

AGRICULTURAL DIGITAL TRANSFORMATION AND DIGITAL VILLAGE MODEL IN THE CONTEXT OF INDUSTRIAL REVOLUTION 4.0

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Abstract

The industrial revolution 4.0 is opening a new era in the development of mankind - the digital age. With scientific and technological achievements having an increasingly strong impact on all aspects of society, digital government, along with the digital economy and digital society, are becoming an inevitable development trend of countries in the world. Digital transformation is an inevitable trend, one of the top concerns of countries in the context of the 4.0 industrial revolution. Digital transformation takes place in many areas including agriculture and rural digital transformation. The desired results of digital agriculture are systems of higher productivity, which are safe, anticipatory and adapted to the consequences of climate change, to offer greater food security, profitability and sustainability. In the context of industrial revolution 4.0, in the world, many digital village models have appeared, typically in the EU, India, Korea, China... These models have provided valuable experiences for agriculture and rural digital transformation in Viet Nam.

Keywords: *digital transformation, agricultural digital transformation, the industrial revolution 4.0.*

1. Introduction

Digital transformation is an inevitable trend in the context of the industrial revolution 4.0. This trend brings many benefits to the socio-economic development of each country, including agriculture and rural areas. Digital transformation in agriculture helps farmers and businesses improve productivity, improve profits, optimize production and deliver value – greater expansion opportunities. Internet of Things (IoT) and artificial intelligence (AI) are simplifying and streamlining the overall collection, inspection, and distribution of agricultural resources with sensors and Big data data governance systems. The application of robots in agriculture can improve efficiency and lead to higher and faster yields. Unmanned aerial vehicles (UAVs) used to spray pesticides and pesticides can significantly reduce the use of agrochemicals. The most innovative part of digital transformation is the ability to use artificial intelligence (AI) in data mining and analysis to forecast trends as well as warn unusual situations, helping manufacturers to make informed decisions. decided even before the start of the season.

Currently, agricultural production in Vietnam is facing many challenges: *firstly*, due to the increasing population, the demand for food and food is constantly increasing; *secondly*, the area of agricultural land is increasingly narrowing due to the process of urbanization; *thirdly*, climate change is complicated, seriously affecting agricultural production; *fourthly*, the process of international integration requires increasing quality of agricultural products; *fifthly*, due to the impact of the Covid-19 pandemic, exporting agricultural products faced many difficulties. Therefore, digital transformation of agriculture and rural areas is the key to narrowing the gap between rural and urban areas, improving productivity, quality and brand of agricultural products, thereby improving the income and living standards of farmers.

1.1. Objective of the Study

The objective of this study is to clarify the general theory of digital transformation in the context of the industrial revolution 4.0. On that basis, the author analyzes the necessity and benefits of agricultural digital transformation; the basic conditions and important drivers of agricultural digital transformation. The article also introduces some typical digital village models in the EU, India, Korea and China. Successful digital village models in the world have provided valuable experiences for the digital transformation of agriculture and rural areas in Vietnam. The author also focuses on clarifying the current situation and proposing basic solutions to promote the digital transformation of agriculture and rural digital transformation in Viet Nam in the context of the industrial revolution 4.0.

1.2. General theory of digital transformation and agricultural digital transformation

The industrial revolution 4.0 will take place in three main areas: digital, biotechnology and physics. In particular, the core elements of digital in this revolution are: Artificial Intelligence (AI), Internet of Things (IoT), Big Data, Fast Data, Cloud Computing (Klaus Schwab,2018).

The industrial revolution 4.0 is opening a new era in the development of mankind - *the digital age*. With scientific and technological achievements having an increasingly strong impact on all aspects of society, *digital government*, along with the *digital economy* and *digital society*, are becoming an inevitable development trend of countries in the world.

According to the Report "Digital Infrastructure Policies and Regulations in the Asia-Pacific Region" (9/2019) of the international telecommunications union (ITU), ***the digital economy and digital society have the following basic characteristics*** (ITU, 9/2019):

- *Digitisation*: essentially, when information is digitised it becomes readable and processable by electronic computers and this means data management and processing tasks that were previously undertaken manually can now be automated. The first types of information to be digitised were numerical but now all forms of information can be converted

to digital formats and managed digitally including high resolution audiovisual content.

- *Connectivity*: When computers are connected by increasingly fast and reliable networks, digitised data can be shared across multiple systems leading to further efficiency gains this means. Connectivity occurs at many levels: person-to-person, person to machine, and machine to machine. One of the results of the smart phone revolution has been the ‘personalisation’ of computing nodes at the edge of the network. Smart phone is an intensely personal device and this means that the user experience can be personalised and optimised and that an enormous amount of data reference to individuals can be collected at low cost.

- *Accessibility*: accessibility arises from a combination of digitisation in connectivity. Access to digitised information over networks vastly decreases the cost of access and leads to further automation and new business models.

- *Automation*: automation is a core goal of the digital economy and, in addition to the examples described above, industry observers are now expecting a revolutionary era of automation in which increasingly sophisticated processes will be undertaken through extensive networks of cloud computing resources that are process using AI and machine learning techniques.

- *Efficiency*: Higher efficiency or productivity is ultimately directed to transforming scarce resources or inputs into products and services that consumers value. While greater efficiency clearly serves economic goals, it can also be a powerful contributor to the achievement of environmental sustainability.

So what is digital Transformation?

According to Gartner - the world's leading information technology research and consulting company, the definition of digital transformation is as follows: Digital transformation is the use of digital technologies to change business models, create new opportunities, revenue and value.

Microsoft believes that: Digital transformation is about rethinking how organizations bring together people, data, and processes to create new value.

From FPT's point of view, digital transformation in organizations and businesses is the process of changing from a traditional model to a digital enterprise by applying new technologies such as big data (Big Data), Internet of Things (IoT), cloud computing... changing operating methods, leadership, working processes, and company culture. Digital transformation brings many benefits such as cutting operating costs, reaching more customers in a longer time, leading to faster and more accurate decision making thanks to timely and transparent reporting system. Thereby, the operational efficiency and

competitiveness of organizations and enterprises are improved³.

The difference between digital transformation and digitization:

Digitization		Digital transformation
Data digitization	Process digitization	
Convert information from analog or physical form to digital form For example: Hard copies of documents are converted into soft files on the computer; Notes on paper imported into Excel spreadsheets or paper reports converted into PDF files file	Leverage digital data to simplify individual, organizational and corporate workflows. For example: Using CRM software, HRM... to optimize workflow; Use software to collect and analyze real-time data.	- The full integration of digital technologies into all areas of an enterprise, applying technologies to change the way of operation, business model and bring new values to customers. enterprise goods. - Digital transformation based on new technology applications (Big Data), Internet of Things (IoT), cloud computing (Cloud)... To change the operating method, leadership, implementation process, and culture of the enterprise.
Manual process (Step 1)	Semi-automatic process (Step 2)	Automated process (Step 3)

The digital transformation process must inevitably produce:

- (1) Big data: complete data about digital versions of entities.
- (2) Means of collecting, storing and connecting big data: IoT, Cloud, Big data
- (3) Big data processing engine: AI
- (4) Appropriate policies for digital technology
- (5) Human resources master digital technology

In the process of digital transformation, the construction and development of digital infrastructure is considered an extremely urgent requirement today and connection infrastructure is one of the core components of digital infrastructure.

According to the Report “Digital Infrastructure Policies and Regulations in the Asia-Pacific Region” of the international telecommunications union (ITU), *Digital infrastructure* is the key to enabling the benefits of the digital economy and society. Digital infrastructure is the physical hardware and associated software that enables end-to-end information and communications system to operate (ITU, 9/2019).

³ <https://ocd.vn/chuyen-doi-so-la-gi-ban-chat/>

Digital infrastructure includes:

- Internet backbone including national and trans-oceanic fibre cables;
- Fixed broadband infrastructure such as analogue coaxial and optic fibre cable networks;
- Mobile communications infrastructure and networks including FWA, transmission towers, radio and optic fiber backhaul networks;
- Broadband communications satellites;
- Data and cloud computing facilities;
- End user equipment such as mobile handsets, PCs, modems and local Wi-Fi and Bluetooth networks;
- Software platforms including computer and mobile device operating systems as well as application programming interfaces; and
- Network edge devices such as sensors, robots, autonomous and semiautonomous vehicles, and other Internet of things facilitating devices and software.

According to the Digital Economy Report 2019, the components of digital infrastructure include: (1) ICT networks (the core digital infrastructure for connectivity); (2) data infrastructure (data centres, submarine cables and cloud infrastructure); (3) digital platforms; (4) digital devices and applications (United Nations, 2019).

Trends in emerging digital technologies include: (1) Blockchain technologies; (2) Three-dimensional printing; (3) Internet of things; (4) 5G mobile broadband; (5) Cloud computing; (6) Automation and robotics; (7) Artificial intelligence and data analytics (United Nations, 2019).

1.3. General theory of digital transformation in agriculture

Inevitability and benefits of digital transformation in agriculture:

Currently, the fourth industrial revolution is fundamentally changing the world's production. This revolution creates a driving force to promote in-depth development of manufacturing industries, reduce consumption of energy and raw materials, reduce harm to the environment, improve the quality of products and services, strongly promote the development of production. In particular, the fourth industrial revolution has comprehensively impacted all areas of production, including agricultural production; profound impact on all classes and strata in society, including farmers.

Agriculture is an important part of the national economy, is the main industry that creates jobs and income for farmers. For the agricultural sector, applying modern technological achievements of the 4.0 industrial revolution, especially digital technology, can help solve the challenges facing the industry: *Firstly*, production conditions production

becomes more and more difficult (agricultural land area is shrinking due to the process of industrialization and urbanization taking place more and more strongly; the labor force in agriculture tends to decrease due to economic restructuring due to economic restructuring, and population aging; climate change makes traditional farming increasingly difficult and precarious...); *secondly*, the income level of consumers is increasing, so the demand for the quality of agricultural products is increasing, shifting from quantity to quality, diversity, abundance and friendliness with the living environment.

The rise of digital agriculture could be the most transformative and disruptive of all the industries, because digital agriculture not only will change how farmers farm their farms, but also will transform fundamentally every part of the agrifood value chain. Digital agriculture will affect the behaviour of farmers, and also affect the way that input providers, processing and retail companies market, price and sell their products. It can be applied to all aspects of agrifood systems and reflects a change in generalized management of resources towards highly optimized, individualized, intelligent and anticipatory management, in real time, hyperconnected and driven by data. For example, rather than treating all fields, crops and value chains uniformly, each could receive their own highly optimized management prescriptions and animals could be monitored and managed individually. Value chains could have traceability and coordination at the lowest level of granularity. The desired results of digital agriculture are systems of higher productivity, which are safe, anticipatory and adapted to the consequences of climate change, to offer greater food security, profitability and sustainability.

Therefore, in this report we classified digital technologies according to the following structure, based on the complexity and stage of penetration of these technologies in the agrifood sector: a) mobile devices and social media; b) precision agriculture and remote sensing technologies (IoT, GNSS, RTK, VRT, PLF, UAV and satellite imagery); c) Big Data, cloud, analytics and Cybersecurity; d) integration and coordination (blockchain, ERP, financing and insurance systems); e) intelligent systems (Deep Learning, Machine Learning and Artificial Intelligence and robotics and autonomous systems) (Food and Agriculture Organization of the United Nations, 2019)

According to The Digital technologies in agriculture and rural areas status report (2019) of Food and Agriculture Organization of the United Nations, *basic conditions for agricultural digital transformation include:*

Firstly, IT infrastructure and network in rural areas (Connectivity: mobile subscription and the access to broadband infrastructure; affordability: costs of ict tools as a precondition for adoption by rural population)

Secondly, Educational attainment, digital literacy and employment among rural communities (literacy rate and the gap between urban and rural areas; introduction of icts to the educational process; employment in the rural areas and agrifood sector;

Thirdly, Policies and programmes for enabling digital agriculture (institutional support and mechanisms include e-government services, e-agriculture services, doing agribusiness initiatives; policy regulation and frameworks; existing digital agriculture strategies)

Enablers for digital agriculture transformation include: (1) Use of digital technologies among rural population and farmers; (2) Digital skills among rural population (global trend on digital skills, digital skills gap between urban and rural areas); (3) Digital agripreneurial and innovation culture (Food and Agriculture Organization of the United Nations, 2019)

2. Method

In this article, the author uses secondary data to clarify the general theory of digital transformation and agricultural digital transformation; learn some typical digital village models in the world; analyzing the current situation of digital transformation of agriculture and rural areas in Vietnam in the context of the industrial revolution 4.0. Secondary data were obtained from government journals and websites.

3. Results

3.1. Typical agricultural and rural digital transformation models in the world

3.1.1. Digital Village model in EU

According to the European Rural Review No.26, smart villages will create 5 main drivers: *firstly*, responding to depopulation and demographic change; *secondly*, finding local solutions to public funding cuts and the centralisation of public services; *thirdly*, exploiting linkages with small towns and cities; *fourthly*, maximising the role of rural areas in the transition to a low-carbon, circular economy; *fifthly*, promoting the digital transformation of rural areas (European Network for Rural Development, 5/2018)

Since 2016, the European Commission has coordinated with the European Parliament to launch a pilot policy to build smart villages in the 2016-2020 period with the name "Europe acting for smart villages" in a number of countries and based on technology connected with indigenous values in order to preserve and develop European values, helping rural people have jobs and prosperous lives.

On the 11th of April 2017, the European Commission presented an "EU action for Smart Villages", a document to launch reflections on villages of the future. It announces a series of initiatives within the EU rural development, regional development, research, transport, energy, and digital policies and funds. This Action Plan is a follow-up of the Cork Declaration of September 2016 in which one of the ten priorities is "investing in rural viability and vitality". Smart Villages is a relatively new concept within the EU policy making. According to this EU action, Smart Villages refer to "rural areas and communities which build on their existing strengths and assets as well as on developing new areas.

The EU Action Plan presents 16 planned actions that will be implemented by 2020 to promote smart villages. The plan is a mix of actions, conferences or calls for proposals already scheduled before the Cork Declaration and some new actions more directly targeting the implementation of Smart Villages.

In April 2018, another declaration that was widely accepted in Europe was the Bled Declaration (Bled, Slovenia) titled “The Smarter Future of Rural Areas in the EU”. The Declaration calls for innovative and inclusive use of digital technologies; strengthened knowledge and entrepreneurship; and complementary support under EU funding instruments to boost the development of rural economies across the EU.

According to the Bled Declaration, the concept of a smart village should include: precision farming, various digital platforms (e-learning, e-health, e-administration, transport, gastronomy, social services, retail), shared economy, circular economy reducing waste and saving resources, bio-based economy, renewable energy, rural tourism, social innovations in rural services and entrepreneurship.

In the EU, the typical smart village models are the German Digital Village model. The German Digital Village project, implemented from 2015 to 2019 with a funding budget of about 4.5 million Euros. The main purposes of the project are: 1) Innovation in the smart rural ecosystem; 2) Building interdisciplinary solutions; 3) Create a culture of collaboration between the people, the local government; 4) Building sustainable solutions; 5) Develop cost-effective digital solutions.

3.1.2. Digital Village model in India

The Government of India launched different schemes for making strong base for farmers so that farmers of India can get the benefit of digital world in their farming business. The rural India has various panchayat. It is important to provide high speed internet connectivity to all panchayat so that all rural areas of India can have high speed internet connectivity. The central and state government of India set up a Core ICT infrastructure and the objective is to taking the digital literacy to the remotest locations of the India. The Department of Telecom (DoT) has established Bharat Broadband Networks Ltd. (BBNL) to spread out the National Optical fiber Network (NOFN). BBNL spread the optic fibre cable terminating in each of the 2,50,000 gram panchayats. In this way all panchayats in the India can have high speed internet connectivity. This will provide digitalization and connectivity to the local institutes like panchayat office, schools, health centre etc. After connecting the local institutes of the rural India with the internet, now the requirement is making the rural India digital literate. National Institute of Electronics and Information Technology [NIELIT] has identified more than 5000 facilitation centers across India for training on courses which literate the rural India about basic online activities. Under the umbrella of Digital India scheme, Department of Electronics and Information Technology [DeitY] launched Mobile

seva through which government departments/agencies deliver public services to the people through mobile only (Jain, 2019)

Akodara village is located in Sabarkantha district of Gujarat. This village is known as “Digital Village” on 2, January, 2015. Akodara village was adopted by ICICI Bank under the Digital Village schemes in 2015. Akodara is known as Digital village and Cashless village. This village is known as the first Digital village of India. All mobile banking activities are done in Hindi, English and Gujarati languages. ICICI bank also provides training to the villagers about the processing of financial activities over the internet. The majority of the villagers are using electronic payment methods or digital methods for making payments. The majority of payments are done through SMS only and the payments are directly goes to the shopkeeper’s accounts. The gram panchayat rented out the premises of village to ICICI Bank’s rural branch. People in Akodara are using mobile phone for making payments of their different purchases. The village has their own website (<http://akodara-digitalvillage.in>) and people are using this website for different purpose. This village has wi-fi facility and people are using wi-fi for different online activities (Sonia Bhatt, 2020).

3.1.3. Model of information network village in Korea

Korea has attracted special attention from the world through the Information Network Village (INVIL) project. The main objective of the project is to close the gap between rural and urban areas, through increasing the availability of e-government services, and to raise people's living standards by promoting e-commerce. The project is expected to raise awareness of the local community in the application of information and communication technology to promote the regional economy through e-commerce transactions, education and public information. INVIL villages often create an environment using the Internet that provides residents with information, training them and guiding them to access various types of information closely related to daily life and business activities. livelihoods of residents, and more importantly, facilitate the formation of local communities and bring them together.

The INVIL project is a partnership between the Ministry of Public Affairs and Security of Korea (MOPAS) with local governments and each INVIL. MOPAS provides information infrastructure such as high-speed Internet connection, PC.... MOPAS is the governing body that establishes plans, budgets, legislation, and supports the network of cooperation between the organizations involved and promotes the project. The local government establishes and manages the information environment in each village, develops local content and centralizes administrative support and practical content, such as computer training, Internet applications, manage the site for local people especially in winter, when the crops are idle in 7 languages. Each INVIL organizes activity committees, manages village centers and develops profit models using the INVIL shopping website and INVIL experience for local people to participate and contribute to the activity sustainability of information networked villages.

The information villages of Korea are built as follows:

- Regarding communication infrastructure: Villages participating in INVIL must be located in locations where high-speed, low-cost Internet infrastructure can be built;
- INVIL Center in the Village: The INVIL Center in the village is built and equipped with facilities for training, as well as providing online public services to residents;
- Developing information content: In order to encourage the participation of residents, INVIL has organized and developed online education and training programs on IT application, exploitation and operation of e-commerce website, tourism. ecology... (including for people with disabilities, the elderly, leaders of villages and communes, etc.).

For farmers, the INVIL project also offers ways to increase people's income in a sustainable way, providing information platforms about crops, prices, farming methods, weather conditions, as well as a market information platform, connecting supply and demand of farmers' products, remote consulting services, medical information...

In addition, the project also encourages local residents to contribute to promoting their communities by posting local news on the website (new.invil.org) and forming clubs (community.invil.org).) on the Internet. By doing so, INVIL has enabled farmers to actively find their own way to manage their villages, develop a business model and seek sustainable development plans.

The successful experiences of the information network village model in Korea:

With these results, in 2011, the INVIL project became the first Korean public policy program to win the first prize of the United Nations Award for Public Service, in the category of "Promoting Participation in Public Services". policy making through innovative mechanisms". The successful case of INVIL can be drawn through the following experiences:

Firstly, the village community is the center of development projects. The active participation of the people is a key factor in ensuring success. For projects applying information and communication technology, as well as digital transformation, training people to become digital citizens is a prerequisite solution.

Secondly, the application of information and communication technology, digital transformation is not a one-time infrastructure investment project, but must be continuously maintained, ensuring the sustainable development of the project. Even the criteria of the project must be continuously reviewed, updated and redesigned to match the realities of life.

Thirdly, the sharing of information and knowledge in implementation, not only between state agencies and enterprises, but also within the population community must also be focused.

Fourthly, applying information and communication technology, digital transformation is not only a solution to socio-economic problems in the short term, but also shapes a community and a country in the future. Therefore, the approach needs to be flexible, both according to a

systematic design mechanism, as well as with inter-sectoral and inter-agency coordination, between localities and the central government, and between localities.

3.1.4. E-commerce for poverty alleviation in rural china (Taobao villages)

China's rapid development of e-commerce has begun to reshape production and consumption patterns as well as change people's daily lives. In 2014, the Alibaba Group, in collaboration with the government, launched the Rural Taobao Programme to help give rural residents greater access to a broader variety of goods and services and help farmers earn more by selling agricultural products directly to urban consumers in online platforms.

The programme has four main activities: 1) Setting up an e-commerce service network in counties and villages; 2) Improving logistical connections for villages through "two-stage delivery" shipping packages from county centres to villages; 3) Providing training in e-commerce and promoting entrepreneurship; and 4) Developing rural financial services through the AntFinancial subsidiary of Alibaba.

The Rural Taobao Programme has expanded rapidly, from 212 villages in 12 counties in 2014 to more than 30 000 villages in 1000 counties in 2018, spreading from the coast to inland. While over 95 percent of the Taobao Villages cluster in the eastern region, particularly in Zhejiang, Guangdong, and Jiangsu, they have started to spread to the inland region, going from four shops in 2014 to over 100 in 2018.

The formation of Taobao Villages broadly proceeded through three stages: 1) Version 1.0 was mainly about grassroots development: Villagers, often returned migrants with distinct entrepreneurial skills, led the establishment of online businesses and created models for other villagers to follow. Examples include the early Taobao Villages, such as Shaji in Jiangsu province. 2) As e-commerce developed and more Taobao Villages prospered, version 2.0 was accompanied by government support: Local governments provided direct support for infrastructure, e-commerce training, and finance. Examples include Jieyang in Guangdong province. 3) In recent years, as more Taobao Villages formed, the platform-ecosystem version 3.0 has emerged: Local governments are providing support through subsidies for specialized e-commerce service providers and firms to build an e-commerce ecosystem with e-platform companies. Tailored support to villagers includes training and developing suitable local online products and branding. This process is typical of Taobao Villages in locations where the industrial base is weak and human capital (entrepreneurship and skills) more limited. Examples include Xifeng in Guizhou province.

Its main activities consist of establishing and improving rural e-commerce public service, fostering rural e-commerce supply chains, promoting connectivity between agriculture and commerce, and enhancing e-commerce training. The programme grew quickly and by 2018 had supported 1016 demonstration counties, covering 737 poverty-stricken counties (89 percent of the total), including 137 counties with extreme poverty (41 percent of the total). The share of poverty-stricken counties among demonstration counties

increased from 27 percent in 2014 to 45 percent in 2015 and 65 percent in 2016, while in 2017 and 2018, more than 90 percent were poverty-stricken counties, with the rest underdeveloped.

While further research is needed to clarify and quantify the relationship between e-commerce participation and household welfare improvement, numerous anecdotal cases show that people gain wealth and have better lives after participating in e-commerce. Women in particular seem to benefit and account for a large share of e-commerce entrepreneurs. The ratio of women to men entrepreneurs in e-commerce is at or near parity, compared to a ratio of 1:3 in traditional businesses. The average age of female entrepreneurs in traditional businesses is 47.6 while the online counterparts tend to be younger, with those aged 25-29 accounting for 30 percent and those aged 18–24 nearly 30 percent on the Taobao platform. The average age of online female entrepreneurs is 31.4.

Success stories in Taobao Villages suggest that digital technologies can contribute to inclusive growth in rural China. They can lower the required skill threshold allowing individuals, including the less educated, to participate in e-commerce and earn more. The experience in Taobao Villages has sparked strong interest among researchers, policy-makers and the private sector to explore the use of e-commerce as a tool for poverty alleviation and rural vitalization (Food and Agriculture Organization of the United Nations, 2019)

3.2. The reality of Vietnam's agricultural digital transformation in the context of the 4.0 industrial revolution

Vietnam is currently an agricultural country with rural areas accounting for 63% of the population, 66% of households, and 68% of working people; Agriculture accounts for 13.96% of GDP. The small, inefficient production model and lack of value chain linkages have always been a "serious disease" of Vietnam's agriculture.

In the context of industrial revolution 4.0, agricultural production in Vietnam is facing many challenges: Due to the increasing population, the demand for food is constantly increasing; agricultural land area is shrinking due to urbanization, so it is necessary to increase agricultural productivity to meet food security; Climate change is taking place strongly, creating great pressure on our country's agriculture; The process of international integration requires higher quality agricultural products. In addition, due to the impact of the Covid-19 pandemic, Vietnam's agricultural exports were at a standstill, the major export markets of China, the EU, and the US froze, plus the double impact of drought, saltwater intrusion and Floods and storms, Vietnam's agriculture witnessed the loss of crops, bankruptcies of businesses and a series of immediate difficulties. Therefore, agricultural digital transformation is an inevitable trend to develop a modern and sustainable Vietnamese agriculture.

To adapt to the new situation and take advantage of the opportunities brought by the industrial revolution 4.0, Vietnam has issued Resolution No. 52-NQ/TW (September 27, 2019) on a number of undertakings and policies to actively participate in the fourth industrial

revolution, which emphasizes the urgent need to accelerate the digital transformation process. On that basis, the Prime Minister signed Decision No. 2289/QĐ-TT (December 31, 2020) promulgating the National Strategy on the fourth industrial revolution to 2030; Decision No.749/QĐ-TTg (June 3, 2020) approving the national digital transformation program to 2025, with orientation to 2030.

The Digital Transformation Program in Vietnam has three main pillars: digital government, digital economy and digital society. The basics of this program include: 1) Awareness plays a decisive role in digital transformation; 2) People are at the heart of digital transformation; 3) Institutions and technology are the drivers of digital transformation; 4) Developing a digital platform is a breakthrough solution to promote faster digital transformation, reduce costs, and increase efficiency; 5) Ensuring network safety and security is the key to successful and sustainable digital transformation, and at the same time is an integral and integral part of digital transformation; 6) The participation of the whole political system, synchronous action at all levels and the participation of the whole people are factors to ensure the success of digital transformation.

The National Digital Transformation Program has introduced many important solutions to support the digital transformation of agriculture, farmers and rural areas towards the goal of building a new countryside to improve the material and spiritual life of the people. citizen; have appropriate socio-economic infrastructure; economic structure and forms of production organization rationally, linking agricultural development with industry and service; linking rural development with urban areas; a democratic, equal and stable rural society, rich in national cultural identity; ecological environment is protected; national defense and security, order is maintained.

In recent years, the agricultural industry has begun to pay more attention to many digital transformation solutions and applications in almost all fields.

In farming, IoT and Big Data technologies have begun to be applied through digital technology products such as software that allows analysis of data on the environment, plant types and growth stages, and consumers. can retrieve and monitor these parameters in real time...

IOT technology, Blockchain, biotechnology are widely applied in large-scale livestock farms. The dairy industry applies digital technology the most, with the prominent models being the modern farms of TH TrueMilk Group and Vinamilk Company.

In forestry, applying DND technology in the management of forest varieties and forest products; GIS technology and remote sensing images to build software for early detection and warning of forest fires from satellite images, monitoring and early detection software for deforestation, forest degradation...

In fisheries, digital transformation is also strong such as the use of ultrasonic fish detectors, flow meters, satellite phones; seine receiver (standing); capture and drop net

capture system, GIS technology and global positioning system (GPS) to help manage offshore fishing fleet. Applying biotechnology selectively, breeding varieties with high yield, quality, disease resistance, good tolerance to the environment, circulating aquaculture technology (RAS), biofloc technology, technology nanotechnology, marine cage culture technology, cold water fish farming technology.

Artificial intelligence technology has been used in shrimp farming to analyze water quality data; feed management and health of farmed shrimp. Automation technology has been widely applied in seafood processing from sorting, steaming, packaging, production lines..., helping to reduce production costs and ensure the quality of seafood products. ...

In the context of industrial revolution 4.0, Vietnam has researched and learned from typical smart village models in the world (EU, India, Korea, China...). Vietnam is also making efforts to implement "smart villages, connected communes" projects with Vietnamese identity, in order to bridge the gap between urban and rural areas, and improve the lives of rural residents.

In September 2020, the Ministry of Agriculture and Rural Development coordinated with the Ministry of Information and Communications to organize a seminar on digital transformation and smart new rural orientation for the period 2021 - 2025. Experts from the Digital Agriculture Cooperative at the Workshop, the "smart village, connected commune" model in Vietnam is a community of hamlets, villages and communes in rural areas using innovative solutions based on local strengths and opportunities, on a participatory, shared approach to developing and implementing economic and social strategies to improve economic, social and environmental conditions, especially differentiated by mobilizing digital technology solutions. The model of "smart village, connected commune" promises to form truly civilized and modern rural areas while still preserving the cultural identity of traditional villages.

The Ministry of Agriculture and Rural Development and the Ministry of Information and Communications jointly have an idea to submit to the Government to develop a project to bring information technology and digital transformation into one of the criteria for building a new countryside in the 2021 period. - 2025. Specifically, digital transformation infrastructure will be essential infrastructure, including broadband connection infrastructure with fiber optic cable covering rural areas, followed by 4G connection infrastructure, then 5G. How can every citizen have access to internet connection through basic connection systems at reasonable costs....

Experts and researchers believe that the construction of smart villages and connected communes in Vietnam needs to start from people, take people as the object of service, build the most direct connections, save money. as complete as possible. Accordingly, smart villages and connected communes will include components of smart institutions, smart people (trained and professional), smart government and smart agriculture.

4. Discussion and Conclusion

4.1. Basic solutions to digital transformation of agriculture in Viet Nam

Basic solutions to digital transformation of agriculture in Vietnam include:

Firstly, develop hi-tech agriculture in the direction of focusing on smart agriculture and precision agriculture, increasing the proportion of digital agriculture in the economy. Implementing digital transformation in agriculture must be based on data. Focus on building big data systems of the industry such as land, crops, livestock and fisheries. Building an integrated observation and monitoring network in the air and on the ground for agricultural activities. Promote the provision of information on the environment, weather, and land quality for farmers to improve productivity and crop quality, and support the sharing of agricultural equipment through digital platforms.

Secondly, apply digital technology to automate production and business processes; managing and monitoring the origin and supply chain of products, ensuring fast, transparent, accurate, safe, and food hygiene. Consider piloting the implementation of the initiative "Each farmer is a trader, each cooperative is an enterprise applying digital technology" with the goal that each farmer will be oriented and trained in digital technology application in the future. produce, supply, distribute, forecast (price, season, ...) agricultural products, promote the development of e-commerce in agriculture.

Thirdly, implement strong digital transformation in management to have timely policies and administration for agricultural development such as forecasting, market warning, planning management.

4.2. Conclusion

In summary, in the context of the industrial revolution 4.0, digital transformation is a global trend and a top concern of countries, including Viet Nam. Vietnam is currently an agricultural country with rural areas accounting for 63% of the population. Agriculture and rural digital transformation in Vietnam is of particular importance to overcome the challenges facing the agricultural sector, to close the gap between rural and urban areas and to improve the living standards of farmers.

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