



Albert Toynbee, in his monumental study of world history, used the concepts of "Challenge and Response" to explain how civilizations rise and fall. The rise and fall of human societies are determined by how they respond to internal and external challenges they face. Human societies have constantly faced a variety of challenges. And human societies have made efforts to overcome these challenges. The first step of all activities that have led to the development of humanity, such as cosmic order, interaction with the natural environment, resolution of social and cultural conflicts, political cooperation, and religious exchange, was 'communication' with the subject that needed to be addressed.

The art of communication has been a fundamental driving force in improving the quality of human life and developing society. And it was precisely information and communication technologies (ICT) that encouraged mankind to communicate well with everything with which they came in contact. From the oral communication of primitive times to the ancient methods of beacon fires and messengers on horseback, to the precursor of Morse code in the mid-19th century and Alexander Graham Bell's invention of the telephone in 1876, and now the era of the internet, information and communication technology has brought about profound changes in human lifestyles. These changes continue with the widespread adoption of personal computers, the emergence of smartphones, and the advancements in AI and IoT technologies, enabling humanity to understand and communicate more effectively. Recent innovative information and communication technologies such as "ChatGPT" and "Vision Pro" are the forerunners of a more convenient and seamless "communication era".

Information and communication technology constantly evolves to enable "communication with more entities. In 1948, von Neumann developed the first computer. In the 1960s, the first computer-to-computer communication, the Internet, opened the world of networking to everyone. Then, at the beginning of the 21st century, the IoT concept was proposed, presenting a new concept in which "everything is connected to the Internet". This required both improved computing power and

communication functions that could exchange information through semiconductors embedded in a variety of objects. This further expands the scope of communication and provides a foundation for the exchange of information among the myriad things in our surroundings. In the future, the connections in information transmission will become even more complex, and the boundaries of connectivity will infinitely expand. Furthermore, it is anticipated that the intelligent and anthropomorphized agents of information transmission will provide a diverse range of services in everyday life involving interactions between humans, devices, and the surrounding environment, even in situations where humans are unable to perceive the underlying processes.

Consolidated Equipment Count Outlook, 2016~2027

Fiscal Year	2016	2018	2020	2022	2027
Consolidated equipment (Billions of units)	46	80	113	144	297

[Source: IoT Analytics, May 23.]

ICT also allows communication to be "faster". In order for different entities to communicate effectively, there was a need for improved communication speeds. The advent of ultra-high-speed information transmission was a key factor in the fulfillment of this need. In the past, long-distance communication was made possible by telephones and fax machines in the 1970s. In the 1990s, the advent of high-speed Internet ushered in the era of global connectivity. As we have moved into the 21st century, the range and speed of communications has continued to expand with the development of mobile communications technologies. Recently, with LTE and 5G, we have entered an era of rapidly exchanging large amounts of data, enabling faster communication from a connectivity perspective and significantly improving communication quality and quantity. Furthermore, quantum computing technology is being researched to overcome classical computing limitations. The introduction of quantum computing into our daily lives has the potential to significantly increase the amount of information and the speed at which it is processed, and thus the speed of human communication.

Generational Speeds in Mobile Communications

Fiscal Year	1984	1996	2006	2011	2020	2030
Technology	AMPS	CDMA, GSM	WCDMA	LTE	5G	6G
Speed	14.4Kbps	144Kbps	14.4Mbps	75Mbps	20Gbps	100Gbps to 1Tbps

[Source: ITU]

History of Intel Microprocessor Technology Transition

Fiscal Year	1979	1989	1999	2009	2019
Model Name	8088	486	Pentium III	Core i5	Core i9
Clock Speed	~5MHz	~25MHz	~500MHz	~2.66GHz	~3.3GHz
Number of transistors (units)	29,000	1.2 million	9.5 million	774 million	1.7 billion
Manufacturing Technology	3 μm (10 ⁻⁶ m)	1 μm	0.25 μm	45 nm (10 ⁻⁹ m)	14 nm

Quantum Computing Age

[Source: Youtube.com, Tech Tators, "Evolution of Intel"]

ICT also allows communicating to become "more convenient". This has been achieved through advances in the technology of the user interface. From the original method of directly typing computer commands as text, to graphical interfaces with elements such as windows, icons, and menus, to the touchscreen interfaces found in smartphones, we have now reached the era of AI-powered conversational interfaces alongside speech recognition. With the introduction of ChatGPT, even the general public without knowledge of computer programming languages can easily operate computers through simple conversation. Looking to the future, we can anticipate the development of brain-computer interface technology, in which the human brain and computers will interact, allowing individuals to activate devices with their thoughts alone - an era of telepathy(?) may soon unfold. These advances in interfacing technologies have made interacting with machines, as well as other objects, easier and more convenient. In addition, the development of immersive media technologies such as VR/AR/MR has enhanced the user experience, making communication more realistic and convenient.

Changes in computer programming language

Period	1940's~	1950's~	1980년's~	2020's~
Programming Language	Assembly language, machine language	Fortran, Pascal	C++, Java, Python	ChatGPT, Bard

Thus, information and communication technology is being developed to help people communicate more, faster, and more conveniently. Based on this direction, ICT must be developed to enable better communication and improve people's quality of life. It will enable us to take full advantage of the benefits of technological development and rewrite human history. I would like to reiterate that the innovation of information and communication technology is the essence of "human development and innovation", and "communication technology" is the way to wisely meet the various challenges of human society.



In 1931, the poet and philosopher Paul Valéry said, "We must expect great innovations that will change the whole technique of art, thus influencing artistic invention itself and perhaps even bringing about an astonishing change in our very concept of art. These words shed light on how the technology of photography at the time had a significant impact on the art world. Technology has always brought about changes in art and new artistic challenges."



AI has long challenged the creative and artistic realms of poetry, literature, painting, video, and music. Using a variety of algorithms and models, it has imitated Shakespeare's sonnets, created Beatles- and Bach-style music, made any painting look like Van Gogh, and even created a chapter in the Harry Potter series.

At Christie's 2018 auction, the painting "Portrait of Edmond Bellamy" surprised everyone when it sold for \$432,500. This was because the artist of this painting was an AI who painted using a technology called GAN. This may just be a marketing example.

However, the generative AI that has been in the limelight recently shows that AI technology will become an essential technology in the various creative fields that humans have enjoyed beyond the previous level. Images created with Mid Journey, Dally 2, and Stable Diffusion have reached a level where it is not too much of a stretch to use them as commercial images. Companies no longer feel the need for freelance designers and illustrators.

In the arts, a work called "Space Opera Theater" won an award at the U.S. Colorado State Fair's Digital Art Competition, an image generated by Mid Journey. A German photographer named Boris Erdachsen made headlines after becoming the creative winner of the "Sony World Photography Award" when he refused to accept the award, claiming that his image was not directly taken, but generated by AI.

It has also been confirmed that the quality of the prompts used to generate images is much better when they are generated by GPT-4, making it difficult for people to distinguish between images that have been created by humans and those that have been created by AI. The Center for Artistic Inquiry and Reporting has just published a letter against the commercial use of such AI illustrations and a request for consent.

The level of the text translated by "DeepEil (DeepL)" is beyond the level of amateur translation. It has not yet reached the level of professional translation of literary works. However, everyday news articles, manuals, legal documents, and website translations are now good enough for machine translation. In an interview, Noh Seung-yong, a well-known translator of scientific books, criticized AI translation. He said that he would never want to improve on AI translations and that he could not find "excellence" in AI translations. He also emphasized that if AI becomes the primary translator, human language development will come to an end. Therefore, a social consensus on this issue is necessary.

In the realm of fiction, a writer named Stephen Marce recently published a novel called "Death of a Writer" using Chat GPT. This is not the level of a poorly written fantasy novel or an outrageous

science fiction novel created by an AI, but a novel in which a professional writer pulls out the entire story while creating each and every prompt.

Those who are most sensitive to the writing of AI are film and drama writers. The Writers Guild of America (WGA) has asked the Alliance of Motion Picture and Television Producers (AMPTP) to ban the use of AI in the creation and re-creation of all source material, let alone as its own source material, and not to use the work of WGA writers to train AI. They even made their opposition to AI clear when they went on strike over the issue of compensation to the streaming service providers. However, ultimately, during the negotiation process, the screenwriters sought to protect themselves from the potential harm caused by AI, while also advocating for the smooth and free use of AI as a tool for creative contributions by humans.

Another Writers Guild is advocating for a "Transparency Commitment" that would provide compensation to authors when their works are used for generative AI learning, and would require AI developers to disclose which works are used to learn. Specifically, if more than 30% of their works are generated by AI, authors, publishers, platforms, and marketplaces must disclose this.



In the field of video production, YouTube marketing videos have been generating intriguing results using various tools. The Balenciaga fashion show video with Matrix and Harry Potter characters made by a YouTuber named Demonflyingfox got an explosive response using software like Chat GPT, Mid Journey, Eleven Labs and DiD. It was very easy to make. Independent short films can now be produced using generative AI tools. Joe Russo, director of Marble Studios, predicted: "Within the next two years we will see movies made with generative AI".

The Beatles recently announced that they will use AI to generate John Lennon's voice and release a new album later this year. The song "Hype Boy" by New Jinsu, sung in Korean by Brunomus, who recently performed in Korea, is a song that Brunomus did not sing at all, but it is an AI-generated source. YouTube is full of such AI cover songs. We are now in an era where we can listen to new songs by deceased artists anytime, and singers can perform anyone's songs using their own voice.

Today, generative AI allows anyone to participate in the creative process to explore new artistic realms. However, copyrights are not yet granted to the results they produce. This is because copyright is still considered a right reserved for humans.

The debate over the artistic merit of computer-generated works ultimately boils down to the question of who recognizes their artistic value and how to reach a societal consensus on this issue. The Society for Computational Creativity argues that creativity is recognized when it is deemed creative by an impartial observer. However, it remains a challenge for us to determine the artistic value of these results without considering the historical and personal background, the experiences and perseverance of the creators, and the meaning of the space in which the artworks exist.

One thing is clear: creators now have highly capable and intriguing partners, much like software developers have their copilots. Creators have new allies and assistants. It is now the responsibility of creators to coexist with these AI tools, recognizing each other's roles and protecting their respective domains.



KOREA EASY PAYMENT FOUNDATION

General Status

- **Implementing Agency**
Korea Data Agency
- **Business Details**
Reinforcement of next-generation Internet business competitiveness

Company Status

- **CEO**
Yun Wan-soo
- **Business Type**
Nonprofit foundation
- **Year of Establishment**
2019. 10.
- **Homepage**
www.zeropay.or.kr

Key Accomplishments

- Operated domestic easy payment infrastructure network.
- Offered mobile gift certificate service.
- Zero Pay member stores exceeds 1.4 million.

Construction of Public Payment Network Open to All



The current mobile easy payment market is called “war in payment system.” As demand for contactless payment is soaring due to COVID-19, the use of mobile easy payment system has been rapidly increasing. In such a situation, Zero Pay appeared in order to reduce small businesses’ burdens by lowering commissions in using credit cards.

As buyers use Zero Pay more, small businesses’ payment commissions become close to 0%, and through this, their net profits can increase. Although it may be thought that it is not different from private sector’s pay service, Zero Pay as a payment network for public purpose does not collide with private pay service. The businesses involved in the Zero Pay service can create added value by freely using the Zero Pay network.

Users can decide the app that they want to use, and Zero Pay can also be used as a platform, since it is a public payment network. MyData platform, namely Milipass, links with various welfare services using soldiers’ HR data that was developed from this context.

Korea's Fintech Network, Zero Pay



Korea Easy Payment Foundation (KEPF) is an institution established for the construction and invigoration of Korea's payment infrastructure, and is operating an easy payment infrastructure called Zero Pay. Zero Pay is Korea's top-notch easy payment service operated by 22 banks and 26 e-financiers. Through Zero Pay, the Korean fintech network was constructed.

Zero Pay can support local currency service of government ministries and local governments in addition to debit card payment, and assists corporate Zero Pay, overseas easy payment, delivery, and online payment.

KEPF pursues technological competence that anybody can easily use, helping small businesses increased their profits. Zero Pay is an open payment system that everyone can use. Payment firms can use the infrastructure of Zero Pay, and consumers can pay through an app without card or cash. Small businesses can manage payment and sales through smartphone without a card terminal. The Zero Pay grown with small businesses is alleviating self-employed people's burden through the commission-free payment system.

Lay the Foundation for Soldiers' Welfare Support through Army Digitalization



KEPF participated in the Korea Data Agency's MyData Demonstration Service Support project, which is an ICT Fund project. KEPF was planning a mobile ID card service project for army soldiers and their families using the Zero Pay platform through an agreement with the Army Headquarters.

As for the Milipass developed through the support project, an ID card, a leave certificate, and pay statement are supported in mobile service for military personnel. It is a MyData platform linking with various welfare services by certifying HR data. Military personnel families can get benefits through a military personnel welfare mall along with such a function as mobile ID card.

KEPF underwent difficulties in constructing a relay system linking with national defense network due to various regulations and security issues while it was developing the platform; however, the company resolved the problems through numerous discussions. Thus, KEPF constructed a relay system and app service linking with the national defense network within a short time, and the number of users exceeded 250,000 in five months of the launch of Milipass. In addition, diverse additional service linkages could be created. Convenient use is planned to be supported through digitalization of the slightly inconvenient type such as deferred payment certificate.

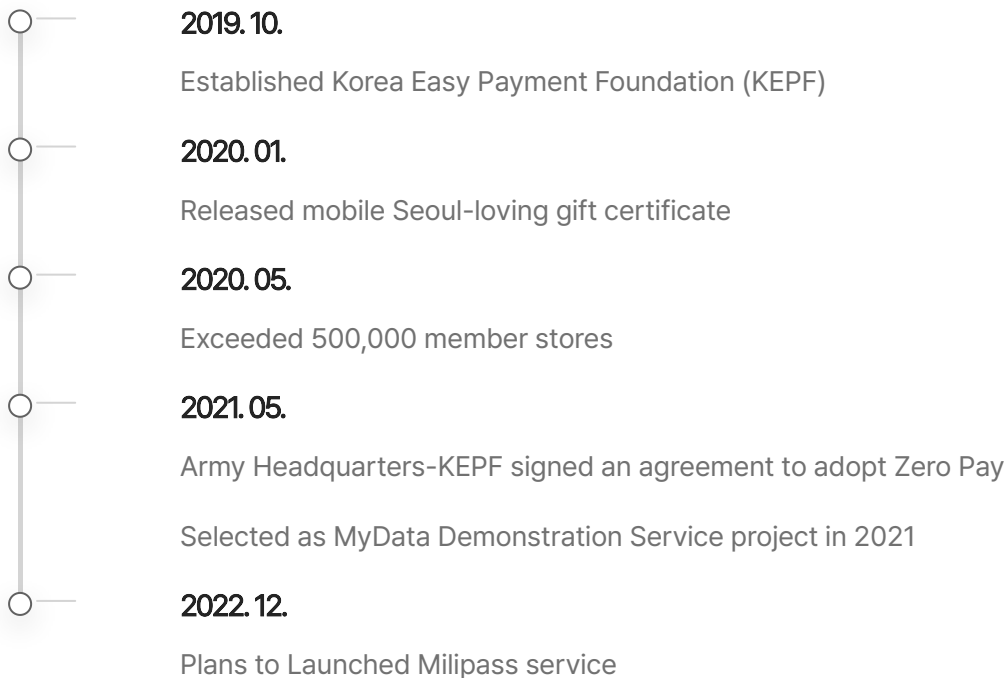
Hopefully Adequately Used for the Welfare of Soldiers and Their Families

KEPF says they could construct the Milipass with help from the army and companies participating in the consortium. The current platform could be developed as a result of efforts to offer various services by reflecting opinions of soldiers and their families.

The launch of Milipass has a meaning in that it laid foundation for soldiers' welfare support as well as army's digitalization. This means that interest in the welfare services for army soldiers and their families has increased.

KEPF plans to link various welfare services including offering voucher service through advancement of Milipass. The foundation plans to offer the Milipass service to the Navy and Air Force in the second half of this year. KEPF explained, "We hope diverse private companies can support the welfare and service benefits for military personnel and their families through Milipass."

TIME LINE





KOREA INFORMATION TECHNOLOGY RESEARCH INSTITUTE (KITRI)

일반현황

- **Implementing Agency**
Korea Internet & Security Agency
- **Business Details**
Nurturing creative information and communications talent

Company Status

- **CEO**
Yoo Joon-sang
- **Business Type**
Academic research, digitalization-specializing manpower fostering
- **Year of Establishment**
1985. 09.
- **Homepage**
www.kitri.re.kr

Key Accomplishments

Created youth employment and jobs through IT experts fostering.

Enhanced corporate competitiveness through SMBs' support and international cooperation business.

Fostered next-generation information security leaders including the most elite white hat hackers.

Demand for Information Security Manpower Soars due to Expansion of the ICT Convergence Industry



increasing in our daily life due to the development of the ICT industry, and cutting-edge ICT technologies are combined with general home appliances not to mention automobiles and smartphones. The public and education sectors and daily life work patterns have changed into contactless work due to the COVID-19 pandemic since 2020, and digital transformation is being accelerated.

As digital reliability becomes the foundation to support society in the contactless era, cyber security is becoming more important than ever. As the ICT convergence industry is expanded, demand for specialized manpower that can use security knowledge is on the rise in all phases of business ranging from accident response to development and sales. However, the specialized manpower compared to Demand for Information Security Manpower Soars due to Expansion of the ICT Convergence Industry demand is really insufficient. The National Intelligence Service (NIS) predicted that about 10,000 information security manpower keeping data will be needed more by 2025.

KITRI has faithfully fulfilled its role as IT software, information security education/training, and expert production technology research institute through cooperation with various government institutions in the era of the Fourth Industrial Revolution. Since KITRI planned the information security talent fostering business in 2011, the 1,454 talents fostered through the next-generation security leaders fostering program (Best of the Best: BoB) have been serving as the core of cyber security in major websites of government and private companies or working internationally.

Fostering Cyber Security Talent with Education and Training through the ICT Fund Project



KITRI has carried out BoB since 2012 as well as the Cyber Guardians Education Program since 2017 to discover immensely talented people with potential in the information security area who can lead the Korean information protection industry and cyber security future. In 2021, KITRI started operating the business through the ICT Fund project.

BoB is a program supporting the intensive fostering of top-class information security manpower leading the cyber security area as the backbone of the Fourth Industrial Revolution and helping them become the next-generation security leaders in each area including industry and security through specialized education and training. KITRI is operating sophisticated annual programs to foster leader-level white hat hackers possessing capabilities to solve problems creatively through one-on-one apprenticeship-style mentoring with top experts in each area of information protection.

The Cyber Guardians Education Program is a program to construct a manpower fostering infrastructure system to cope with social demand for specialized security manpower through information protection education offering by life cycle from middle school to high school. Through the program, outstanding resources can be discovered and nurtured early through information protection base expansion by offering a consumer-tailored education program.

KITRI fostered 946 specialized personnel to lead the information protection sector in the digital transformation and the Fourth Industrial Revolution era including 196 next-generation security leaders and 750 people supporting cyber guardians' activities in 2021. KITRI was awarded the Order of Civil Merit and "Camellia Medal" thanks to its meritorious deed of contributing to the information protection industry and talent fostering in July 2021.

KITRI is fostering some 200 white hat hackers and 750 high school students and leaders annually by participating in the ICT Fund project. With Japan and Taiwan benchmarking the program, KITRI is developing as an information security education control tower in the world.

The Most Elite White Hat Hackers through a Virtuous Structure of Fostering Program



KITRI plans a virtuous-cycle structure connected to BoB (Best of the Best) by adopting a class division system through the performance of a new task for the BoB program innovation and consolidation of the Cyber Guardians project, an education program targeting middle and high school students.

Through division into the project execution class, major knowledge specialization class, and general class, KITRI will continuously strive to secure global competitiveness by promoting trainees' competitiveness and increasing the number of trainees receiving overseas training benefit. KITRI plans to create a virtuous cycle of employment and investment through startups by expanding the startup-related Grand Prize system. It intends to support the system by expanding the existing system that supported only one team and obtain the Grand Prize manpower pool including the program₁ completing trainees. KITRI devises a measure to encourage venture capital investors to be connected to actual investments so that startups can grow after they are established. It is determined to play a role in leading the Digital Transformation era by fostering the most elite white hackers responsible for Korea's cyber security.

TIME LINE

- — **1985. 09.**
Established Computer Education and Training Center (KITRI reorganized in 1992 through expansion)
- — **1999. 12.**
Awarded the Science and ICT Minister’s Excellent Educational Institution Citation
- — **2000. 11.**
Won the Excellent Institution Commendation from the Trade, Industry, and Energy Minister
- — **2002. 01.**
Designated as an occupational capability development training facility (Employment and Labor Minister’s Citation in November 2022)
- — **2009. 12.**
Knowledge and Economy Minister’s Commendation(excellent institution in public office discipline)
- — **2011. 07.**
Grand Prize at the 2011 Korea Social Contribution in the excellent research institute category)
- — **2016. 07.**
Won an Achievement Award at the RSA Conference ASIA in the information security education category
- — **2016. 12.**
Received Trade, Industry, and Energy Minister’s Citation(excellent institution in public office discipline)
- — **2017. 02.**
Received Education Minister’s Citation(related to specialized high school)
- — **2017. 07.**
Received commendation from the Science, ICT, and Future Planning Minister(information protection development)
- — **2020. 05.**
Appointment and execution as ICQA state-certified qualification testing place
- — **2021. 07.**
Awarded the Order of Civil Merit, Camellia Medal