-matter
-Adherence to approved codes of conduct or certification mechanisms
-Financial benefits gained, or losses avoided, directly or indirectly, from the infringement.
*Infringements of the GDPR provisions shall be subject to administrative fines up to 20million, or in the case of an undertaking, up to 4 % of the total worldwide annual turnover of the preceding financial year, whichever is higher

[Figure 83] GDPR penalty calculation criteria [34]

③ US Consumer Privacy Bill of Rights[35]

- Individual Control: The right of the data subject to control personal information
- Transparency: Transparency in access to information
- Respect for Context: The right to know the context and reason for the act of collecting, using, and disclosing information
- Security: Strengthen the security of personal information
- Access and Accuracy: The right to access personal information as the data subject and to its accuracy
- Focused Collection: The right of the data subject to personal information collected and held by businesses
- Accountability: Data collecting agency's compliance with legislation and actions taken accordingly

02 Ex Ante and Ex Post Response Method for Personal Information Infringement

A) Proactive Measures for Personal Information Controllers

① Technical/Administrative Protection of Personal Information

34 Korea Internet & Security Agency, EU Privacy Policy Status, 2018.

35 US White House(www.whitehouse.gov), "Consumer Privacy Bill of Rights"

Administrative Protection	• Establish and implement an internal management plan for processing personal information • Control personal information to be more difficult to access than general data • Differential grant of the access right to personal information • If the personal information controller is changed, the access authority of the personal information processing system is changed or canceled without delay (record the details and keep it for at least 3 years)
Technical Protection	• Access control and security measures through network • Installation and operation of access control (intrusion prevention/detection/blocking) system • Application of encryption of personal information DB • Storage of access records and prevention of forgery and alteration • Security program installation and operation

	Characteristics of personal information	Causes of personal information infringement	Occurrence of personal information infringement
Individual	• Provision of personal information is an essential requirement for cyber activities • Recognize personal information as assets and goods	• Desire to use other people's information (anonymity) • Increased public sharing of information due to the emergence of Web 2.0 (blog, UCC, P2P)	• Theft of personal information such as resident registration number • Customer information hacking and voice transaction • Personal information leakage in P2P, etc.
Business	• Target marketing, CRM utilization • Securing personal information is the key to competitiveness	• Negligence and carelessness • Conventionalized collection of the resident registration number • Saturated communications market, overheated market competition	• Exposure of personal information such as resident registration number • Leakage from internal employees and branches • Illegal collection and provision of personal information
Public	• Increased use of information through service enhancement • Collection and use of personal information is similar to that of private companies	• Negligence and carelessness • A climate where unauthorized use of personal information is not an issue for the sake of service efficiency	• Exposure of personal information • Data spills by internal handlers

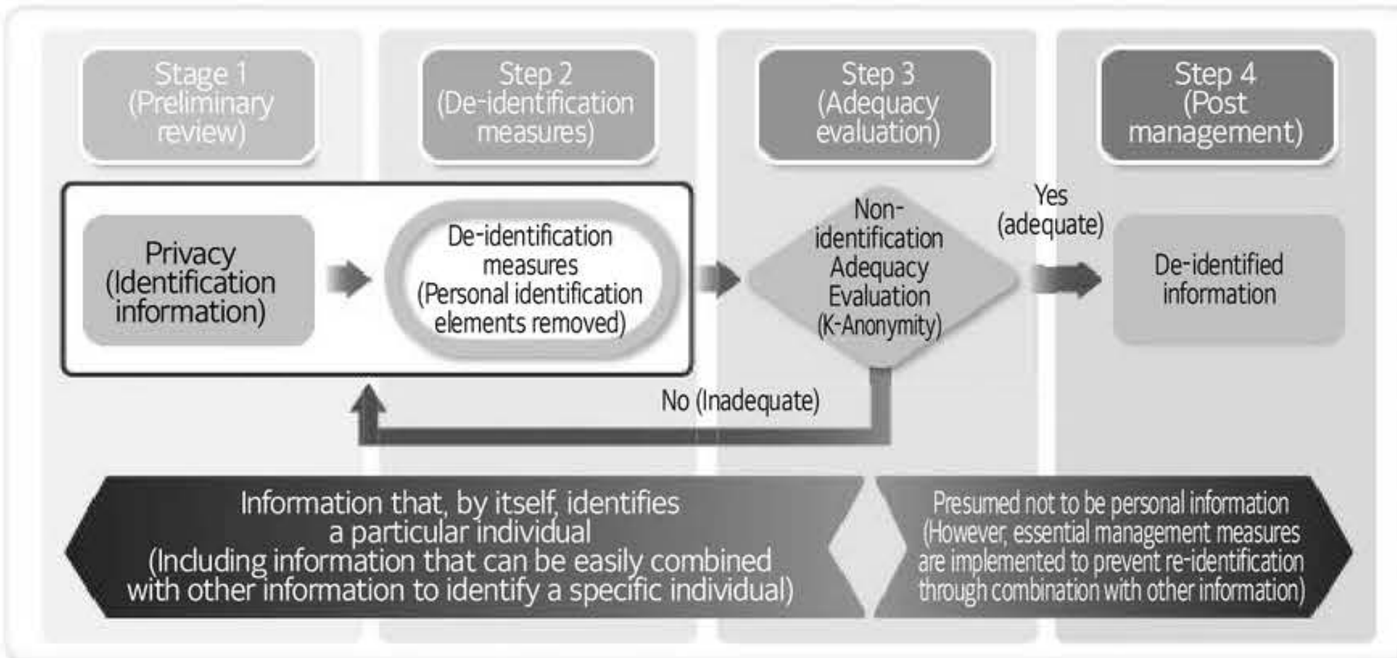
[Figure 84] Characteristics and causes of infringement of personal information by individual, company, and public sector[36]

② De-identification Process of Personal Data

Businesses, who want to process information for data analysis, etc., should de-identify and manage the information if it is personal information.

De-identification refers to de-identifying elements that can identify an individual so that a specific individual cannot be identified by processing personal information with alternative methods such as pseudonymization, aggregate processing, deletion, categorization, and data masking.

36 US White House(www.whitehouse.gov), "Consumer Privacy Bill of Rights"



[Figure 85] De-identification Process of Personal Information

- De-identification Standards for Identifiers: As a rule, an identifier included in datasets should be deleted. However, an identifier that is absolutely needed for a purpose of the use of data can be utilized after de-identification.
- De-identification Standards for Attribute Values: As a rule, an attribute value included in datasets should be also removed if it is irrelevant to a purpose of the use of data. Attribute values like rare disease or unique professional experiences need strict de-identification as they are highly likely to identify an individual under certain circumstances.

<Example> Attribute value	
Personal characteristics	• Gender, age (age), nationality, hometown, city/county/city, zip code • Military service, marital status, religion, hobbies, clubs, etc. • Smoking, drinking, vegetarianism, concerns, etc.
Physical characteristics	• Blood type, height, weight, waist circumference, blood pressure, eye color, etc. • Medical examination result, disability type, disability level, etc. • Disease name, injury code, medication code, treatment history, etc.
Credit characteristics	• Tax payment, credit rating, donation, etc. • Health insurance premiums paid, income quintile, medical aid beneficiaries, etc.
Career characteristics	• School name, department name, grade, academic background, etc. • Career, job, job type, company name, department name, position, former workplace name, etc.
Electronic characteristic	• Cookie information, access date, visit date, service use record, access log, etc. • Internet access records, mobile phone usage records, GPS data, etc.
Family characteristics	• Family information such as spouse, children, parents, siblings, legal representative information, etc.

[Figure 86] Examples of Personal Information Identifiers

< Example > Identifier

- Unique identification information (resident registration number, passport number, alien registration number, driver's license number)
- Name (including Chinese/English name, pen name, etc.)
- Detailed address (address included up to the district(gu) unit)
- Date information: birthday (yang/lunar calendar), anniversary (marriage, first birthday, sixtieth birthday, etc.), date of certificate, etc.
- Phone number (mobile phone number, home phone number, company phone number, fax number)
- Medical record number, health insurance number, welfare recipient number
- Account number, credit card number
- Various qualifications and license numbers
- Vehicle number, registration number & serial number of various devices
- Photos (still photos, videos, CCTV footage, etc.)
- Body identification information (fingerprint, voice, iris, etc.)
- Email address, IP address, Mac address, homepage URL, etc.
- Identification code (ID, employee number, customer number, etc.)
- Other unique identification number: military serial number, business registration number of sole proprietorship, etc.

[Figure 87] Examples of Personal Information Identifiers

• Methods of De-identification: A range of methods including pseudonymization, aggregation, data suppression and data masking can be used individually or in combination. There are various kinds of technology in place to realize each method. The most suitable methods and specific techniques need to be chosen and utilized based on the purpose of data usage, and strengths and weaknesses of each method.

<Example> De-identification Methods

Processing Method	Example	Detailed technology
Pseudonymization	• Hong Gil-dong, 35 years old, live in Seoul, attend Korea University →Lim Kkeokjeong, 30s, live in Seoul, attend International University	1. Heuristic pseudonymization 2. Encryption 3. Swapping
Aggregation	• Lim Kkeokjeong 180cm, Hong Gil-dong 170cm, Lee Kongji 160cm, Kim Patji 150cm → Sum of height among physics major students: 660cm, average height 165cm	4. Aggregation 5. Micro Aggregation 6. Rounding 7. Rearrangement
Data Reduction	• Resident registration number 901206-1234567 → 90's born, male • Date information related to individuals (date of final pass, etc.) is processed annually	8. Identifier deletion 9. Identifier partial deletion 10. Reducing records 11. Complete deletion of identifiers

Data Suppression	• Hong Gil-dong, 35 → Mr.Hong, 30-40 years old	12 Suppression 13. Random rounding 14. Data ranger 15. Controlled rounding
Data Masking	• Hong Gil-dong, 35 years old, live in Seoul, attend Korea University → Hong ○○, in his 30s, live in Seoul, attend ○○ university	16. Adding random noise 17. Blank and impute

[Figure 88] De-identification Methods

<Example> Application of non-identification measures

Original data

Resident registration number	Gender	Hospitalization date	Age	Disease name
770914-1234567	Male	2015/06/23	39	Flu
850930-1234567	Male	2015/10/01	31	Flu
710119-2345678	Female	2014/01/21	45	High blood pressure
770619-2345678	Female	2014/09/23	39	High blood pressure
830425-1234567	Male	2015/04/16	33	hepatitis
860804-2345678	Female	2014/11/11	30	hepatitis

De-identified data

① Data deletion (resident registration number)

Resident registration number	Gender	Hospitalization date	Age	Disease name
	Male	2015/06/23	39	Flu
	Male	2015/10/01	31	Flu
	Female	2014/01/21	45	High blood pressure
	Female	2014/09/23	39	High blood pressure
	Male	2015/04/16	33	hepatitis
	Female	2014/11/11	30	hepatitis

② Data masking (resident registration number, hospitalization date), aggregation (average age)

Resident registration number	Gender	Hospitalization date	Age	Disease name
7*****-1******	Male	2015/**/**	35	Flu
8*****-1******	Male	2015/**/**	35	Flu
7*****-2******	Female	2014/**/**	35	High blood pressure
7*****-2******	Female	2014/**/**	35	High blood pressure
8*****-1******	Male	2015/**/**	35	hepatitis
8*****-2******	Female	2015/**/**	35	hepatitis

[Figure 89] <Example> De-identification Methods

③ Personal Information Protection Management System

There is the ISMS-P certification system which establishes a personal information protection management system, examine whether systematic and continuous protection is performed, and grant certification if the standards are met, in order to protect personal information

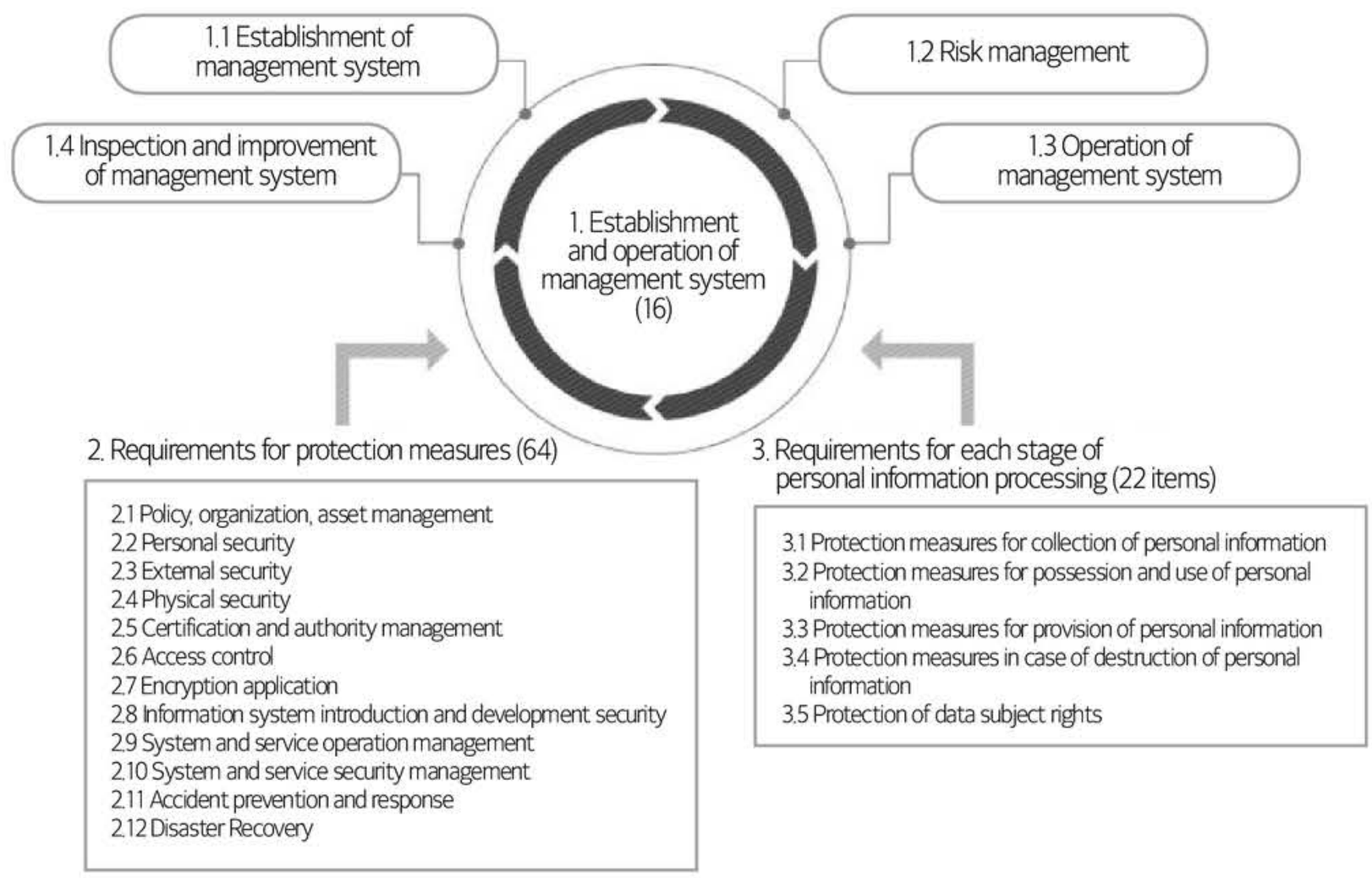
All persons falling under the following <Table 7> among "telecommunications business operators" and "persons who provide information or mediate the provision of information using telecommunications services of telecommunications business operators" (Article 47, Paragraph 2 of the Information and Communication Network Act) are the subject of the obligations.

<Table 102> Criteria for obligated persons

Classification	Criteria for obligated persons
ISP	A person who has obtained permission pursuant to Article 6 (1) of the Telecommunications Business Act and provides information and communications network services in Seoul and all metropolitan cities.
IDC	An integrated information and communications facility operator pursuant to Article 46 of the Telecommunications Business Act
A person who meets any of the following conditions	Among those with annual sales or revenue of 150 billion won or more, the following applies: • Superior General Hospitals pursuant to Article 3-4 of the Medical Service Act • Schools pursuant to Article 2 of Higher Education Act with more than 10,000 enrolled students as of December 31 of the previous year
	A person with a sales of 10 billion won or more in the previous year (or the previous business year in the case of a corporation) in the information and communications service sector
	Those with more than 1 million daily users of information and communications services in the 3 months immediately preceding the previous year

In addition, companies and institutions that do not meet the criteria, but voluntarily establish and operate an information protection and personal information protection management system are classified as voluntary applicants and can apply for certification and receive certification examination.

Whether institutions and companies have a personal information protection management system and systematically and continuously perform protection tasks, and grant certification when the standards are satisfied, are objectively examined.



[Figure 90] Personal information protection management system

B) Follow-up measures for personal information controllers

① Response to personal information leakage

If personal information is leaked (mandatory obligation in case of more than one thousand data subjects - Article 34 of the Personal Information Protection Act, Article 39 of the Enforcement Decree of the same Act), the data subjects must be notified immediately and actions such as confirmation of facts, blocking of the website, notification of password change, etc. must be promptly initiated.

In addition, victims of leakage may file collective dispute mediation with the Dispute Mediation Committee or file a lawsuit against the infringement of rights to the court, which requires thorough preparation.

② Notification of personal information leakage

If personal information over a certain scale is leaked, it is required to report to specialized agencies such as the Ministry of Security and Public Administration and the Korea Internet & Security Agency (KISA) to provide support for damage prevention and recovery technology.

<Table 103> Notification of personal information leakage

Who to report	If personal information of more than 1,000 data subjects is leaked
When to report	Within 5 days (notification to the data subjects and report of the results of response measures)
How to report	1) Report and submit a report of leakage via e-mail, fax, or the website 2) In case there is not enough time or of special circumstances: a leak report can be submitted after reporting by phone
What to report	Name of the institution, notification status, items and scale of leaked personal information, time and course of leakage, measures taken to minimize leakage damage and results, methods of minimizing damage that can be done by the information subject and remedy procedures, contact information of the department in charge, etc.

<Table 104> Details of personal information leakage found in domestic companies

Date	Type of Breach	No. of Breach(damage) Cases	No. of Breach(damage) Victims	Results of Administrative Sanctions
'Mar 2017	Personal information leakage due to hacking	A total of 3.41 million cases ※ 3.24 million cases of accommodation reservation ※ 170,000 members	970,000 people	• 310 million won in penalty • 25 million won in fine • Order of correction and publication • Recommendation of disciplinary action
'Aug 2016	Violation of provision of personal information to a third party	180,000 cases in total ※Personal information provided to 3 property insurance companies	29,000 people	• 180 million won in penalty • 20 million in fine • Order of correction

'May 2016	Personal information leakage due to hacking	25.4 million cases in total ※ 14.16 million individual members ※ 11.2 million dormant members	20.51 million people in total ※10.33 million individual members ※10.18 million dormant members	• 4.48 billion won in penalty • 25 million won in fine • Order of correction and publication
'Sep 2015	Personal information leakage due to hacking	1.95 million cases	1.95 million people	• 102 million won in penalty • 15 million won in fine • Order of correction
'May 2015	Use of personal information other than the original purpose ※ Unauthorized use of prepaid phones for foreigners	870,000 cases	150,000 people	• 360 million in penalty • Order of correction and publication

③ Necessity of personal information protection

- The emergence of public and private services in which personal information is used in combination with information technology.
- Personal information is not just information but becomes an asset of a company such as electronic civil service for public institutions, education, finance, information and communication, medical care, entertainment, etc.
- If personal information is leaked, it can be abused for crime and fraud through illegal trafficking and impersonation.
- Increasing personal information infringement accidents and class action lawsuits by victims of leakage cause loss of corporate management.
- Protection of personal information becomes an essential element of national and social safety and corporate development.
- Personal information and privacy protection, which has become a global trend, serves as a growth engine of Korea.
- Personal information protection becomes an important issue in industries.
- The signing of FTAs with countries around the world has increased cross-border exchange of personal information.
- Personal information issues affect public administration credibility and national brand.

XII. Copyright and Industrial Property Protection

Recent Trends and Major Issues

Intellectual property rights consist of all property rights arising from intellectual activities, industrial property rights for the purpose of industrial development, and copyrights for the purpose of cultural development. With recent economic, social, or cultural changes or the development of science and technology, various intellectual properties are also emerging in new fields.

Intellectual property is an important corporate asset, and the transaction of intellectual property is exploding. Therefore, by learning about intellectual property rights that you must know while working in the IT business field, you can understand the importance of intellectual property protection.

Learning Objectives

1. To be able to explain about copyrights and copyrights infringement prevention.
2. To be able to explain intellectual property rights and industrial property rights.

Keywords

Intellectual property rights, copyrights, author's rights, industrial property rights, new intellectual property rights, business works, software copyrights, prevention of unfair competition, trade secret protection, patent rights

✚ Preview for practical business

If a company's trade secrets are leaked, competitors can easily produce products and engage in dumping using the leaked trade secrets, which can lead to a business crisis and intensify competition between companies.

According to the results of the Korea Intellectual Property Office's survey of 616 domestic companies in 2017 on the trend and actual condition of accidents involving technology leakage, 67.4% (duplicate response) of trade secret leaks occurred in the event of employee turnover, and 81.4% were caused by internal staff.

It is analyzed that the reason why the trade secret protection system has not been activated is because in many cases, executives and employees in companies related to trade secrets do not know exactly the contents of the Unfair Competition Prevention and Trade Secret Protection Act, which regulates trade secrets.

According to Article 2 (2) of the "Act on the Prevention of Unfair Competition and Protection of Trade Secrets", the term "trade secret" means information, including a production method, sale method, useful technical or business information for business activities, that is not known publicly, is the subject of reasonable efforts to maintain its secrecy, and has independent economic value;

Violation of trade secrets is subject to criminal penalties. Imprisonment for up to 5 years is imposed for domestic cases and up to 10 years for overseas cases. Along with imprisonment, there are fines. In addition, even if trade secrets are not actually leaked, any person who has attempted, or intends or conspires to commit a crime can be punished.

Even if companies reinforce security technologies to protect technology, trade secrets are leaked by people, so it is necessary to prepare for them.

[Source] Article: Junggi Economy, 2018-12-10

01 Understanding of Intellectual Property Rights

A) Definition of Intellectual Property Rights

Intellectual property rights mean rights to intellectual property recognized or protected by laws or treaties. They include knowledge, information and technology created or discovered by human creative activities or experiences, expressions of ideas or emotions, representations of business or objects, varieties or genetic resources of living organisms, and other intangibles of realizable property value.

B) Types of intellectual property rights

Intellectual property rights are largely divided into the following three types.

- Copyright: Exclusive rights recognized for academic research findings or literary creations
- Industrial property rights: Industrial property rights are rights recognized for new industrial inventions, practical inventions, product forms or trademarks
- New intellectual property rights: New intellectual property rights are rights to intellectual property that emerges in new fields due to economic, social, or cultural changes or development of science and technology.

02 Understanding of Copyright

A) Definition and Classification of Copyright

① Definition of Copyright

Copyright is a right arising to a person who created a work, and generally refers to an exclusive right granted to the author of a work by law. The copyright applies from the time the work is created, and follows the non-formality principle, meaning that it is automatically generated even without formal requirements or registration procedures for the work.

Copyright is largely divided into moral rights, author's economic rights, and neighboring rights. Copyrights, which are the rights of authors, can be classified into moral rights and author's economic rights.

In the case of moral rights, it is a non-monetary right to protect the author's honor and character, and is non-transferable (the right under exclusive belongingness of oneself). The moral rights include the right of attribution, the right to have a work published anonymously or pseudonymously, and the right to the integrity of the work.

Authors' economic rights are related to the property of the author, are monetary rights and are transferable.

Author's economic rights include the right of reproduction, performance, broadcasting, transmission rights, exhibition, distribution, production of derivative works.

The copyright holder may allow other people to use the work, and a person who has obtained permission to use the work may freely use the work within the scope of the permitted use methods and conditions. In addition, even if a work has been licensed for use, it cannot be transferred to another person without the consent of the copyright holder, so it is necessary to pay attention to the use of the work.

Meanwhile, neighboring rights refer to the rights of neighbors such as performers, record producers, and broadcasters. Neighboring rights are given differently to each neighboring right holder, and since it is usually a secondary right to

create added value by using the work, more restrictive rights are given to the copyright holder.

Moral rights	• The personal and mental rights that the author has in his work • Non-monetary, non-transferable (the right under exclusive belongingness of oneself) • The right of attribution, the right to have a work published anonymously or pseudonymously, and the right to the integrity of the work.
Author's economic rights	• The property rights the author has with respect to the use of the work • Monetary rights and transferable • The right of reproduction, performance, broadcasting, exhibition, distribution, rental, production of derivative works.
Neighboring rights	• Rights of performance/record/broadcasting as stipulated by laws - Performers: the right to have a work published anonymously or pseudonymously, the right to the integrity of the work, the right of reproduction, distribution, rental, performance, broadcasting, transmission, and the right under exclusive belongingness of oneself) - Record producers: the right of reproduction, distribution, rental, transmission, etc. - Broadcasters: the right of reproduction, performance, simultaneous broadcasting

[Figure 91] Copyright and Neighboring Rights

If it is difficult to know who actually created the work, any person who falls under any of the following subparagraphs shall be presumed to have the copyright for his or her works as an author: (「Copyright Act」 Article 8 (1))

- A person whose real name or well-known pseudonym (referring to the stage name, pen name, abbreviated name, etc.; hereinafter the same shall apply) is indicated as the name of the author in a usual manner on the original or copies of a work;
- A person whose real name or well-known pseudonym is indicated as the name of the author in the public performance or public transmission of a work.

If the name of the author is not indicated as prescribed under any of the subparagraphs of paragraph (1), the person who is indicated as a publisher, public performer or a person making the work public shall be presumed to have the copyright. (「Copyright Act」 Article 8 (2))

<Table 105> Terms related to copyright

Terms related to copyright
• "Public performance" means to present to the public works, performances, phonograms or broadcasts by acting, musical playing, singing, narrating, reciting, screening, playback or other means. • "Public transmission" means transmitting works, stage performances, phonograms, broadcasts or database by making such available to the public by wire or wireless means so that the public may receive them or have access to them. • "Publication" means a reproduction and distribution of the works or phonograms to meet public demand. • "Making works public" means to make the works open to the public by means of public performance, public transmission, or exhibit and by other means, and to publish the works.

② Types of Works

The term "work" means a creative production that expresses human thoughts and emotions.

Copyright is established only when a work with originality and externality is created, and the types of works recognized are as follows.

<Table 106> Types of Recognized Works

Classification	Content
Literary Works	• Novels, poems, theses, lectures, speeches, plays and other literary works • Not only books, magazines, pamphlets, etc., but written works and oral works such as speeches are all included in literary works.
Musical Works	• Novels, poems, theses, lectures, speeches, plays and other literary works • Not only books, magazines, pamphlets, etc., but written works and oral works such as speeches are all included in literary works.
Theatrical Works	• Expressions of human thoughts and emotions through body movements, such as dramas, choreographies, pantomimes, etc.
Art Works	• Paintings, calligraphic works, sculptures, printmaking, crafts, works of applied art, etc., expressed aesthetically in shapes or colors
Architectural Works	• Buildings, architectural models and design drawings
Photographic Works	• A creative expression of the photographer's thoughts and emotions, with original and aesthetic elements
Cinematographic Works	• Creations of moving images, such as movies or dramas, that can be reproduced or viewed by mechanical or electronic devices
Diagrammatic Works	• Maps, charts, design drawings, models, and others expressed by figures
Computer Program Works	• A creation expressed in a series of instructions or command which are directly or indirectly applied within devices having a capability of processing information, such as a computer, in order to obtain certain results
Derivative Works	• A creative work produced by means of translation, arrangement, alteration, dramatization, cinematization, etc. of an original work is protected as an independent work.
Compilation Works	• A compilation which is of creative nature in terms of selection or arrangement of its materials regardless of the material or its constituent parts. • A collection of papers, numbers, figures, and other data that is systematically organized to be searched using an information processing device (database)

③ Works Made for Hire

The term "work made for hire" means a work made by an employee of a legal person, organization or other employers (hereinafter referred to as "legal person, etc." during the course of his or her duties and on the initiative of legal person, etc[37].

The authorship of a work made for hire which is made public under the name of such a legal person, etc. as the author shall be attributed to that legal person, etc., unless otherwise stipulated in the contract or work regulation, etc[38].

In order for a legal person, etc. to become the author of a work made for hire, it must meet all of the following requirements (Korea Copyright Commission's Consultation Case Book)

- The work must be initiated by a legal person or the like.
- It must be written by a person who is engaged in business such as a legal person.
- It must be a work written for business.
- It must be publicized in the name of a legal person, etc.
- There must be no other things set in the contract or work rules.

37 Copyright Act, subparagraph 31 of Article 2

38 Copyright Act, Article 9

④ Computer Program Works

According to Article 2 of the Software Industry Promotion Act, the term "software" means a collection of instructions and commands (including audio or visual information, etc.) that enables equipment, such as computers, communications apparatuses and automation equipment and peripheral equipment to command, control, input, process, save, output and interact, and descriptions used to prepare them and other related data.

A computer program work is a generic term for a computer program and a work of descriptive language of a program. A computer program work includes programming language (C, Java, etc.), protocol, algorithm, source code and object code (compiled source code), and ⑤ structure and arrangement method of the program. Here, the source code, object code, program structure and arrangement are protected by copyright, but programming languages, protocols, algorithms, etc. for programming are excluded from the protection. In other words, the product of writing software is protected by copyright, but programming languages, protocols, and algorithms for writing programs are excluded from copyright protection.

Software is copyrighted so that only the software author has the right to use, copy, distribute, and modify the software. If the software author gives someone the right to perform certain actions, this is called a "license." The software license agreement contains detailed regulations based on the basic contents of the purpose of the contract, the definition clause, the establishment of the license, the term of the contract, the storage of records, and royalties, in order to clearly set forth the criteria for settlement in case of dispute.

⑤ Open Source Software Copyright

Open source software (OSS, Open Source Software) refers to software in which anyone can freely use/copy/distribute/modify its source code. Representative examples include Apache web server, FireFox Web Browser, and Linux Kernel.

<Table 107> Open Source Software License

BSD (Berkeley Software Distribution License)	• License distributed by the University of California, Berkeley • Wide allowable range and no obligation to disclose source code • When distributing software, there is no copyright notice or warranty liability
Apache License 2.0	• Self-produced by the Apache Software Foundation • No obligation to disclose source code • If you modify and distribute the Apache license source code, you must include the Apache license version 2.0 and disclose that it is software made by the Apache Foundation.
GPL 2.0/3.0 (GNU General Public License 2.0/3.0)	• Free software license created by the Free Software Foundation (FSF) • Adopted by the most open source software • Obligations are stricter than other licenses
GNU LGPL 2.1 (GNU Lesser GPL 2.1)	• A license created separately from the GPL for use in the library, does not apply the copyleft provisions of the GPL, and there is no obligation to provide source code • Allow linking to simple libraries and modules
MPL (Mozilla Public License)	• Developed to release source code of Netscape Browser with Mozilla Public License • By separating the copyright of the source code and the executable file, the executable file can be distributed under an exclusive license.

Most open source licenses require the following basic requirements.

• Indicate or include matters about the developer or contributor and matters about copyright on the product

- If the source code is modified, information on the modification, such as who modified the code and when, should be included.
- When distributing software, attach a copy of the license to provide license information on open source.

Depending on the type of open source license, some licenses require a copyleft to redistribute under the same license. If the copyleft clause is included, the source code is also distributed when the software is distributed.
The characteristics of each open source license are as follows.

<Table 108> Comparison of open source licenses by features[39]

License name	Rights to reproduce, distribute, and modify	Attach a copy of license upon distribution	Keep notices of copyright or attribution	Obligation and range to provide source code upon distribution	Writing Larger Works and distributing other licenses	Notice of revision	Explicit patent license	The end of a license upon a patent litigation by the licensee	Restrictions on use of name, tradename, trademark	Disclaimer of warranty	Limitation of Liability
BSD	O		O		O				O	O	O
Apache License 2.0	O	O	O		O	O	O	O	O	O	O
GPL 2.0	O	O	O	All code	Conditional					O	O
GPL 3.0	O	O	O	All code		O	O	O		O	O
GNU LGPL 2.1	O	O	O	Derivative Work	O	O	O	O		O	O
MPL	O	O	O	File unit	O	O	O	O	O	O	O

⑥ Works not protected by copyright law

No work which falls under any of the following subparagraphs shall be protected under this Act:

- Constitution, Acts, treaties, decrees, and municipal ordinances and rules;
- Bulletins, public notifications, directives and others similar thereto which are issued by the central or local government; Compilations or translations of works which are produced by the central or local government;
- Judgments, decisions, orders, or adjudications of courts, as well as rulings and decisions made by the administrative appeals procedures, or other similar procedures;
- Current news reporting which delivers simple facts.

39 Korea Copyright Commission, OpensourceSW License Information Systems, https://www.olis.or.kr/license/compareGuide.do

⑦ Duration of Protection of Author's Economic Right

The following types of works of which protection period has expired can be used freely without obtaining permission from the author. (Articles 39 through 41 of the 「Copyright Act」).

<Table 109> Protection Period of Copyright by Type

Type of Works	Commencement Year of Copyright Term	Protection Period
Independent Works	• The next year of the death of the author	70 years
Joint Works	• The year following the year of the last author's death	
Anonymous and Pseudonymous Works	• The year following the publication of the work	
Works Made for Hire	• The year following the publication of the work	

The author's economic right to a work made for hire shall continue to subsist for a period of 70 years after it has been made public (the main text of Article 41 of the 「Copyright Act」): Provided, That if it has not been made public within 50 years after its creation, the author's economic right shall continue to exist for a period of 70 years after its creation (the Sub-section of Article 41 of the 「Copyright Act」).
The author's economic right to a joint work shall continue to subsist for a period of 70 years after the death of the last surviving co-author (Article 39 (2) of the 「Copyright Act」).
The author's economic right to a work that is anonymous or bears the pseudonym which is not widely known shall continue to subsist for a period of 70 years after it has been made public (the main text of Article 40 (1) of the 「Copyright Act」).

⑧ Concept of Registration of Copyright

Copyright registration means that certain facts and legal relations related to a work, such as the author's name, are registered in a public ledger called the Copyright Register and disclosed to the public.

An author may register any of the following:

- Real name, pseudonym (limited to the case where pseudonym is used at the time of making it public), nationality, domicile or residence of an author;
- Title, types or date of creation of a work;
- Whether a work has been made public, and the country and date/month/year in which the work was first made public;
- The title and author of the original work in case of a derivative work
- Information on the medium in which the work is published if the work is published
- If there are more than two registered rights holders, matters related to their own shares

When attempting to register a copyright, the following documents must be submitted to the Korea Copyright Commission.

- Copyright registration application (in the case of computer program works, program registration application)

- Copyright registration application statement (in the case of computer program works, program registration application statement)
- Copies related to registration, documents such as drawings, photographs, etc. or electronic recording media (in the case of computer program works, an electronic recording medium containing a copy of the program). If it is possible to prove the fact of creation with only part of the program content, a partial excerpt may be submitted, and in this case, the document displayed in the program language before being converted by a computer is submitted.
- Documents proving the reason for registration (limited to cases where proof of registration is required)
- The list of authors, neighboring authors, database producers, heirs, registration rights holders, or registration obligation holders, if there are two or more authors, neighboring rights holders, database producers, heirs, registration rights holders, or registration obligation holders,
- The list of works, neighboring works, and databases in the case of registering works, adjacent works, and databases in large quantities.
- The Korea Copyright Commission must issue a copyright registration certificate to the person applying for copyright registration (Article 55 (4) of the 「Copyright Act」, Article 28 (1) of the 「Enforcement Decree of the Copyright Act」, Article 8 (1) of the 「Enforcement Rule of the Copyright Act」 and Attachment No. 25).

03 Understanding of Industrial Property Rights and New Intellectual Property Rights

A) Concept of Industrial Property Rights

① Definition and Types of Industrial Property Rights

Industrial property rights are to protect any invention that has commercial value, and mainly refer to patent rights, utility model rights, design rights, and trademark rights.

<Table 110> Industrial Property Rights by Type

Classification	Content
Patents	• Right to an advanced invention • Methods such as of manufacturing, production, etc. are subject to patent application only • Inventions that were publicly known or performed, or published in publications, or made available to the public through telecommunication networks at home and abroad prior to filing a patent, are not subject to patent application. • The duration of the patent right is 20 years from the date of the patent application
Trademarks	• Right to a mark used to identify one's own products (services or products related to the provision of services) from those of another. • Mark: Any mark that displays a product with symbols, letters, figures, sounds, smells, holograms, movements, or colors. Trade names can also be registered as trademarks • Service mark: a trademark used in connection with services, such as academies, restaurants, etc. The domain of a website can also be registered as a service mark • A service mark (trademark) takes precedence over the registered domain of a website. • Trademark rights and service mark rights can be used virtually permanently by registering for renewal every 10 years.

Classification	Content
Designs	• The right to a design of the form, shape, and color of an article or a font, or their compositions, which have aesthetic appeal. • The duration of design rights is 20 years from the date of registration.
Utility Models	• Utility model rights are of a somewhat lower technical level than patent rights, and are the right to protect practical designs. • A product of which practicality is enhanced by improving the shape and structure of the existing one subject to a utility model • The duration of utility model right is 10 years from the date of application.

② Acquisition of Industrial Property Rights

Industrial property rights are acquired by registering with the Korean Intellectual Property Office.

The first-to-file rule applies to registration, and since it is protected only in the country in which the registration is made, the rights are recognized only when a separate application is made in each country (Article 38 of the Patent Act, Article 8 of the Utility Model Act, Article 16 of the Design Act, and Article 9 of the Trademark Act).

Industrial property rights grant the creator an exclusive right for a certain period of time, after which anyone can use it, in order to seek technological progress and industrial development.

③ Cases and Punishment for Violation of Industrial Property Rights

<Cases>

- Display the patent registration (application) number that has not been applied to the product, or the patent registration (application) number that does not exist
- Display a product of which patent application has not been completed with a patent mark or as a patent product
- Display a mark that is easy to be confused with the patent mark
- Mark a patent on something registered as a utility model, design or trademark, or as a patented product
- Display a trademark that has not been registered or have not been applied for trademark registration as if being a registered trademark
- Or as if being applied for registration of trademark
- Display false trademarks on commercial advertisements, signboards, labels, product packaging, or other commercial transaction documents
- Theft of renowned domestic and foreign trademarks
- Mark a utility model registration application or as a utility model registration application product even though the application for utility model registration is not in progress
- Mark a design registration or marking a design registration application on an item not registered for design, a product not pending design registration, or the container or packaging of the item, or display a mark that is likely to be confused

<Punishment>

- A person who falsely displays intellectual property rights is regulated to be punished by imprisonment for not more than 3 years or a fine of not more than 20 million won (*Article 228 of the Patent Law, Article 48 of the Utility Model Law, Article 95 of Trademark Law, Article 222 of the Design Protection Law)
- The act of misrepresenting intellectual property rights is offense not subject to complaint, so a third party who is not the victim can also file criminal charges with the prosecution and police.

B) Concept of Industrial Property Rights

① Definition and Types of Industrial Property Rights

Intellectual property rights related to computer programs, genetically engineered plants and animals, semiconductor design, the Internet, and animated characters, which are difficult to protect with traditional intellectual property rights such as patent rights and copyrights, are called new intellectual property rights.
New intellectual property rights are of the following types.

- Industrial copyright: computer program, artificial intelligence, database, etc.
- High-tech industrial property rights: semiconductor integrated circuit layout design, biotechnology field
- Information property rights: trade secrets, multimedia, etc.

The World Trade Organization WTO covers the scope of new intellectual property rights in literary, artistic and scientific works, albums and broadcasts of directors and artists, inventions in all fields of human endeavors, scientific inventions, industrial designs, registered trademarks, service marks, trade names and other names, rights under protection against unfair competition, and all other rights arising from intellectual activities in the fields of industry, science, literature or art.

04 Understanding of Unfair Competition Prevention and Trade Secret Protection

A) Concept of Unfair Competition Prevention

① Concept of Unfair Competition Prevention

"Unfair Competition Prevention and Trade Secret Protection" is to prevent acts of unfair competition such as improper use of domestically well-known trademarks and trade names, and by preventing infringement of trade secrets.
The term "act of unfair competition" means any of the following acts:

- using marks identical or similar to, another person's name, trade name, trademark, or container or package of goods or any other mark[40] indicating another person's goods, which is widely known in the Republic of Korea; or by selling, distributing, importing, or exporting goods bearing such marks; or selling, distributing, importing, or exporting goods bearing such marks
- An act of making false marks of the place of origin on goods, or on trade documents or in communications by means of advertisements of the goods or in a manner that makes the public aware of the marks; or by selling, distributing, importing, or exporting goods bearing such marks
- An act of falsely assuming another person's goods or an act of advertising any goods or making a mark in any manner of leading the public to misunderstand their quality, content, manufacturing process, usage, or quantity, in latter goods or advertisement thereof, or selling, distributing, importing, or exporting goods using such method or mark;
- An act of using a trademark, without good cause, on goods identical or similar to the designated goods of the

40 Mark: include the overall appearance of the place where business is provided, such as product sales and service provision method, or signboard, exterior, interior decoration, etc.

trademark, or an act of selling, distributing, exporting, or importing goods with such trademark, by an agent or a representative of the owner of the trademark that is identical or similar to a trademark registered in any of the following countries or by a person who was an agent or a representative within one year of the date of such act:
(1) Any party to the Paris Convention for the Protection of Industrial Property (hereinafter referred to as the "Paris Convention");
(2) Any member state of the World Trade Organization;
(3) Any signatory state of the Trademark Law Treaty

- An act of registering, holding, transferring, or using a domain name identical or similar to, another person's name, trade name, or trademark, or any other mark, which is widely known in the Republic of Korea, by a person who does not have a legitimate source of right for any of the following purposes:
  (1) The purpose of selling or lending a mark, including a trademark, to a person who has a legitimate source of right concerning the mark or a third party;
  (2) The purpose of preventing a person who has a legitimate source of right from registering or using a domain name;
  (3) Other purpose of obtaining any commercial profits;
- An act of transferring or lending goods whose shape has been copied from the goods manufactured by any other person; exhibiting such goods for transfer or lending; or importing or exporting such goods
- An act of unfairly using information which includes another person's technical or business ideas with economic value in the process of negotiating or conducting transactions such as a business proposal, auction, and public offering for his or her business interests or the business interests of a third party in violation of the purpose of the provision or an act of providing such information to another person so that he or she can take advantage of it

② Concept of Trade Secret

The term "trade secret" means information, including a production method, sale method, useful technical or business information for business activities, which is not known publicly, is managed as a secret, and has independent economic value.

Trade secrets are established according to the following requirements.

- Non-publicity: The information must be publicly unknown.
- Economic usefulness: Technical or management information useful for business activities, and the information itself must have independent economic value
- Confidentiality: The information must be kept confidential by reasonable efforts (disclosure and notice of confidentiality, restriction of access method, imposition of confidentiality obligation, etc.) Anyone can access it, and the technology known to everyone is no longer a trade secret.

The term "infringement of trade secrets" means any of the following acts:

- An act of acquiring trade secrets by theft, deception, coercion, or other improper means, or subsequently using or disclosing the trade secrets improperly acquired;
- An act of using or disclosing trade secrets after acquiring them, with knowledge of the fact that an act of improper acquisition of the trade secrets has occurred or without such knowledge due to gross negligence;
- An act of using or disclosing trade secrets to obtain improper benefits or to damage the owner of the trade secrets while under a contractual or other duty to maintain secrecy of the trade secrets;

<Precedent related to infringement of trade secrets in software development process>

1. Precedents for infringement of trade secrets

- When only new features are added based on other source code
- In case of developing, producing, and selling substantially similar programs by performing reverse analysis of program code (reverse engineering) (Article 101-4 of the Copyright Act)
- In the case of reverse analysis in violation of the contract, even though the prohibition against reverse analysis and the prohibition against disabling technical protection measures to prevent reverse analysis

2. Precedents that do not fall under infringement of trade secrets

- When the programming language in which the software was developed, and the method of implementation are completely different
- In case of performing reverse analysis of code for the purpose of obtaining information necessary for compatibility in situations where it is not possible to easily obtain information necessary for program compatibility for a program that has been legally purchased by a legitimate method (Article 101-4 of the Copyright Act)

XII. Ethical Issues of the Latest IT Business Services

Recent trends and Major Issues

With the revolution of the IT industry, new products and services are being developed across industries through the combination/convergence of technologies. However, while using the latest products and services, technical competence is improving, on the contrary, various side-effects such as safety accidents, information leakage, and invasion of privacy are increasing due to the lack of ethical awareness and understanding of ethics. In addition, these downsides are a factor that hinders the development of the IT business. Therefore, in order to continue the development of IT business services, it is necessary to examine ethical issues in each service field and establish a correct ethical awareness.

Learning Objectives

1. To be able to explain the ethical issues of the latest IT business services.
2. To be able to describe ethical compliance in the latest IT business services.

Keywords

Cloud Computing Ethics, Autonomous Vehicle Ethics, Big Data Ethics Issues, Artificial Intelligence Ethics, Drone Ethics

✚ Preview for practical business

In a paper titled "The Social Dilemma of Autonomous Vehicles" published in the scientific journal Science in June 2016, a survey on self-driving cars was conducted.

The question was as follows.
There is a self-driving car whose brakes are broken while driving. If you drive as it is, you would hit 5 pedestrians, and if you turn the steering wheel, you would hit 1 pedestrian. The car has a program that makes judgments about the steering wheel, but if the person who would be injured by turning the steering wheel is not a pedestrian but a car occupant, who should the vehicle save between the pedestrian and the occupant?
In this survey, the majority of people (78%) said it was more ethical to protect the most number of pedestrians. What was interesting was the next question.

When asked, "Would you buy an autonomous vehicle that prioritizes the safety of pedestrians over car occupants?", most people answered that they would not buy such a car. It would be rational to prioritize the more number of pedestrians, but if the car occupant is you or your family, you may end up in a dilemma.

This ethical dilemma is emerging as an inevitable challenge in the era of the Fourth Industrial Revolution. Therefore, by thinking about the ethical issues of the latest technology, it is necessary to understand the safe use of technology by looking at the benefits of technology and problems that may arise from the misuse of technology.

[Source] Article: Esquire, The October 2018 Edition

01 Major Ethical Issues of the Latest IT Business Services

A) Ethical issues of the Latest IT Business Services

① Ethical Issues of Artificial Intelligence(AI)

The emergence of intelligent robots and the phenomenon of intelligentization of products and services led to the transition to an intelligent information society while ushering in the era of the 4th industrial revolution. Ethical issues in artificial intelligence and robot technology are largely divided into moral and philosophical ethics for the identity of AI(robots) and its relationship with humans, and practical ethics required of professionals who participate in the development and use of artificial intelligence which is distributed to consumers.

The following major announcements have been made regarding AI ethics.

- In 2010, UK EPSRC (Engineering & Physical Sciences Research Council) presented Principles of Robots: Present all AI issues from the perspective of designers, builders, and users.
- In October 2016, the NSTC (National Science and Technology Commission) published an AI report titled "Preparing for the future of artificial intelligence"[41] : Emphasize the role of state in developing artificial intelligence as an important economic growth engine, Form a national and social consensus on future issues that may arise from AI.
- In December 2016, the IEEE (Institute of Electrical and Electronics Engineers) announced "Ethically Aligned Design": Emphasize to design by taking into account ethical aspects from the beginning of developing artificial intelligence and automatic systems. Deal with accountability that should be held by suppliers and suppliers, transparency, awareness-raising, personal information protection, employment issues, etc.
- In December 2016, the Japanese Ministry of Internal Affairs and Communications announced "Proposal of Discussion toward Formulation of AI R&D Guideline": Present eight major principles that AI developers must comply with, including transparency, user support, controllability, security, safety protection, personal information protection, ethics, accountability, etc.
- In January 2017, FLI (Future of Life Institute) in the U.S. announced "Asilomar AI Principles"[42] : signed on 23 principles to adhere to when developing artificial intelligence. More than 2,000 AI scholars, futurists, and industry, academia, and research associates signed the keywords of AI ethics such as safety, transparency, accountability, privacy protection, sharing of profits, and prevention of AI arms race.
- In February 2017, the European Union (EU) released the "Civil Law Rules on Robotics": Advise all developers, researchers, and designers involved in robot development to prioritize human dignity when planning, designing, and implementing robots, respect personal privacy, and put human safety first.

Some argue that AI developers as individuals or companies who are planning and designing artificial intelligence (robots)

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41 The seven topics presented in the report are as follows.
①Applications of AI for Public Good, ② AI in the federal Government ③ AI and regulation, ④ Research and Workforce, ⑤ AI, Automation, and the Economy ⑥ Fairness, Safety, and Governance ⑦ Global Considerations and Security

42 This principle is evaluated as proposing an international norm for the principles for the development and use of artificial intelligence. It was designed by AI engineers, futurists, and AI-related industry-academia-research officials including physicist Stephen Hawking, Google Deep Mind CEO Demis Hassabis, futurist Ray Kurzweil, and Tesla Motors CEO Elon Musk.

at the order of a business client must follow ethical guidelines that are differentiated from existing IT developers. The reason for this is that artificial intelligence is not only affected in its performance by human interactions, but it is difficult to predict its behavior, so it is more complicated than conventional software in terms of the characteristics and security of artificial intelligence itself. The ethical guidelines that AI developers should follow are as follows:[43]

1. Design and develop accurately, clearly and fairly, faithfully to the order of a business operator
2. Conduct the quality certification process and supply AI (robot) to the business operator
3. Maintain a sense of responsibility for the product and provides continuous upgrades
4. Prepare a countermeasure against malfunction and provide within the product
5. Comply with global standard design and implementation as much as possible and share knowledge
6. When dealing with customers, be honest and unbiased when treating customers, complying with the laws of society and the nation, as well as the global community, and fulfill universal social responsibility, such as respecting the intellectual property of others

<Table 111> Comparison between AI supplier ethics and similar professional ethics

Supplier	Supplier ethics	IEEE (Institute of Electrical and Electronics Engineers)	NSPE (National Science and Technology Commission)	ACM (Association for Computing Machinery)	KIEE (the Korean Institute of Electrical Engineer)
Business Operator	1) Recognize the rights of consumers and satisfy them as much as possible.	② Avoid conflicts of interest		⑦ Privacy ⑧ Respect for confidentiality	② Faith ③ Address conflicts of interest
	2) Contribute to the social discussion on the level of autonomy of artificial intelligence (robots)				
	3) Share responsibility for social problems caused by artificial intelligence (robots).	⑤ enhance the understanding of technology			① Social responsibility
	4) Place orders to the developer with good intentions (clear usage and purpose).	⑨ Nonmaleficence	⑤ Prohibit deceptive acts	① Contribute to welfare ② Nonmaleficence	

43 Myung-Joo Kim, Ethics for Artificial Intelligence (Robot) from the Supplier's Perspective (Information Culture Forum Policy Research Report), 2016

Devel-oloper	1) Design and develop in accurately, clearly, fairly, and faithfully to the business order.	④ Refuse bribery ⑦ Fair assessment ⑧ equitable treatment	④ Employer and customer accountability	③ Integrity, Credibility ④ Fairness	⑦ Principle of fairness ⑧ Principle of equitableness
	2) Conduct the quality certification process and supply AI (robot) to the business operator				
	3) Maintain a sense of responsibility for the product and provides continuous upgrades	① Safety, health, welfare	① Safety, health, welfare		④ Fair use of materials
	4) Prepare a countermeasure against malfunction and provide within the product	① Safety, health, welfare	① Safety, health, welfare		
	5) Comply with global standard design and implementation as much as possible and share knowledge	⑤ enhance the understanding of technology ⑥ Operational Conditions	② Operational Conditions		
	6) fulfill universal social responsibility	③ Integrity ④ Refuse bribery ⑨ Nonmaleficence ⑩ Cooperation	③ Be discreet in public speech ⑥ Cooperation	⑤ Property rights ⑥ Intellectual Property	⑤ Legal compliance ⑥ Intellectual Property ⑨ Contribute to field of expertise ⑩ Eco-friendliness

From the ethical point of view, the most fundamental of the identity of artificial intelligence (robots) and its relations with humans, is the Three Laws of Robotics by Isaac Asimov.

The Three Laws of Robotics is a set of principles that regulate the behavior of robots, which must be observed for every robot and present an ethical perspective on the identity and function of artificial intelligence robots and their relationship with humans.

Mr. Asimov first introduced the rules in his 1942 short science fiction story "Runaround" and then came up with the Three Laws of Robotics in the 1950 collection "I, Robot."

The Three Laws of Robotics is an "command" that is put into an AI robot at the manufacturing stage. It is not an ethics that an AI developer must follow, but a "moral code" that the AI itself to be developed must have. The three commands or the three laws are as follows.

Asimov's Three Laws of Robotics
• First Law: A robot may not injure a human being or, through inaction, allow a human being to come to harm • Second Law: A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. (However, the First law takes precedence over the Second.) • Third Law: A robot must protect its own existence as long as such protection does not conflict with the First or Second Law. (However, the First and Second laws take precedence over the Third.)

Asimov later revised the rules in 1984 with the addition of the principle that "A robot may not harm humanity, or, by inaction, allow humanity to come to harm."

The Asilomar AI Principles[44] published by FLI (Future of Life Institute) in the United States are largely divided into three issues.
Items 1-5 are composed of Research Issues, 6-18 are Ethics and Values, and items 19-23 are Longer-term Issues.

<Table 112> The Asiloma AI Principles

Classification	Principle	Explanation
Research Issues	Research Goal	The goal of AI research should be to create not undirected intelligence, but beneficial intelligence.
	Research Funding	Investments in AI should be accompanied by funding for research on ensuring its beneficial use.
	Science-Policy Link	There should be constructive and healthy exchange between AI researchers and policy-makers.
	Research Culture	A culture of cooperation, trust, and transparency should be fostered among researchers and developers of AI.
	Race Avoidance	Teams developing AI systems should actively cooperate to avoid corner-cutting on safety standards.
Ethics and Values	Safety	AI systems should be safe and secure throughout their operational lifetime, and verifiably so where applicable and feasible.
	Failure Transparency	If an AI system causes harm, it should be possible to ascertain why.
	Judicial Transparency	Any involvement by an autonomous system in judicial decision-making should provide a satisfactory explanation auditable by a competent human authority.
	Responsibility	Designers and builders of advanced AI systems are stakeholders in the moral implications of their use, misuse, and actions, with a responsibility and opportunity to shape those implications.
	Value Alignment	Highly autonomous AI systems should be designed so that their goals and behaviors can be assured to align with human values throughout their operation.
	Human Values	AI systems should be designed and operated so as to be compatible with ideals of human dignity, rights, freedoms, and cultural diversity.
	Personal Privacy	People should have the right to access, manage and control the data they generate, given AI systems' power to analyze and utilize that data.
	Liberty and Privacy	The application of AI to personal data must not unreasonably curtail people's real or perceived liberty.
	Shared Benefit	AI technologies should benefit and empower as many people as possible.
	Shared Prosperity	The economic prosperity created by AI should be shared broadly, to benefit all of humanity.
	Human Control	Humans should choose how and whether to delegate decisions to AI systems, to accomplish human-chosen objectives.
	Non-subversion	The power conferred by control of highly advanced AI systems should respect and improve, rather than subvert, the social and civic processes on which the health of society depends.
	AI Arms Race	An arms race in lethal autonomous weapons should be avoided.

44 Futureoflife, Asilomar AI Principles, https://futureoflife.org/ai-principles

Longer-term Issues	Capability Caution	There being no consensus, we should avoid strong assumptions regarding upper limits on future AI capabilities.
	Importance	Advanced AI could represent a profound change in the history of life on Earth, and should be planned for and managed with commensurate care and resources.
	Risks	Risks posed by AI systems, especially catastrophic or existential risks, must be subject to planning and mitigation efforts commensurate with their expected impact.
	Recursive Self-Improvement	AI systems designed to recursively self-improve or self-replicate in a manner that could lead to rapidly increasing quality or quantity must be subject to strict safety and control measures.
	Common Good	Superintelligence should only be developed in the service of widely shared ethical ideals, and for the benefit of all humanity rather than one state or organization.

② Ethical Issues of Big Data

In the era of the 4th industrial revolution, data is a technology that has created profits and technology benefits by creating information for products and services as the core of industrial growth. However, when big data loses its ethical neutrality, it can create harmful data. Therefore, big data must be operated in an ethical manner throughout the entire process of the processing and management system, such as collection and management, use, and disposal.

The ethical issues related to big data include the following:

- Ethical operation and prevention of abuse of big data management system
- Data access control at the collection stage, safe storage and management of data, anonymization/encryption data processing, prevention of generating information that infringes privacy, safe data destruction
- Restrictions on the creation of big data of sensitive information such as ideologies, beliefs and political opinions of specific individuals
- Prohibit use of analyzed information for purposes other than the intended purpose, prevent unauthorized use of analyzed information
- Prevention of misuse and leakage of personal information
- Operation of policies on ownership and rights of big data
- Regulation on creators and users of big data
- Consider the matter of simply using big data for commercial purposes (resolving health inequality, strengthening public medical systems, avoiding the use of simple big data for commercial purposes, not for academic research, etc.)

Cloudera, Inc. recently announced the evolution of big data technology and the ethical use of data, with the following four key principles to ensure that data is not abused.[45]

1) Adjustment of expectations between organizations and individuals on how data are used
2) Establishing best practices for data management
3) Setting boundaries
4) Supervision and regulation can be led by the government or industry, and by itself.

As a guideline for dealing with personal information in big data, there is "Guidelines for De-identification of Personal

45 [Source] Article, "Press Conference for Presentation of' The Evolution of Big Data Technology and the Ethical Use of Data" hosted by Cloudera" http://kr.acrofan.com/detail.php?number=94778&thread=BA07. Quotation Date: 2018.12.12.

Data". This suggests standards on methods of de-identification for big data utilization to ensure the safety of personal data, and for businesses who intend to use and provide de-identified personal data.

<Procedure for de-identification for big data utilization>

① (Preliminary Review) Verify whether specific data is personal data or not. Data that is confirmed to be non-personal data can be used as freely as possible without any legal restrictions.

② (De-identification) Take measures to make individuals unidentifiable by means of, for example, deleting or replacing all or some of the elements from dataset. If the attributor included in the dataset is not related to the purpose of data use, it is deleted in principle.

③ (Adequacy Assessment) Assess whether an individual is identifiable by easily combining de-identified data with other data by the "De-identification Adequacy Assessment Panel"

④ (Follow-up Management) Take necessary measures such as safety measures for de-identified data and monitoring likelihood of re-identification to prevent re-identification in the process of using de-identified data.
Managerial Safety Measures: Need to designate a person in charge of de-identified data files, prohibit sharing of data on de-identification, and destroy data once a purpose of usage is achieved.
Technical Safety Measures: Need to restrict access to de-identified data files, manage access records, and install and operate security programs.

- Protective measures when de-identified data is leaked: Analyze cause of leakage, and implement both managerial and technical safety measures to prevent additional leakage, Withdraw and destroy leaked de-identified data

③ Ethical Issues of Autonomous Vehicles

Self-driving cars are integrated with technology that collects information from the external environment, communication technology among vehicles and between vehicles and road infrastructure, and advanced information processing technology and excellent algorithms.
Self-driving cars store information gathered from sensors in the cloud and analyze them with big data to find the optimal route. Since it reduces the accident rate from the user's point of view, it provides stability and saves users the time to concentrate on driving, providing convenience and efficiency.
However, like the recent incident on the Internet where a company hacks and remotely controls autonomous vehicles, problems such as remote control attacks by hacking and information leakage due to malicious code infection are emerging as related issues. The major ethical issues related to self-driving cars are as follows.

- The ethical dilemma of self-driving cars (controversy on how to deal with accidents and who is the cause of the accident)
- Safety issues of autonomous vehicles (reaction to detection of pedestrians and obstacles in the vehicle path, occupant protection and safety)
- Remote control attack and availability threat due to hacking
- Threat of life and property loss due to hacking, real-time exposure of user information
- Privacy invasion due to leakage of personal information collected by in-vehicle sensors and computers such as travel

route and address

- The possibility that self-driving cars will be abused as unmanned vehicles that monitor others and invade the privacy of others

④ Ethical Issues Related to Drones

As the drone-related industry has recently emerged as a representative field of the 4th industrial revolution, the investment and research on drones are actively being conducted. Drones are becoming an issue in the education filed, with the rise of education using drones and training for professional drone pilots.
Recently, drones are not limited to a hobby or mere filming, but are also used for industrial purposes such as delivery, forest fire monitoring, and distribution of pesticides. As drones can be used for real-time command systems, surveillance systems, high-definition video recording and sharing, and autonomous driving, its use is expected to spread to all industries.
Along with the increased use of drones, various accidents such as drone crashes, collisions with buildings, and flying in no-fly zones are also increasing.

Major Drone Accident Log
• On May 10, 2012, a drone crashed in Songdo, Incheon due to a cyber-attack presumably from North Korea • In August 2013, a drone appeared above the submarine manufacturing plant of the British Navy • On October 5, 2014, a drone crashed at 7 nuclear power plants in France • On January 26, 2015, a drone crashed into the White House On April 22, 2015, a drone carrying radioactive material crashes at the Japanese Prime Minister's office On June 23, 2015, a drone crashed into Duomo in Italy On July 10, 2015, a student at the Department of Mechanical Engineering at Central Connecticut State University in the U.S. made a shooting drone On July 26, 2015, a drone appeared at the nudist beach in Studland, England On July 26, 2015, a drone dropped drugs over Mansfield Correctional Institution On July 29, 2015, a drone for monitoring the beach in Busan crashed over the sea. • On April 17, 2016, a British Airways A320 plane collided with a drone

[Figure 92] Drone Accident Log[46]

As drones are becoming more popular, the number of drone accidents continues to increase.
Drone hacking and privacy invasion accidents as well as crashes, are frequently occurring.
There have also been incidents of hacking drones to disrupt remote control or steal the imagery captured in drones. For example, data of U.S. combat drones was leaked to hackers and traded on the black market, and there were cases in which a video footage of a country's key intelligence data stored in the drone was leaked due to the hacking.
The number of personal information infringement cases is increasing as videos related to personal life are illegally filmed and collected/transmitted by drones.
Therefore, it is necessary to understand drone-related regulations and ethical guidelines before operating drones to

46 Source: Weekly Chosun article, "[News in News] It is good to deregulate drones for accidents… ", 2016.06.06.

ensure that drones are used safely.

<Ethical guidelines to be considered for drone use>

- accident prevention: Prevents the risk of human and object collision and minimizes damage in case of collision
- Hacking prevention and security enhancement: Drones without security functions are vulnerable to hacking and interference. Information should not be leaked by hacking.
- Prohibition of malicious use: Drones should not be used as weapons or used for terrorism, as well as a tool of "spy camera"
- Prevention of invasion of privacy and leakage of personal information: It is prohibited to arbitrarily collect/transmit information related to the public and private life of others by drones. Filming to identify the personal data subject without his or her consent, and the collection of personal location data should be prohibited. The freedom and rights of others from being violated by drones should be prevented.
- Prevention of theft: Prevention of data leakage due to theft of drones
- Understanding and compliance of policy: Drone compliance by country. Understand drone policies by country and region and operate drones accordingly
- Operation and safety education: Safety education on drone control can reduce the risk of safety accidents and help clearly understand response measures and accountability in the event of an accident.

The key drone policies in major countries at home and abroad are as follows.

<Table 113> Comparison of domestic and foreign drone operation policies

Classification	Drone Operation Policy
South Korea	• Drones can only be flown during daylight hours after sunrise and before sunset (no flying at night from after sunset to before sunrise) • The maximum flight altitude for a drone is 150m above the ground. • An object to be dropped from a drone is prohibited.
US	• The weight limit for drones is 55 pounds (25kg) or less. • Drones can only be flown during daylight hours after sunrise and before sunset. • Drones should be kept within sight of a pilot or observer • The maximum flight altitude for a drone is 500 feet (152m) above the ground, and the speed 100 mph(87 knots). • The minimum age to fly a drone is 16 years.
EU	• There is no unified drone regulation, but EU member states have their own rules. • Electronic registration is mandatory for all drones from 2019. • The weight limit for drones across the EU region is 330 pounds (136kg) or less. • France: requirements are subdivided in terms of the location and purpose of drone use, based on the threshold of 25kg of weight. • Germany: Uniform requirements apply for a drone of 25kg or less. Public disclosure of a drone photograph is prohibited. • Austria: Drone images of identifiable individuals are prohibited.
Southeast Asia	• In order to protect the privacy, safety and military information of most individuals, drone flight is strongly regulated, and drones must be pre-registered. • Thailand: Drones should only fly within sight no higher than 90m above the ground, only during the day and not at night. Drones over 2kg of weight require prior permission. • Philippines: Daytime flight is allowed only. Drones over 7kg of weight require prior permission. • Vietnam: Regulations are extremely stringent. The use of drones must be approved by the Ministry of Defense of Vietnam, and non-approved flights are prohibited.

⑤ Trolley dilemma

There is a trolley dilemma suggested by Philippa Foot, a British ethical philosopher, as a thought experiment related to the ethical dilemma of self-driving cars and drones. The trolley dilemma is an experiment on whether it is morally permissible to sacrifice five workers on the rail on which the train travels, or one other worker on the other rail, in a situation where the trolley train with broken brakes is running. This experiment is often cited in relation to which of the drivers or pedestrians to protect in the accident of an autonomous vehicle.

<Table 114> Examples of the trolley dilemma

Classification	Definition	Related Technology
Case 1	Soldiers operating combat drones cannot afford to engage sensible judgment even when shooting ammunition capable of killing hundreds of thousands of people, and avoid facing the ethical dilemma by justifying that they have only performed the given order.	Control a drone as a weapon
Case 2	Control issues of autonomous vehicles There are many people (including small children) in front of an autonomous vehicle running at a fast speed. It is difficult to avoid the accident and the driver is highly likely to die when avoiding it. The vehicle must choose whom to save between the driver and the most number of the people in front.	Emergency control of autonomous vehicles

⑥ Ethical Issues of Clouding Computing

<Guidance for Cloud Computing Service Providers>[47]

- Cloud computing service providers shall endeavor to protect user information and provide reliable cloud computing services.
- Cloud computing service providers shall endeavor to enhance the quality and performance of cloud computing services and the level of protection of information.
- In case of an infringement accident, user data leakage, or service interruption without prior notice, the cloud computing service provider must notify the relevant users without delay.
- Where a cloud computing service provider intends to provide any user information to a third party or to use the user information for any purpose other than for the purpose of providing services, it shall notify the user of the following matters and shall obtain consent thereto.
- Where the contract made with a user terminates, the cloud computing service provider shall return the user information to the user and destroy the user information possessed by the cloud computing service provider.
- Where a cloud computing service provider intends to close its business, it shall notify each user of the closure of business, return the user information before the date of closure of business, and destroy the user information possessed by the cloud computing service provider

<Privacy Policy for Cloud Computing Service Providers>[48]

- Clearly notify the location of the server where data is stored, applicable laws and regulations related to personal information, and the policy for processing data stored by customers

47 ACT ON THE DEVELOPMENT OF CLOUD COMPUTING AND PROTECTION OF ITS USERS

48 KISA online privacy portal, Privacy Policy for Cloud Service Providers, https://i-privacy.kr/images/noti_img/new/cloud/cloud_service_rule.pdf

- Equip the clearly defined function of access control
- Periodically check the implementation of basic privacy policies and standards from a trusted third party and provide results to customers
- In case of an inevitable access to customer data rather than a random access, present reasons for the access, etc.
- Operate a personal and customer data protection organization, establish and implement internal management plans
- Prevention of the use, alter, or damage of personal data stored by customers
- Complete deletion of customer data when the customer opts out of the service
- Notify the contact information for inquires and processing procedures in case of a personal data dispute
- Promptly relieve damage in case of a personal data dispute