

Abstract

There has been a diverse discussion ongoing in defining the Fourth Industrial Revolution(4th IR), but it is agreed upon that 4th IR suggests a new socio-economic paradigm combining real world and virtual world based on 3rd IR technologies such as Artificial Intelligence(AI), Big Data, Internet of things(IoT), Cloud system and Blockchain.

Technological advance triggered by 4th IR dramatically spreads among the high-income countries with high social flexibility, further aggravating digital divide between high income with low and middle income countries which have relatively lower level of technologies and social flexibility.

Applying 4th IR technologies to development cooperation projects can transform the way that development has been carried out and improve its effectiveness. At the same time technology transfer and spillover effects to developing countries can be expected. Against this backdrop, this paper defines AI, Big Data, IoT, Cloud, and Mobile Technologies along with other related techniques as *4th IR Innovative Technologies* and examines their applicability to development cooperation projects. However, since developing countries have different digital capacity and supporting structure the application of *4th IR Innovative Technologies* to development projects with a strategic approach in consideration of the local context is highly required.

The study looks into applicability of *4th IR Innovative Technologies* to general international development projects by sector as followed; response to climate change, water and sanitation, agriculture, health, trade, transportation, construction, energy, education and public administration. These technologies enable to build more effective, productive, sustainable, transparent and accountable system of each sector. In the sector of response to climate change and energy, *4th IR Innovative Technologies* could advance energy efficiency, thereby minimize

distribution losses and unnecessary energy consumption. Utilized in renewable energy they could also contribute to carbon emission reduction. In the field of water and sanitation, adopting smart meter could prevent water leakage, improve water service, and with real-time and remote sensing, it could early detect contaminants in waterways and effectively monitor them. In the sector of agriculture, smart farm could optimize the environments related to growth of crops and livestock by remotely controlling them with means of digital technologies, which could lead to a more productive and sustainable cultivation and distribution. Telemedicine with diagnosis and prescription utilizing big data analytics could realize health equity in health sector and make the provision for old age more healthy and productive. *4th IR Innovative Technologies* in trade, transportation and construction could help in effective decision making and enhance convenience and safety throughout the whole relevant processes. In education sector, these digital technologies could be applied to assure high quality education to everyone and promote opportunities for lifelong education. In regard to public administration, these technologies could help improve public service delivery to citizens and make governments accountable providing advanced and effective public services.

Various cases of utilizing *4th IR Innovative Technologies* to development cooperation projects by the German Federal Ministry for Economic Cooperation and Development(BMZ), Netherlands, United Nation Conference on Trade and Development(UNCTAD) and Asian Development Bank(ADB) are examined in this study.

4th IR Innovative Technologies could help to strengthen the effectiveness of development cooperation and accelerate technology transfer in developing countries, however, it is worth noting that these technologies also have potential negative impacts. Low skilled jobs will be replaced by automation, with high risks of widening inequalities and social unrest. Social assistance programs are needed to tackle these problems, accompanied by strategic and coordinated efforts to raise digital literacy and data security, protect personal information, prepare related

guidelines and regulations, and build essential infrastructure by mobilizing funds from private sector.

Taking these pros and cons into account, this study reviews applicable technologies to KOICA's current development projects in each sector; public administration, education, technology, environment and energy, agriculture, forestry and fisheries, and health and examines their potential for utilization.

A major component of KOICA projects is construction and equipment. In case of construction, BIM(Building Information Modelling) platform could help minimize errors in design process and project management by facilitating collaboration between architects, engineers and end-users. In addition, drones and sensors could be used to prevent safety accidents. Virtual Reality(VR), and Augmented Reality(AR) could provide tangible job training in education sector as well as in health sector. IoT makes telemedicine available. In public administration sector, KOICA could create an integrated and coordinated working system and strengthen security and accountability for e-government projects with helps of Big Data, IoT and Blockchain technologies. In agriculture, forestry and fisheries sector, smart farm system, adjusted to existing infrastructures, could be adopted to rural development projects. In technology, environment and energy sector, IoT and Big Data could assist to build an efficient and comprehensive water management system for water resource management projects. Furthermore, KOICA could actively utilize *4th IR Innovative Technologies* via Creative Technology Solution(CTS) program in cooperation with IT start-ups and venture enterprises.

Adopting *4th IR Innovative Technologies* to some components of the projects could improve their effectiveness and further reduce risks of starting whole new projects. Due to barriers including low quality of infrastructure and affordability in developing countries, gradual introduction of technologies and digital strategies rooted in the local context are highly recommended. Moreover, to lay the groundwork for sustainable and active use of *4th IR Innovative Technologies*, participation of private sectors to development should be encouraged. Besides,

follow-up studies to increase digital capabilities and innovation clusters' capacities in developing countries are required. In long term, KOICA should facilitate a data management system to effectively manage ongoing projects and search for future projects in use of *4th IR Innovative Technologies*.