

# Increasing Trade Capacities of Developing Country SMEs in the advent of the 4<sup>th</sup> Industrial Revolution



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## **Index of abbreviations**

AI	Artificial Intelligence
ASEAN	Association of Southeast Asian Nations
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GVC	Global Value Chain
4IR	4th Industrial Revolution
ICT	Information and Communication Technologies
IoT	Internet of Things
IR	Industrial Revolution
R&D	Research and Development
SDGs	Sustainable Development Goals
SME	Small and Medium Enterprise
SME1	Small and Medium Enterprise Delco
SME2	Small and Medium Enterprise pork farm
SME3	Small and Medium Enterprise DCD
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
US	United States
VND	Vietnamese Dong

## **Abstract**

Latest research raises important questions regarding the opportunities and challenges that come along with the 4th Industrial Revolution (4IR): how disruptive are its effects going to be? will developing countries benefit from it, or will they instead be left even more behind? Theory on technological incorporation broadly suggests that 4IR related technologies have the potential to raise global income levels and improve the quality of life of many around the globe, through a technological innovation that leads to immense improvements in supply-chain processes and long-term gains in efficiency and productivity. However, it is not clear to what extent this affects firms in less developed countries. This research paper takes a closer look at the trade capacities of SMEs in the Vietnamese agricultural sector, and analyses whether the incorporation of 4IR related technologies could have positive effects on productivity of SMEs. Trade capacities in this case are referring to the value of export. After taking a general look at the Vietnamese agricultural sector's weight in trade, and the latest efforts towards technological incorporation, the research draws from description of firm-cases and builds on data collected through interviews and questionnaires. The conclusion is that, despite the firm's efforts to adopt advanced technologies, and through this adoption increase their capacity to trade, there are still great barriers to incorporate such technologies and therefore firms do not benefit from the opportunities that the 4th Industrial Revolution offers.

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# Increasing Trade Capacities of Developing Country SMEs in the advent of the 4<sup>th</sup> Industrial Revolution

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## 1 Introduction

Developing countries play an increasingly important role in world trade, but the growth-promoting potential of free trade remains strongly constrained by barriers of different kinds. In fact, although developing countries' share of global exports grew from 18% in 2000 to 28% in 2012, it has since plateaued at that level.<sup>1</sup> Alongside poor governance, import and export barriers still significantly hamper trade for many developing countries; and the poorer the country, the higher its tariffs and technical trade barriers tend to be.<sup>2</sup>

Contrarily, a trend that is exponentially growing is the so-called 4th Industrial Revolution (IR). As stated by Klaus Schwab, Founder and Executive Chairman at the World Economic Forum, we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. Due to its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before.<sup>3</sup>

While the first IR encouraged the production through the use of steam engine, the second IR was driven by electricity and oil as new forms of energy, followed by the third IR introducing digital technologies such as computers and the internet.<sup>4</sup> The fourth Industrial Revolution (4IR) is at its nascent stage, and like the revolutions that preceded, it has the potential to raise global income levels and increase trade around the world, by bringing forward a technological innovation that will lead to a supply-chain miracle, with long-term gains in efficiency and productivity. Especially for developing countries, 4IR offers huge opportunities to bypass preceding traditional phases of industrial development and leapfrog expensive stages of development.<sup>5</sup> However, there is a nuanced view of the outcomes too: the technological gap between developing and developed countries could also be widened as the latter ones face comparative advantages in value chains that use frontier technologies.<sup>6</sup>

Not all countries have benefited equally from previous industrial revolutions and neither do they equally benefit from current advances in industrial technology. Indeed the “how” of production is more important than the “what”.<sup>7</sup> As major players in the economy in general, and in trade in particular, Small and Medium-Sized Enterprises (SMEs) stand on a particular situation in this matter. For them, the situation widely differs when looking at different parts of the world, even inside the developing country spectrum. Hence, and as a step towards understanding the potential implications of 4IR related technology on trade capacity among developing country SMEs, further research ought to be conducted

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<sup>1</sup> UNCTAD: Developing Economies in International Trade.

<sup>2</sup> UNCTAD (2018): Trade policy frameworks for developing countries: A manual of best practices, p.26

<sup>3</sup> Schwab, Klaus (2016): The Fourth Industrial Revolution: what it means, how to respond.

<sup>4</sup> Runde, F. Daniel (2019): Beyond Technology. The fourth Industrial Revolution in the developing world, p. 1-2

<sup>5</sup> UNIDO (2017): Industry 4.0-Opportunities behind the Challenges. Background Paper, p. 31.

<sup>6</sup> UNCTAD (2019): Structural transformation, Industry 4.0 and inequality

<sup>7</sup> Hallward-Driemeier and others. (2017): Trouble in the Making?: The Future of Manufacturing-Led Development., p. 10.

to disentangle the relationship between technology incorporation and capacity to trade, taking regional and sectoral contexts into account. This paper focuses on the analysis of the possible influence of 4IR related technology incorporation on trade capacities, tackling specifically the case of Vietnam and its agricultural sector, on which the country's economy heavily relies.

The paper is structured in six main parts: firstly, a literature review is presented covering the general trade situation of developing countries, and the possible effects of the 4IR on these trade capacities. This is followed by the specification of the research question based on the identified literature gap, accompanied by research guiding hypotheses and by the empirical strategy to be applied. The third part contextualizes the Vietnamese agriculture sector in terms of its current status and trends in trade as well as the incorporation of technology for agricultural SMEs, done by an in depth desk research. These findings are supplemented by three case studies based on primary research; which insights are analyzed in part five together with the ones from the desk research. Finally, the paper concludes and depicts some policy recommendations.

## 2 Literature Review

### 2.1 Trade Capacities of Developing Countries and Implementation of 4IR technology

The global economic environment has changed significantly over the past few decades: there is an increasing trade in tasks - in services, following new outsourcing strategies- and the location of production is shifting following different patterns; technological progress has improved access to Information and Communication Technologies (ICTs) and reduced trade costs; emerging economies are playing more active roles in global trade, finance, and governance than in the past, since their development needs and challenges are increasingly on the international focus.

These developments present both opportunities and challenges for developing countries in their quest for growth and poverty reduction through increased participation in international trade. In a recent UNCTAD report, trade is still considered as one of the main means to tackle poverty and drive growth.<sup>8</sup> In fact, in the last decades developing countries have increased trade-to-GDP ratios; they became more dependent on trade<sup>9</sup>. Twenty years ago, 62% of all bilateral trade was between just developed countries, while now that share is down to 47%. Developing countries have become more prominent trading partners, and the value of trade between emerging economies is up 10-fold during the last 20 years.<sup>10</sup>

However, since 2010, exports of developing countries have slumped, with a 14% decrease in merchandise exports in value terms and a 13% decrease in imports in 2015.<sup>11</sup> Considering developing countries' population, this trade trends indicate that they have not fully reaped the potential benefits of trade for development.

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<sup>8</sup> UNCTAD (2016): Making Trade Work for Least Developed Countries, p.8

<sup>9</sup> UNCTAD (2016): Making Trade Work for Least Developed Countries, p. 2.

<sup>10</sup> Andre Tartar and others (2019): How the Rise of Developing Countries Has Disrupted Global Trade, Bloomberg.

<sup>11</sup> WTO (2016): World Trade Statistical Review 2016, Chapter VI, p. 54.

A major contribution of trade can only occur if development and utilization of productive capacity is also taking place, which in turn involves a basic process: technological progress. Technological progress refers to the discovery of new and improved methods of producing goods, and although being an ongoing process, highest intensity periods fall into what is known as IR.<sup>12</sup> Having gone through three of them, now a fourth one is building on the last one. The 4IR is a new trend in manufacturing. It is based on the integration of a set of technologies that enable ecosystems of intelligent, autonomous and decentralized factories and integrated products and services. In broad terms, 4IR is linked to the smart collection and application of real time data and information by networking all individual elements, so as to reduce the complexity of operations, increase efficiency and effectiveness, and reduce costs in the long term. It is also marked by emerging technologies – advancements in Internet of Things (IoT), big data and data analytics, robotics, autonomous systems, sensors and automation, and production methods.<sup>13</sup>

UNIDO argues that developing countries, under certain conditions, have the opportunity to bypass traditional phases of industrial development and move directly to 4IR. This can boost manufacturing output and trade. Integration of developing countries into global production networks was in the past associated with reductions in transportation costs and trade tariffs, a trend that can be further intensified with 4IR related technology.<sup>14</sup>

The adoption of 4IR technologies can improve the situation not only in manufacturing but also in the agricultural sector of developing countries. Agriculture 4.0 stands for an integrated system of farm operations, in which digital information is collected in all farm sectors and processed for the benefit of a better control of operations and hence cost reduction and higher output.<sup>15</sup> Hi-tech farms are in general based on the following elements: detection, decision rules, execution and evaluation. That means that farmers take into account the specific conditions of the soil, hours of sunlight and climate for optimizing the yield. Achieving this requires automatic detection (sensors) to determine the variation in soil, crop and animal behavior. GPS is used to map the variation and to give it a georeferenced; decision support systems, decision rules and models that will translate the measured variations into action.<sup>16</sup> Through this enhanced control and output, Agriculture 4.0 technologies are the cornerstone to satisfy new demands of food and standardized products. From the farmers' side, and as a response to rising productivity pressures, digital technologies can support them and make their work easier by optimizing operating procedures and resource utilization, or by meeting the requirements for greater transparency in the agricultural value chain. It helps to reduce inefficiencies and negative externalities of the agriculture value chain, such as pollution and food safety issues; pressing concerns among developing countries.<sup>17</sup>

Applications of Agriculture 4.0 technologies include precision farming, smart greenhouses and livestock monitoring. Considering that an important issue faced by farmers, which negatively impacts

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<sup>12</sup> Ayesha J.: Technological Progress and Economic Growth | Economics, Economics Discussion.

<sup>13</sup> Santos C. and others (2017): Towards Industry 4.0: an overview of European strategic roadmaps, p. 97.

<sup>14</sup> UNIDO (2017): Industry 4.0-Opportunities behind the Challenges. Background Paper, p. 31.

<sup>15</sup> Dung L. T. and others (2018): IR 4.0: Opportunities and Challenges to Vietnam's Economic Development, p. 551.

<sup>16</sup> Wilde de, Silke (2016): Trends The future of technology in agriculture, p. 45.

<sup>17</sup> 365FarmNet (2017): White paper: Agriculture 4.0 – ensuring connectivity of agricultural equipment, p. 4.

the sustainability of livestock and profit generating ability, is animal illness, this last application is highly relevant since it facilitates livestock management by monitoring animal's vital systems.<sup>18</sup>

The market value of smart agriculture and precision farming is forecasted to be 27 billion and 2.42 billion U.S\$ by 2020, respectively.<sup>19</sup> Some authors stress that 4IR technology-based agricultural practices are not a phenomenon restricted to developed economies; they can be cost effective and practically available to farmers around the world, including in economically developing countries.

Nevertheless, challenges that 4IR brings to developing countries cannot be ignored, since the risk they pose could even invalidate the aforementioned opportunities. Developing regions are confronted with developed countries being the frontrunners of the ongoing transformation and risk to be even more left behind, by making it more difficult for some countries to climb up the Global Value Chains (GVCs) and diversify exports. Among the most determinant risks, reshoring cannot be left without mention, which threatens significant disruptions in employment, particularly for low-skilled labor in developing countries.<sup>20</sup> In conclusion, in order for 4IR to take off successfully in developing countries, certain preconditions have to be met, such as robust technological infrastructure, access to finance to invest in new technology, a workforce with digital skills, work systems with required levels of security, and adequate governance structures.

## 2.2 Potential influences of 4IR related changes on SMEs' trade capacities in developing countries

The 4th Industrial Revolution is at its nascent stage, and like the major industrial developments that preceded, it is expected to result in significant, disruptive changes to the way in which products are produced, consumed and designed. Thus, business models and the industrial architecture that supports them will also be forced to evolve and adapt, and “Business as usual” will not succeed in promoting growth in developing countries in the advent of the 4IR.<sup>21</sup>

This is something to be considered by well-known internationally competitive enterprises that have lately arisen in developing countries. Nevertheless, these last coexist with far greater numbers of traditional, local micro-, SMEs. Those smaller enterprises, confronted with the perennial challenges of gaining access to finance, technology, human resources and market information, must also adjust to the new opportunities and threats posed by increasing globalization and augmented by the 4IR. SMEs will have to adapt to new 4IR standards and methods in order to remain competitive and linked into existing value chains and production networks. If big companies exploit their first-mover advantage to set industry standards, they could compel SMEs to adopt these standards.<sup>22</sup>

This raises the question as to how SMEs can utilize the benefits of 4IR and ensure they are not left behind by larger firms. SMEs may face major challenges regarding the take-up of these technologies, such as: lack of awareness of the technologies and their potential benefits; low financial ability to buy technology and/or invest in R&D; limited capacity to run pilots to test out 4IR mechanisms; shortage

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<sup>18</sup> Filho L. Walter. and others (2019): International Business, Trade and Institutional Sustainability, p.294.

<sup>19</sup> Statista (2018): Smart agriculture - Statistics & facts.

<sup>20</sup> Hallward-Driemeier and others. (2017): Trouble in the Making? : The Future of Manufacturing-Led Development. p.1.

<sup>21</sup> Hallward-Driemeier and others. (2017): Trouble in the Making? : The Future of Manufacturing-Led Development. p.5.

<sup>22</sup> UN-ESCAP (2009): Globalization of Production and the Competitiveness of SMEs in Asia and the Pacific, p.12

of highly skilled ICT specialized staff; and increased dependency on big firms since the 4IR may make internationalization of production more pertinent than ever.<sup>23</sup>

While further investigation into how prepared SMEs are for 4th IRs is needed, it is understandable how smaller companies do not actually find 4th IR relevant to their businesses, as the concept is still new, and they would be the least likely to afford the transition to more advanced. From a firm perspective, SMEs appear to show limited interest in 4IR, and devote minimal attention to developing a game plan to deal with the trend.<sup>24</sup>

Besides these generalities, little is known on how SMEs perceive the incorporation of 4IR technology in order to increase trading capabilities; and as underlined by literature, even if uncertainty also holds among large corporations, further and deeper investigation is required into the effects of 4IR on SMEs. This is particularly important for developing economies, where SMEs account for half of the employment and around 33% of the country's GDP.<sup>25</sup>

### 3 Research Question

#### 3.1 Research Question

4IR related technology distincts itself from previous ones mainly in terms of velocity, scope, and systems impact. Current literature covers those three issues and tries to foresee which effects will prevail, also in the context of developing countries, and on particular agents such as SMEs. Nevertheless, this has, so far, been carried out from a rather general and broad perspective, contrary to when the topic has been addressed to companies in developed countries.

Widespread statements on the effects of these technologies on developing region companies may allow policy-makers, CEOs and other stakeholders to grasp general ideas on the matter. Nevertheless, these broad notions might lack the required precision to be practically applicable by those who will be strongly affected by the forthcoming effects of the 4IR.

The literature analyzed suggests that characteristics of the coming changes are not innate to the technologies to be used in business processes, highlighting the need of analysis by targeting specific locations and sectors rather than attempting to tackle whole economies. As stated by several reports, further research on economic impacts of the use of 4IR technologies in agricultural practices using a case study approach or even interviewing farmers who have implemented such technologies can further highlight the potential benefits of this application.<sup>26</sup>

The aim of the current study is to analyze the effects of 4IR related technologies. The particular question is: **How does the implementation of technology related to the 4th Industrial Revolution influence trade capacities of SMEs in the agricultural sector of Vietnam?**

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<sup>23</sup> UNIDO (2017): Industry 4.0-Opportunities behind the Challenges. Background Paper, p. 34.

<sup>24</sup> De Beule, Filip and others (2018): The Impact of Industry 4.0 on FDI, MNE, GVC, p. 13.

<sup>25</sup> OECD (2017): Enhancing the contributions of SMEs in a global and digitalised economy, p.6

<sup>26</sup> Filho L. Walter, and others (2019): International Business, Trade and Institutional Sustainability, p. 300.

### 3.2 Motivation and Importance

UNIDO follows inclusive economic and social development criteria, which is supported within an environmentally sustainable framework. Successful implementation of 4IR models could lead to more sustainable production and consumption patterns in developing countries, contributing to the implementation of the 2030 Agenda for Sustainable Development and the achievement of the SDGs. The present study is especially pertinent to Goal No. 9: *Build a resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*<sup>27</sup>; since in a successful scenario SMEs in developing countries might benefit from the experiences of more advanced countries, leapfrog into the 4th Industrial Revolution, and achieve low-cost sustainable agriculture.

Vietnam and its agricultural sector serve as an insightful case to study the effects of the recent and future incorporation of 4IR technologies in SMEs. This is due to, first, the strength of agriculture in the overall economy and exports basket of the country - 57% of the workforce works in the agricultural sector, and Vietnam has become one of the top 25 largest food exporters in the world.<sup>28</sup> A second reason is the national and international pressure the sector faces considering the gap between the current status of agricultural production and the new requirements for development, leading to a needed reform towards sustainable development, accompanied by greater benefits to farmers, where comprehensive investment in agricultural technology innovations such as Agriculture 4.0 becomes crucial and has recently taken off.<sup>29</sup>

A third crucial consideration for having chosen Vietnam as our focus region is that SMEs are the backbone of its economy, as it happens with most ASEAN countries.<sup>30</sup> These enterprises are also an important source of innovation. As highlighted in different reports, UNIDO emphasizes the importance of new technology implementation and innovation management standards that can help developing countries and economies to leapfrog expensive stages of development.<sup>31</sup>

Moreover, and considering that SMEs in general are limited in their ability to grow because of lacking access to finance, business services, information, and markets, UNIDO is playing a fundamental role for ASEAN countries in building awareness of the 4IR consequences and providing access to know-how, skills, education and technology, while also publishing case studies and best practices regarding successful implementation of the 4th Industrial Revolution in developing countries.<sup>32</sup> Until now, previous UNIDO projects have benefited over 1.2 million commercial entities in Viet Nam, for example with 100,000 new enterprises registered during the year under the national business registration system.<sup>33</sup> Therefore, the Vietnamese agricultural sector, with a well-developed pre-existing trade capacity, was chosen as case to analyze potential impacts that 4IR related technology might have on trade capacities of local SMEs.

With the present study, we aim to contribute to UNIDO's already existing skills development and training for innovation, and to the specific knowledge of the potential benefits of 4IR technologies on

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<sup>27</sup> UN. Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.

<sup>28</sup> FAO (2019): Vietnam at a glance.

<sup>29</sup> Dung L. T. and others (2018): Industrial Revolution 4.0: Opportunities and Challenges to Vietnam's Economic Development, p. 550.

<sup>30</sup> ACCA (2016): SME development in ASEAN, p.7

<sup>31</sup> UNIDO (2018): Industry 4.0 - the opportunities behind the challenge, p. 11

<sup>32</sup> WEF and ADB (2017): ASEAN 4.0: What does the Fourth Industrial Revolution mean for regional economic integration?, p. 8.

<sup>33</sup> UNIDO (2017): Annual Report 2016, p.6

the Vietnamese agricultural sector, as a detailed description of success stories or current barriers in the presented sector can provide a unique perspective and help enhance UNIDO's knowledge and policy recommendation capabilities in this arena.

### 3.3 Research guiding hypothesis

The specific variables used in the study are of economic nature. Our outcome variable of interest consists in the international trade capacity of agricultural sector SMEs in Vietnam. Other outcome variables to consider include business-related ones such as profitability, efficiency, production levels, etc. As input variables, on the other hand, the focus will be on the incorporation and use of 4IR technologies, development of policies regarding 4IR related technologies in Vietnam, characteristics of the labor force, and the role of SMEs in agriculture.

Regarding the causal relationship between these variables, the literature analyzed widely suggests that the successful implementation of 4IR related technologies can have major beneficial effects on SMEs in developing countries, also as of their export capacity. Nevertheless, recent literature also highlights the various challenges companies in developing countries, and more even so SMEs, need to overcome in order for this trend to have actual implications for comparative advantage and therefore patterns of globalization.

All in all, based on the literature and its causal links, our research guiding hypothesis goes as follows: the adequate implementation of 4IR related technologies on SMEs in the Vietnamese agricultural sector has a considerable potential to increase their trading capacities. Nonetheless, without careful attention to the specific risks faced particularly by these companies in a developing country such as Vietnam, the positive outcomes could be voided. For a proper implementation to take place, the business environment in which SMEs are exposed to in Vietnam, and variables such as technological infrastructure development, digital skills of labor force and governance play an important role. On the business level, limited access to finance and technology, market information and awareness of technological benefits are of great relevance.

The presumption of the potential benefits of 4IR technology incorporation in Vietnam is further backed by the fact that Vietnam has lately been spotted for having critical success factors to positively include 4IR related technologies in its economic system, based both on the structure of production (the baseline of current production) and the drivers of production (the key enablers that position a country to capitalize on emerging technologies to transform its production systems). Vietnam is strongly positioned in the Asia-Pacific region on: demand, scale and physical infrastructure. Strong trade linkages in this country could also help diffuse best practices from developed economies, further supporting our hypothesis.<sup>34</sup>

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<sup>34</sup> WEF (2018): Driving the Sustainability of Production Systems with Fourth Industrial Revolution Innovation, p. 24.

## 4 Methodology, analytical focus, methods

### 4.1 Empirical Strategy

To analyze potential influences on SMEs in the Vietnamese agricultural sector, we follow a qualitative approach that will allow us to combine primary with secondary information and increase understanding about the dynamics of the Vietnamese agricultural sector and the role of SMEs in light of incorporation of 4IR technologies. First, we build on secondary sources and descriptive statistics to develop a conceptual framework that relates the dynamics of the Vietnamese agricultural sector, the role of SMEs in it, and their current contribution to international trade; as well as the incorporation of 4IR technologies for this specific sector.

Next, in order to develop case studies, information from the following three SMEs was collected:

1. DELCO: a company manufacturing and using (Delco Farms) 4IR related technology in agriculture such as monitoring, automatized control systems and IoT;
2. A company active in the pork industry using I3.0. related technology to monitor pigs' health;
3. DCD: manufacturer of I3.0.-related technology that enhances operational and managerial processes of companies, not explicitly in agriculture.

Hence, we were able to collect information from agricultural SMEs using technology, and also from SMEs that manufacture the technology.

### 4.2 Research Instrument, Measurement, Interpretation

Primary information was collected with several research tools. For the first SME we used two separate standardized questionnaires (providers/users of 4IR related technology). Skype call was suggested but declined due to time constraints from the interviewee side. With two other SMEs we conducted a semi-structured Skype interview using the previous questionnaires as guidelines.

The opportunity to use data collected from interviews and describing direct experience with 4IR related technology in the agriculture sector will allow us to better understand the problems within the complexity of the existing data (general publications, academic papers...). The information collected via interviews was analyzed so as to focus on specific phenomena of interest and build a strong connection between our conceptual framework and our empirical work.

## 5 The Current Direction of the Vietnamese Agricultural Sector

### 5.1 The agricultural sector in Vietnam

#### 5.1.1 *Status Quo of the Vietnamese agricultural sector*

The agricultural sector in Vietnam builds the base of the country's economy, and over the past quarter century, it has made enormous progress. Even if the share of agriculture in Vietnamese GDP and trade

has been relatively flat since the mid-2000s, when looking at an extended period, Vietnam's rate of agricultural growth has been impressive by regional standards.

Between 2000 and 2012, Vietnam's agricultural value-added grew at an average yearly rate of 3.7%, higher than that experienced in all other Asian countries other than China, Mongolia, and Cambodia. Agricultural growth in Vietnam has also been less volatile than elsewhere in the region, due to having very ample water supplies and a comparatively large proportion of its agricultural area serviced by irrigation: more than 70 percent of Vietnam's cultivated area is now serviced by irrigation infrastructure.<sup>35</sup>

In terms of volume, the agricultural production in Vietnam tripled over the period from 1990 and 2016. Undergoing several significant structural changes, a shift away from staple foods to export commodities could be observed.<sup>36</sup>

Despite the immense increase in agricultural production over the last years', the overall economic importance of the agricultural sector declined over time with agriculture only contributing for about 15.3% to Vietnam's GDP while accounting for roughly 41% of the labor force in 2017.<sup>37</sup> More recent numbers of the year 2018 show that agriculture accounted for 14.57% of total GDP.<sup>38</sup> Along the same lines, the country's agricultural growth rate has been decelerating: between 1994 and 2000 the average rate of growth was an impressive 4.5% per annum; between 2001 and 2007 the average growth rate fell to 3.3% per annum, and between 2008 and 2013 it fell further to 2.6%.<sup>39</sup>

Regarding specifically the relevance of SMEs in this context, these firms generally play an important role in the Vietnamese economy, and agriculture is no exception. Studies released by the General Statistics Office of Vietnam indicate that in 2015 SMEs accounted for about 98% of the total number of enterprises. While nearly 60% of the labor force was employed in SMEs, they accounted for about 40% of the production in consumer goods and contributed to 47% of the total GDP. In terms of international trade, SMEs made up for 25% of the total exports.<sup>40</sup> Most of the Vietnamese SMEs are micro and small-sized enterprises; the latter account for 35% of all enterprises.<sup>41</sup>

Looking at the industry-wide distribution, the majority of SMEs is located in less-knowledge intensive service industries. In the specific case of the agro-forestry industry, the sector accounted for only 0.73% of the total SMEs in 2015, steadily decreasing since 2006.<sup>42</sup>

Regarding new export products, Vietnam has diversification opportunities in the machinery, textiles sectors, and processed food (dried mushrooms and truffles). The production of the latter product involves a relatively strong participation of SMEs.<sup>43</sup>

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<sup>35</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 22.

<sup>36</sup> OECD (2019): Agricultural Policy Monitoring and Evaluation 2019 Part II, p. 333.

<sup>37</sup> OECD (2019): Agricultural Policy Monitoring and Evaluation 2019 Part II, p. 333.

<sup>38</sup> Anh, Dao The and Van Bo, Nguyen. (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

<sup>39</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 23.

<sup>40</sup> Hăng, Trịnh Thị Thu (2019): Measuring the Scale Efficiency of Agricultural, SMEs Exporting in Vietnam, p. 460.

<sup>41</sup> Benedikter, S. and others (2013): Local Entrepreneurship in Vietnam's Rural Transformation. A Case Study from the Mekong Delta, p. 10.

<sup>42</sup> Trinh, Pham Thi Tuyet and Thanh, Nguyen Duc (2017): Development characteristics of SME sector in Vietnam, p.15.

<sup>43</sup> International Trade Centre (2017). SME Competitiveness Outlook 2017 – The region: A door to global trade, p. 231.

### 5.1.2 Trade in agriculture

Vietnam has achieved a relevant position in international trade, part of which being due to recent trade agreements. In 1995, Vietnam joined the ASEAN and became a member of its Free Trade Area.<sup>44</sup> In this period of increasing regionalization and globalization, Vietnam's Membership in ASEAN helped hasten its integration into the world economy and international competition. Hence, as Vietnam's economy is subject to competition from other ASEAN countries, resources are pulled towards those activities that generate greater income and welfare.<sup>45</sup> Its trade capacity was also enhanced with the accession in the WTO in 2007, which gave Vietnam a Most Favored Nation status assuring quota removal, tax reduction, and other benefits with WTO members.<sup>46</sup>

Overall, Vietnam already has 12 trade agreements, including six as a member of ASEAN, and bilateral Free Trade Agreements with Japan, Korea, Chile and the Eurasian Economic Union. Vietnam also signed FTA agreement with the EU, which is not yet finalized as in 2020, since the European parliament still needs to vote on it.<sup>47</sup> These agreements have strengthened the position of Vietnam as a trading partner. Specifically, with regards to agriculture, between 2000 and 2012 Vietnam ranked among the top five global exporters for commodity groups such as rice, coffee, pepper, natural rubber and cashew nuts.<sup>48</sup> Among them, rice continues to be the dominant commodity, reaching about 35% of the whole value of agricultural production.<sup>49</sup>

Looking specifically at the composition of Vietnam's trade in agricultural products, the turnover of exports in agro-forestry products in 2018 reached US\$ 40.2 billion which equals a 31.4% increase compared to 2015.<sup>50</sup> Two-thirds of the agricultural exports are intermediate goods delivered without further processing. Over time, the import of agricultural products also increased as they served as inputs into the processing sector.<sup>51</sup>

The share of agricultural trade in total trade turnover maintained constant for the last two decades at roughly 10%. This is due to the fact that from 2000 until 2016 the share of agricultural imports in total imports increased from 6% to nearly 10%, while the share of agricultural exports in total exports fell from 11% to 10%.<sup>52</sup> The Ministry of Industry and Trade released numbers in 2018 showing that exports in agriculture, forestry and fishery account for 16-17% of the total national export turnover.<sup>53</sup>

Vietnam's biggest export markets in terms of agricultural commodities are China, followed by EU, US, ASEAN states, Japan and South Korea. The export turnover to these markets in 2018 equaled a value of US\$ 20.31 billion, namely 76.4% of the country's total export turnover in agricultural products.<sup>54</sup> In

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<sup>44</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 63.

<sup>45</sup> Association of Southeast Asian Nations (2012): Vietnam in ASEAN: Toward Cooperation for Mutual Benefits.

<sup>46</sup> Barai, Munim. (2009): Poverty Reduction in Vietnam: Role of Doi Moi and Agriculture, p. 9.

<sup>47</sup> European Parliament PE 642.270 (2019): Martin Russell, EU-Vietnam trade and investment agreements, p. 3.

<sup>48</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 37.

<sup>49</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p.37.

<sup>50</sup> Anh, Dao The and Van Bo, Nguyen. (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

<sup>51</sup> OECD (2019): Agricultural Policy Monitoring and Evaluation 2019 Part II, p. 333.

<sup>52</sup> Diem, Hoang Xuan and others (2019): Investment in Agriculture in Recent Times: The Case of Vietnam, p. 7.

<sup>53</sup> Anh, Dao The and others (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

<sup>54</sup> Anh, Dao The and others (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

2018, many products such as rice, cashew nuts, vegetables rubber and coffee reached an export value of above US\$ 2 billion.<sup>55</sup>

All in all, Vietnam is an agricultural country with a low average income. Despite its huge export volume, the turnover is not high, revealing structural problems within the sector.<sup>56</sup>

### 5.1.3 *Challenges within the agricultural sector*

Years of development uncovered several weaknesses and fragmentation causes of the agricultural sector, which is low in productivity and quality of products, especially in the context of the rising competition in the world agricultural market,<sup>57</sup> which requires good and diverse products.<sup>58</sup> The main challenges hindering Vietnamese agricultural sector to take full advantage of market opportunities could be categorized as follows:

a. **Low competitiveness of the sector and of SMEs within it:** The low weight of agriculture in the country's GDP relative to the one in employment explains why Vietnam is ranked at the bottom among Southeast Asian countries regarding agriculture productivity, despite its leading position in terms of value. Vietnam is losing its competitiveness as agricultural products are good but only in quantity, not quality. The more the production grows, the prices get lower due to oversupply, resulting in a vicious cycle. Hence, agricultural production becomes excessive, not because the markets do not need the products but because the products produced do not meet the new requirements of the market.<sup>59</sup> Regarding specifically SMEs, the main reason for their low productivity is the combination of high operating costs and small size operations.<sup>60</sup>

b. **Meeting international standards:** Vietnam's agricultural sector is under pressure of international economic integration, which requires meeting common commitments such as rules on origin of goods, intellectual property, public procurement, agricultural services, free movement of capital and human resources. These technical regulations increase the cost of production and reduce competitiveness. Entering the world market is difficult for businesses and farmers who are not able to apply the required quality controls to the production process.<sup>61</sup>

In connection, Vietnam's agro-food trade faced a relatively high number of food product consignment interceptions or rejections by regulatory authorities due to food safety regulations. Examples of such cases are the presence of (unapproved) antibiotic residues in farmed fish, or violent pesticide residues in tea, fruits and vegetables.<sup>62</sup>

Along the same lines, the Vietnam Trade Promotion Agency stated that SMEs in general are facing limited understanding of foreign markets and international trade issues and have limited market

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<sup>55</sup> Anh, Dao The and others (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

<sup>56</sup> Anh, Dao The and others (2019): Overview of Vietnam's Recent Agricultural and Rural Development Policy.

<sup>57</sup> Tran Thi Hoang Mai and others (2018): Vietnam's agriculture towards sustainable development, p. 67.

<sup>58</sup> VietnamNet (2015): The challenges of Vietnam agriculture.

<sup>59</sup> VietnamNet (2015): The challenges of Vietnam agriculture.

<sup>60</sup> Tran Thi Hoang Mai and others (2018): Vietnam's agriculture towards sustainable development, p. 67.

<sup>61</sup> Bui Nu Hoang Anh, (2017): Opportunities and Challenges for Sustainable Development of Agriculture in Vietnam, p. 121-122.

<sup>62</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 39.

research and marketing skills.<sup>63</sup> Relative to large firms, the largest lag of SMEs lies precisely in owning international quality certificates giving them the leverage in competitiveness.<sup>64</sup>

c. **Fragmented Nature of landholdings:** Small farms are often rendered less efficient by the fragmented nature of their landholdings, namely, the fact that they are often made up of non-contiguous plots. In many locations, farmland was allocated to community members in an egalitarian way, affecting the efficiency of household farm labor and management. Despite the government's attempts to implement land consolidation programs, fragmentation still remains a constraint for agricultural modernization.<sup>65</sup>

d. **New players on the market:** Most countries purchasing Vietnamese agricultural products have been doing so since many years, but new agricultural exporters appearing on the market such as Cambodia, Myanmar and Pakistan create fierce competition on Vietnam's traditional market.<sup>66</sup> Consequently, the competitiveness of the agricultural sector is steadily impeded by the openness and complexity coming along with growing diversity of the market.<sup>67</sup> Intensive competition among Vietnamese exporters has enabled international buyers to negotiate prices downward.<sup>68</sup>

#### 5.1.4 Policies and regulations related to SMEs

The country has traditionally focused on enhancing the legal, regulatory and operational framework for SMEs; however, increasingly developing targeted measures enhance their productivity, trading capacity and innovation, and thus tackle the aforementioned challenges.<sup>69</sup> Moreover, the government is committed to further develop market liberalization and other general reforms.<sup>70</sup>

As examples of the first, several policies targeting trade capacities of local SMEs have been established, among which we have: *ASEAN Strategic Action Plan for SME Development 2016-2025*, *National trade promotion program for internationalization and market penetration of SMEs*, or the *Law on Foreign Trade Management*. These programs provide SMEs with support of different kind (provision of information, consultancy and funds for trade participation<sup>71</sup>), work on infrastructure upgrading and reduce unnecessary barriers to trade activities.<sup>72</sup> Moreover, policies focusing on financial aid for SMEs have also been put into place, as is the case of the *SME Development Fund* or the *SME Law (2019)* by which they enjoy different types of tax incentives.

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<sup>63</sup> OECD/ERIA (2018): SME Policy Index: ASEAN 2018 Boosting Competitiveness and Inclusive Growth, p. 473.

<sup>64</sup> International Trade Centre (2017): SME Competitiveness Outlook 2017 – The region: A door to global trade, p. 231.

<sup>65</sup> OpenDevelopment Vietnam (2018): Land Classification - Land Consolidation

<sup>66</sup> VietnamNet (2015): The challenges of Vietnam agriculture.

<sup>67</sup> Tran Thi Hoang Mai, Nguyen Thi Hai Yen (2018) Vietnam's agriculture towards sustainable development, p. 67.

<sup>68</sup> World Bank Group (2016): Vietnam Development Report. Transforming Vietnamese Agriculture: Gaining more from less, p. 39.

<sup>69</sup> OECD (2018): SME Policy Index: ASEAN 2018 Boosting Competitiveness and Inclusive Growth, p. 465.

<sup>70</sup> KPMG (2018): ASEAN Business Guide: The economies of ASEAN and the opportunities they present, p. 97.

<sup>71</sup> Nguyen, Chuc others (2019): Vietnam SMEs' participation in regional economic integration, p. 445.

<sup>72</sup> Rödl & Partner Vietnam (2018): New regulations on state management of foreign trade activities.

## 5.2 Incorporation of 4IR Technology for SMEs in Agricultural Sector in Vietnam

Considering the depicted landscape, the future increase in food demand, and thus the need for improved efficiency of agriculture, science and technology development have lately been flagged as an effective strategy for agriculture development, with 4<sup>th</sup>IR and its application as a strategic core.<sup>73</sup>

Despite Vietnamese traditional agricultural reliance on human and animal labor, mechanization has increased significantly over the past decade. In 2011, some type of machinery was used in more than 90% of paddy farms for land preparation and threshing, tractors, water pumps and mechanical harvesters constituted the most widely used machines<sup>74</sup>.

One contributing factor to the depicted slowdown in productivity gains in agriculture has been underinvestment in agricultural research and a sub-optimum performance of the agricultural innovation system. This system played an important role in the earlier take off of the sector, especially the introduction of improved crop varieties. Yet, Vietnam's current research and innovation capacity is limited by various factors. Despite recent steps to reform it, the innovation system tends to be supply-driven and priorities are identified centrally, making it insufficiently responsive to farmers' demand. Moreover, it is still rather weak in collaborating with other institutions and the private sector. Public funding for agricultural research is provided through several governmental departments, and although the size of the envelope has increased—it rose from some \$10 million in 2000 to \$40 million in 2012—it is small in comparison to that of Asian peers as a fraction of agricultural GDP.<sup>75</sup>

Currently, after previous development periods and in order to move away from the depicted standstill stage, Vietnam is approaching the Agriculture 4.0 model, with several hi-tech agriculture projects being implemented.<sup>76</sup> However, for the correct incorporation of hi-tech agriculture, and regarding specifically the Vietnamese context, science and technology applications in this field need the engagement of not only the state and research organizations but also the participation of farmers and businesses. Indeed, businesses play a growing role in raising the sector's technology level while increasing farmers' access to hi-tech applications. All in all, the model of agricultural production in general and hi-tech agriculture, in particular, should therefore meet three basic requirements: economies of scale, strong linkages to value chains, and enhancement of bargaining power of farmers.

### 5.2.1 *Recent policies tackling Agriculture 4.0*

The Vietnamese government released, already in 2008, a law on high technology, according to which every organization or individual working on the R&D or application of hi-tech in agricultural production would receive support in the form of exemptions on taxes and fees –also related to land use-, and import-export tariffs.

On top of this, in 2014, the so-called Agricultural Restructuring Plan was approved.<sup>77</sup> Building upon previous policy trials aiming to incentivize the development of hi-tech agricultural zones, it lays out expected changes in the roles and spending patterns of the government, while discussing the need to

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<sup>73</sup> Dung L. T. and others (2018): Industrial Revolution 4.0: Opportunities and Challenges to Vietnam's Economic Development, p. 550.

<sup>74</sup> World Bank Group (2016): Transforming Vietnamese Agriculture: Gaining More from Less, p. 102

<sup>75</sup> World Bank Group (2016): Transforming Vietnamese Agriculture: Gaining More from Less, p. 34

<sup>76</sup> Hortidaily (2019): Time is ripe for Vietnam's agriculture digitalization.

<sup>77</sup> World Bank Group (2016): Transforming Vietnamese Agriculture: Gaining More from Less, p. 13.

work with other stakeholders, including private ones. There are currently many initiatives aiming in these directions.

Among the first, we find the *Master plan for hi-tech agricultural parks and zones* targeted to the period 2020-2030.<sup>78</sup> The plan is based on idea that hi-tech agricultural parks constitute the technological core for development of hi-tech agricultural zones, with the general objective of “promoting development of agriculture toward modern and large-scale commodity production of high yield, quality, efficiency and competitiveness; ensuring national food security, and boosting exports”. As of 2020, the aim stated was to build 10 hi-tech agricultural parks, and a (not specified) number of zones, in the areas of cultivation, animal husbandry and aquaculture. Regarding animal husbandry, it highlights the development of high-tech pig farming zones in the Delta River (North) and around Ho Chi Minh City (South-East), a topic we will come back to later on.

A broader raft of investment incentives for hi-tech agriculture has been introduced; specifically targeting R&D activities, workers’ training, and support for hi-tech agricultural businesses. A credit package for hi-tech and clean agriculture has also been set (US\$4.4 million to be loaned out with lower than average interest rates), considered a nudge for agricultural enterprises to expand production. The government has also committed to support up to 60% of the total investment capital to enterprise investment of hi-tech agro-forestry product processing plants; up to a maximum of VND 7 billion (US\$ 318.000).<sup>79</sup>

Alongside national incentives, many cities and provinces (Ho Chi Minh City, Lam Dong, Vinh Phuc, and Quang Ninh) have enacted specific mechanisms to assist businesses and push up administrative reforms to attract investors, turning into desirable destinations for hi-tech agricultural businesses.

### 5.2.2 Role of SMEs in Agriculture 4.0

As present, Vietnam has three hi-tech agricultural zones in Hau Giang, Phu Yen and Bac Lieu provinces. From 28 agricultural businesses applying advanced technologies that have received government certificates for such, nine specialize in growing vegetables and flowers, eight breed animals, and 11 operate in aquaculture. In addition, three provinces have built plans for the construction of hi-tech agricultural zones: Thai Nguyen, Thanh Hoa and Lam Dong provinces.<sup>80</sup> According to updated data of 2017, there were 15 hi-tech agricultural projects supported by the government, with a state fund for reciprocal capital between 6.7-12.3 million US\$. Although some projects have been implemented, most of them are of smallest scale. Some hi-tech applied agricultural zones are being sluggishly carried out because of capital shortage, unfavorable location or scale, among others.

However, funds are not just publicly sourced, since several large enterprises, not necessarily active in the agricultural sector, have recently invested more and more in the hi-tech agriculture, such as Hoang Anh Gia Lai Group (real estate), Hoa Phat Group (urban constructor), and Vingroup (real estate and medical services). There are also further examples of SMEs currently active in the area of high-tech agricultural development having incorporated 4IR related technology. Their description can be found in Appendix 1.

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<sup>78</sup> Prime Minister in Decision No.575/QĐ-TTg; May 4, 2015.

<sup>79</sup> Dung, Luu Tien and others (2017): The revolution of agriculture 4.0 and sustainable agriculture development in Vietnam., p. 321.

<sup>80</sup> Luu Tien Dung and others (2018): Industrial Revolution 4.0: Opportunities and Challenges to Vietnam’s Economic Development, p. 557.

### 5.2.3 Challenges of 4IR incorporation in the Vietnamese Agricultural Sector

Even if the government has made a big push for agricultural reform, concerns rise about the ineffectiveness of such policies. This is noticeable considering the fact that, despite the many incentive policies, few companies are interested in agricultural investment - the number of agricultural businesses makes up less than one per cent of total businesses in Vietnam. Specifically, according to the depicted governmental action plans, by late 2020 Vietnam should be home to 200 hi-tech agricultural businesses, while in 2018 only reported 22 hi-tech. This gap between the vision for hi-tech farming and the current reality is still quite large, meaning that Vietnam's agricultural sector must cope with a range of serious challenges:

- a. **Land Structure:** Most agriculture models in Vietnam are currently in a period of transformation, with small land plots and backward technology, making it difficult to apply hi-tech to large-scale agriculture.<sup>81</sup> The land is one of the greatest obstacles that investors face in Vietnam's agricultural sector, also concerning foreign investment as a way of boosting Agriculture 4.0.
- b. **Infrastructure Development:** Agriculture is at a low level and inferior in both IT application and production compared to other countries regionally and internationally; and the causes of this trend are manifold. For example, rugged terrain in mountain areas presents a problem in applying hi-tech because internet networks cannot cover such areas.
- c. **Financial support:** Enterprises take long studying the financial aid programs, and thus, loans provided to agricultural businesses only account for 10% of total outstanding loans in the banking system. One problem suggested is that their property and assets are not acceptable collateral.<sup>82</sup> The credit support policy for hi-tech agriculture is therefore ineffective, considering that this trend requires significant investment capital while capital recovery is slow.
- d. **Transfer of knowledge:** Vietnam lacks high-quality human resources to manage and operate modern equipment, which constitutes another significant barrier for technology adoption.<sup>83</sup>
- e. **Inequality increase:** 4th IR has the potential to accelerate returns to talent and knowledge, and thus to widen inequalities within countries and among agriculture sectors. This non-inclusive growth has the potential to increase social and political instability within countries, and undermine popular support and trust in greater regional integration.

## 6 Case Studies

In the following, three cases are analyzed, each related to a firm that incorporated I4.0 technology. The firms analyzed share the following common characteristics: 1) their yearly revenues fall into the range of 4-50 billion VND and have between 11 and 50 employees, meaning they are considered SMEs from a legal perspective<sup>84</sup>; 2) they have been actively incorporating technology (not necessarily 4IR related one) into their business model for 2-3 years. This section is based on the answers gathered in two skype calls and one email exchange, using the interview guideline described under section 5.

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<sup>81</sup> OpenDevelopment Vietnam (2018): Land Classifications, Land Consolidation.

<sup>82</sup> Luu Tien Dung and others (2018): Industrial Revolution 4.0: Opportunities and Challenges to Vietnam's Economic Development, p. 556.

<sup>83</sup> Vietnam Development Report (2014): Skilling up Vietnam, p. 28.

<sup>84</sup> Hãng, Trịnh Thị Thu. (2019): Measuring the Scale Efficiency of Agricultural, SMEs Exporting in Vietnam, p.4.

## 6.1 SME1: Delco Farm

Located in the province of Bac Ninh, an hour drive away from Hanoi, Delco Farm consists in one of the most intelligent and modern agriculture models in the North of Vietnam. Its mission, as stated by the employee replying to our questionnaire, is the “research and application of technologies and machines to support farming in accordance with the climatic conditions, soil conditions, and the level of Vietnamese farmers”. As for the future, the vision is to “apply new technologies on preliminary processes and posterior food processing, in order to build a brand of clean and clear origins, aiming to serve domestic and international customers.” Delco has two main types of clients: vegetables, fruit and tuber farmers/farm owners to which technology is transferred through leasing, and consumers in domestic and international markets to which products are distributed either directly or via supermarkets or import-export enterprises.

The technology developed and applied within Delco, and also leased to other farms, is based on monitoring, automatized control systems and IoT. The firm deems its effects to be highly noticeable right after the implementation, which takes between seven and 12 months and usually becomes quite troublesome - reason why Delco believes they would profit from additional assistance. These effects are positive in several areas, among which the firm underlines efficiency –through less time, workers and pesticides use-, increased product quality, increased sales and revenues, and increased international trade through two mechanisms: enhanced product quality and smart traceability of the whole production system.

Delco believes that Vietnam lies on a medium level of 4IR related technology application, and underlines that the challenges for further improvement are twofold: on the one hand, it requires a huge investment effort by SMEs that is further complicated by the implementation process; on the other hand, official standards of food quality and origin are unclear, which leads to undivided competition between firms as Delco and “dirty food manufacturers”.

## 6.2 SME2: pork farm

Located in Binh Phuoc, a strategic area due to its proximity to Ho Chi Minh City and governmental support in terms of land allowance to carry out this type of business in the region, this SME consists in a farm where pigs are bred. It has a specific business model based on a contract with a large Thai firm, which operates as the farm’s main supplier and client. The Thai firm provides the farm with the pigs, the appropriate resources for their growth and the machinery; and once the pigs are raised, they repurchase them directly from the farm, so as to process and commercialize the final product, namely, pork. The SME is not informed about the final destination of the pork, and thus does not know whether it enters the international market. This specific model makes, as stated by a farmer’s investor, the SME highly dependent on the big firm, relative to the technology they are allowed to use and the markets they are able to enter.

Nevertheless, the fact that the farm does not directly enter the international market does not seem problematic to this particular investor, and neither does the lack of incorporation of 4IR technology. Regarding the first point, national demand is currently larger than supply due to an expanded pig disease, and the China-US trade wars are even increasing international demand due to China’s current undersupply of pork. As for the technological incorporation, our interviewee reckons that agriculture is still extremely traditional in Vietnam, and the application of I3.0 technology (mostly within

automatization) in their farm already gives them a competitive advantage since it enables to detect and monitor pigs' diseases, currently the biggest concern among Vietnamese farmers.

However, considering future possibilities, both the incorporation of 4IR technology and the direct participation in international trade seem plausible and desirable; accordingly, the spread of new technologies and globalization are viewed as highly positive trends. As for the first, the application of particularly IoT would highly increase the monitoring and control of cattle's health, improving upon the present technologies. Regarding the expansion to international trade, the interviewee reckons that this would allow losing dependency towards their main Thai partner, and would additionally increase the profit margin. Along these lines, the farm is currently discussing a potential partnership with a French 4IR technology developer, which would allow the farm to take a step towards both internationalization and modernization.

Nevertheless, the interviewed representative of the company believes the vast majority of the Vietnamese agricultural business models are not well suited for the incorporation of 4IR technology yet. Among the different reasons, the agricultural sector still being mainly stuck in Industry 1.0 or 2.0, there is a widespread lack of willingness and knowhow for modernization, and the lack of financial resources does not provide the right incentives. On a country level, an important infrastructure gap is also underlined (connection to the internet, electricity...), together with the difficulty of tracking the quality of the origins along the agricultural sector value chain, making it impossible to differentiate between "good and bad practices".

### 6.3 SME3: DCD (technology provider)

The third firm within our case study is a platform developer located in Ho Chi Minh, in the southeast of Vietnam. DCD incorporates platforms compatible with IoT and AI related technologies to its clients' operational and managerial processes, while additionally providing consulting services on the appropriate use of such technologies. The average client is a medium-big size company operating in manufacturing and/or retail, while small size firms are not targeted due to their lack of financial capabilities. The technology provided enhanced company efficiency by automating processes mainly related to logistics and the tracking of products. Apart from the direct positive effects on resource and time saving, clients also witness an increase in trading capabilities due to the smart tracking.

DCD founder admits that the implementation of such technologies is hard due to insufficient infrastructure at the clients' working spaces and limited knowledge on the technologies implemented, which causes misunderstandings throughout the process and a widespread resistance to change among employees. However, the overall lack of know-how does not only limit the implementation of new technologies, but the more general modernization possibilities of Vietnamese business models. Only managers with enough resources, incentives and competences (e.g. fluency in English) are going to be willing to invest in these technologies, which is not the case in the majority of SMEs. This reality is even more pronounced within the agricultural sector due to the lack of economies of scale that the small land plot structure generates, which leads to hard technological implementation, and thus limited automation of processes.

From a country perspective, the founder of DCD stresses the lack of transparency that the Vietnamese democratic setting currently deals with. There are several national policies trying to help SMEs in

agriculture modernization, and besides, Vietnam is a main beneficiary of ODA from Japan and the USA. However, allocation of funds and help is again not publicly available, and instead works its way through networking and contacts, a mechanism that predominantly benefits local wealthy families and big firms.

## 7 Main Results

The background information emphasizes the importance of SMEs in the Vietnamese agricultural in terms of international trade; together with efforts and challenges for their modernization through the incorporation of 4IR technology. Nevertheless, the case studies allowed us to consider the topic from a firm perspective, underlying the following relevant issues.

**Agricultural farms and SMEs do not appear to be interested in modernization:** Reports covering the transformation of the Vietnamese agricultural sector underline the important process of modernization, specifically in the advent of the 4th IR. Nevertheless, this does not completely match the ideas gathered through our empirical work, where the SMEs interviewed stressed the traditional nature of this sector - SME2 also added that most of the farms are still using 1IR or 2IR related technologies, meaning no application of automatization systems whatsoever. Indeed, the few SMEs that have thus far incorporated 3IR technology already possess a competitive advantage in terms of efficiency, quality and trading capacities, and thus many view the further step towards 4IR technologies not worth the investment, as stressed by SME2 and SME3.

One potential factor of the tendency towards remaining in the Status Quo was underlined by SME2. Because of the US-China trade wars and a major pig disease causing shortage of pigs in China, pork production in Vietnam is in high demand. SMEs in that industry do not see the need for technological innovation as long as 3IR related technology will sufficiently mitigate control over pig disease and maintain high trade capacity and profits.

**Agricultural SMEs' business model is not suitable for 4IR technology incorporation:** Even if agricultural SMEs were increasingly interested in the incorporation of 4IR technology, which is likely going to be the case in the near future as stressed in the literature, the standard business model would not allow them to easily introduce and utilize such technologies, due to several challenges. Background research and all interviewees also pointed out limitations on the grounds of small pieces of land (fragmentation) that is making any type of economies of scale practically unattainable, and thus any attempt to modernize basically out of reach. That is why some SMEs choose to rather work along the lines of the contract model, in our case SME2. Such dynamics do not provide the right incentives to increase trade capacities through modernization as it makes SMEs dependent on investors in terms of technology modernization and market presence.<sup>85</sup> General inefficiencies could be alleviated by financial aid specifically targeted to these farmers/SMEs. However, despite the government's endeavor to provide easy reach-credit, agricultural SMEs still suffer from financial constraints considering the relatively big investment effort that I4.0 technology incorporation supposes - which takes about four to five years to become profitable, as SME1 and SME2 pointed out.

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<sup>85</sup> World Bank Group (2016): Transforming Vietnamese Agriculture: Gaining More from Less, p. xvi.

All of our interviewees also reported on general low know-how to manage and use 4IR technologies in the agricultural sector. We can connect that with the fact that agricultural workers are generally not highly educated and therefore also not aware of potential benefits that the mainstream literature stresses regarding the incorporation of 4IR related technologies. As it is observed from SME3, relevant manuals that could help understand the technology are usually in English but, according to the interviewee, most of SMEs managers in agriculture do not speak this language. Second, Vietnam's value chain lacks a proper tracking system, meaning that export companies cannot assess whether the origin of the product comes from clean and monitored processes, or from a "dirty" (as our interviewees have named) one.

**4IR technology has the potential to increase trading capabilities:** In line with the literature analyzed throughout this paper, our empirical study also hints that with proper incorporation of 4IR technology SMEs can benefit in terms of trade capacities. The positive effects reported from interviewed SMEs seem to work through two mechanisms: 1) enhanced quality of production, which may help companies to exit the vicious cycle of oversupply of low quality products; and 2) enhanced traceability of product origin, allowing differentiating between optimum quality and clean agricultural output vis a vis food produced without quality checks.

Moreover, our interviewed SMEs show positive attitudes about incorporation of 4IR related technology in order to increase trade capacities. Their perspective towards globalization is overall optimistic and enhancing trade in international markets is part of the business strategy plans for the near future. SME2 sees incorporation of 4IR technologies and the increased role in international trade also as potential way to lose the dependency towards the big manufacturing firms in the contractual models.

**Governmental action would likely benefit from an in-depth reform:** The secondary information collected through published reports already hinted at the fact that government policies tackling the modernization of agriculture have not been as effective as appealing the initial plans were. Along the same lines, our interviewees have pointed out structural issues that are drastically holding back the potential benefits of such policies.

An important concern to be raised is the lack of transparency throughout the process of aid allocation. Public fund assignment is mainly accessed by informal contacts via network/individual relations, rather than being objectively based on a clear distributional criterion. In consequence, companies in industrialized areas unevenly benefit from this process. Most of the SMEs therefore cannot access any funds. In a similar way, the ODA received by Vietnam follows the same irregular distributional destination, damaging local SMEs, which are indeed among the economic agents in need of further external support. As a final point, the large infrastructure gap reported by all of our interviewees in terms of not only internet or other advanced connectivity instruments, but also basic procurements such as electricity in rural areas, terribly limits any kind of 4IR related technology incorporation attempt. This could be understood as one of the main reasons why the so called "leapfrogging" effect that the literature suggests would not be able to properly take place in the Vietnamese context.

## 8 Conclusion & Policy Recommendations

In the advent of the 4th IR and the unprecedented disruptive forces it entails, the present paper builds upon the general ideas and causal relationships that the literature covers with regards to SMEs' trading capacities, while narrowing down the focus to the specific case of the Vietnamese agricultural sector.

Once having understood that one of the sector's major trade-limiting factors for Vietnamese agricultural SMEs is constituted by a vicious cycle of overproduction in low quality agricultural products, the incorporation of 4IR related technologies has the potential to alleviate this situation. The specific mechanism through which this phenomenon could work does not solely consist in enhancing the quality of the product by utilization of 4IR related technology. Perhaps more surprisingly, and as suggested by the case studies developed, the incorporation of particularly IoT could improve the traceability throughout the whole production process, from the small farmers all the way to the large exporting firms, and shedding some light on the origins of each product that enters international trade.

Nevertheless, SMEs in the agricultural sector will most likely struggle to benefit from the previous opportunities under Vietnam's current economic, social and political context. Besides farmers' and SME managers' insufficient knowledge and incentives towards the application of 4IR technologies, the current business models do not facilitate the costly and disruptive transition towards such technologies even if enough willingness was to be there.

The evidence gathered suggests that agricultural SMEs and farmers would highly benefit from fostering collective action. International experience points to the multiple approaches and benefits of strengthening collective action in its many possible incarnations,<sup>86</sup> from which agro-based cluster development could be underlined. Strengthening linkages among farmers and various commercial players would facilitate realization of economies of scale for technological upgrading and absorption, know-how transmission, and product traceability.

For such economies of scale to further materialize, the government would have to address land issues by enabling pooling of land. Moreover, it should quite urgently proceed to cover infrastructure gaps in least industrialized and rural areas, where many agricultural firms are based.

SMEs would also benefit from further financial support, but particularly from clearer aid allocation, by the establishment of objective and a clear cut distributional criteria. This inevitably implies the continuation of the process of democratization and reforms enhancing the rule of law as a first cornerstone for securing effective policies aiming for inclusive development. Public-Private partnerships and the particular mechanism of blending finance could be used as a tool for more efficient allocation of public funds, and greater leverage of private capital.

Last but not least, the government would need to focus on vocational training for farmers about these innovative farming techniques, equipment, and products; so as to ensure that the utilization of 4IR technology would be the optimal once having been implemented.

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<sup>86</sup> World Bank Group (2016): Transforming Vietnamese Agriculture: Gaining More from Less, p. 80

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## 10 Appendix:

### 10.1 Vietnamese SMEs using 4IR related technology

In the following lines you may find further examples of SMEs currently active in the area of high-tech agricultural development having incorporated 4.0 related technology:

- **Vingroup** is carrying out the first phase of a 29.8M\$ worth hi-tech agricultural center project in 43 out of 200 hectares, producing about 20 types of vegetables and fruits. The project employs cutting-edge technologies from Japan, Israel, and South Korea to ensure products meet VietGap, GlobalGap, and organic food standards.
- **Cau Dat Farm**<sup>87</sup> is considered a pioneer in the incorporation of IoT systems, importing technology developed by French firm Demeter and Intel. The farm utilizes a system of sensors, weather stations, and robots to enable the management of farm operations via the Cloud. Besides, it serves as a platform for other agricultural businesses to join the network to implement IoT in their operations and processes; aiming to establish an agricultural database, the first of its kind in Vietnam to connect value chains, farmers, agribusiness companies, retailers, experts, and users.
- **MimosaTek** is a Vietnamese provider of IoT solutions in agriculture, and the first to build and develop high technology watering systems. The solution is supported for managing large farms and glass-house.
- The agriculture start-up **Hachi** launched in 2016 a solution using IoT that eases the planting of vegetables via a smartphone app, and has seen remarkable results reducing risks in the planting process, such as drought and a lack of soil nutrition, and productivity increases from 30% to 50% compared to traditional methods. Farmers enter data about the status of their crop through the app, which is then sent to a processing unit. Based on information about soil, climate and plant growth, a quick summary with advice is then given to farmers.

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<sup>87</sup> Springer 2019: International Business, Trade and Institutional Sustainability

## 10.2 Interview Transcript

UNIDO team : [00:00:00] wanted to ask you first if you would be fine with us, are regarding as the voice of the interview in order for later to dress transcript.

[00:00:11] Dinh Do (SMEs in Vietnam): [00:00:11] So transcript to English.

[00:00:15] UNIDO team : [00:00:15] No, no if you're fine with us transcription of the interview. So later we can go over it again so we can, write it down.

[00:00:23] Dinh Do (SMEs in Vietnam): [00:00:23] That's okay.

[00:00:24] UNIDO team : [00:00:24] Okay, perfect. Thank you. So, um, since we saw that you, you are working for two different companies, but we would be interested in both as since both of them are related to our research, we thought of maybe, yeah.

[00:00:43] Going through the questionnaires that you already answered, like both of them first agriculture, the one related to the pig raising company and the other one related to the industry 4.0. technology company and just go a bit deeper in some answers that you [00:01:00] gave us and that we're interested in them.

[00:01:03] Dinh Do (SMEs in Vietnam): [00:01:03] Yeah, sure, sure.

[00:01:08] UNIDO team : [00:01:08] So, yeah. Starting with the, uh, with your company in the area of Binh Phuoc, and I'm not sure if I'm pronouncing it correctly, I'm sorry. Eh, this is your this company. you work in the department of finance, right?

[00:01:24] Dinh Do (SMEs in Vietnam): [00:01:24] Yes. Yes. So basically we are raising a pigs, you know pork, you know pigs, pigs.

[00:01:31] UNIDO team : [00:01:31] Yeah, yeah, yeah, yeah. So it's a firm where you raise pigs?

[00:01:38] Dinh Do (SMEs in Vietnam): [00:01:38] Uh, so basically we have the contract with, uh, you know, like, uh, with a manufacturer. So basically they provide us on the material, on the pet on, on the engine or the food for the pig. And then after we raise the pig, [00:02:00] then we sale them up to process into meet.

[00:02:03] UNIDO team : [00:02:03] Um, so you are basically just raising the pigs and then you deliver them back to the manufacturer who was making pork out if it?

[00:02:16] Dinh Do (SMEs in Vietnam): [00:02:16] Yes, yes, that's correct.

[00:02:18] UNIDO team : [00:02:18] Okay. Okay. Okay. And yes. So is there a reason why you are, uh, eh, presenting this area in raising pork, is it because it's a rural area or more closer, closer to a city or closer to a, some industry?

[00:02:38] Dinh Do (SMEs in Vietnam): [00:02:38] Right. So, so can you ask again, I mean, like you're asking the reason why I'm doing this or the reason that I do the area.

[00:02:47] UNIDO team : [00:02:47] The area, yeah, like the location of the company.

[00:02:51] Dinh Do (SMEs in Vietnam): [00:02:51] Okay. Okay. So I actually, um. So, so this is quite different. I mean, like, uh, uh, [00:03:00] we, okay.

[00:03:00] So we are an investor and when we invest, we looking at different type of project and this project saved to our priorities. You know, like a good return would return. And then, uh, and it's quite safe. Also, most of us, we are not farmers, We are not farmers. We're not farmers. We are investors.

[00:03:27] And so we hire the people to work for us. Yes. And also the reason that we choose the area is because, uh, the gap element, they allow this area to be, uh, to have the function to, to be able to choose these, uh, this business. So, uh, that the government. They, um. they will allocate which land area we'll be able to do the business.

[00:03:59] So [00:04:00] that's, Binh Phuoc, Binh Phuoc is, um, province provinces. Uh, it's about two hour, two hour drive from or that we can say it is the biggest city in the South of Vietnam of the province. And we, um, okay. So this area, need to be, uh, I think 10 kilometers from the populated area and, 10 kilometers from populated area.

[00:04:36] UNIDO team : [00:04:36] Oh, okay. Thank you. So, yeah, moving now a bit. Eh. Yeah. You, you told us that your, you consider your company to be out of five in terms of innovation in four level. So that would be a quite high level. And we were wondering, um, which was the reason for this [00:05:00] answer. And based on, maybe you gave us this answer based on other farms, uh, raising pigs, or is it relative to maybe other countries in Southeast Asia or, yeah, related to what. Can you please answer?

[00:05:16] Dinh Do (SMEs in Vietnam): [00:05:16] Right, right. So, so basically because we have the contract with the manufacturer, the manufacturer is, um, I have to say the biggest, the biggest one in Thailand. You know, like we have contract with them and we have two use their technology and their procedure. Actually, I think four is, might be a bit high. I think three, three maybe better out of five, might be better. Yes. We are not too advanced. If we're talking about a five to zero, we may have Vinamilk and [00:06:00] other farms in Vietnam, they are much more advanced.

[00:06:05] Who are these farms?

[00:06:08] All right. They are the two biggest, uh, uh, cow, cow, uh, milk producers in Vietnam, they are two biggest I think that their factory is four out of five. But our farm, only three out of five. Yes. Yes.

[00:06:31] UNIDO team : [00:06:31] Okay. So the manufacturer gives you the technology for all the process of raising the pigs, right?

[00:06:38] Dinh Do (SMEs in Vietnam): [00:06:38] Yes. We have to comply, so we have to build a company, so as they say.

[00:06:48] UNIDO team : [00:06:48] Okay, eh, and you said that this manufacturer is from Thailand. Yeah, did I answered, did I hear correctly?

[00:06:56] Dinh Do (SMEs in Vietnam): [00:06:56] Thailand, the country [00:07:00] of Thailand.

[00:07:01] UNIDO team : [00:07:01] Yeah. Okay. And then, okay, so what this manufacturer would be your supplier, but also your client, because afterwards you sell the pork to them again.

[00:07:14] Dinh Do (SMEs in Vietnam): [00:07:14] Yes, that's correct. So we are only doing the raising of the pigs. We did not do any processing.

[00:07:21] UNIDO team : [00:07:21] Okay. So they're basically your own supplier and your only supplier and your only client too?

[00:07:27]Dinh Do (SMEs in Vietnam): [00:07:27] Yes. Yes, correct. Okay.

[00:07:31] UNIDO team : [00:07:31] And for what reason are you growing the pigs in Vietnam?

[00:07:38] Dinh Do (SMEs in Vietnam): [00:07:38] Okay, so the thing is that, uh, you know, the pork shortage in China?

[00:07:49] Because of the trade wars. America and China. So they is a shortage of pork. That's the first reason. The second reason is because, you know, um, we still have a lot of land in [00:08:00] Vietnam. And, uh, the land, the land cheap right. And, uh, the labor costs also cheap.

[00:08:16] UNIDO team : [00:08:16] Now that you talked also about the trade wars, and how that is affecting your business model. Um, we also like yea we are wondering, because you said that you don't, eh, you're not active in the international market and for the moment, your company's not interested in expanding to that market.

[00:08:41] But then you also mentioned that you see, um, you see it as a potential strategy for the future. So we were wondering, how come you don't, you don't see it for the moment, but you do for sometime in the future?

[00:08:56] Dinh Do (SMEs in Vietnam): [00:08:56] Okay. So currently we work with, uh, the, [00:09:00] the Thailand technology. But, um, you know, uh, for the future, I am working with the Vietnamese guy and he got the, the got the technology itself and is currently working with a French, French partner. So, uh, in the future we might make a much bigger project. We will export the, uh, the, uh, the pork. If that is enough, but that will be in another year or so. Yeah.

[00:09:32] UNIDO team : [00:09:32] Exporting the pigs where? Were, in France?

[00:09:37] Dinh Do (SMEs in Vietnam): [00:09:37] Yes.

[00:09:40] UNIDO team : [00:09:40] Internationally?

[00:09:41] Dinh Do (SMEs in Vietnam): [00:09:41] Right, yeah. So for that's our future plan, the guy he can do the processing , he can do the processing also. So we will not work with Thailand. But we will work with the French. Okay.

[00:09:58] UNIDO team : [00:09:58] But now that your [00:10:00] technology comes from Thailand, but then do you sell the pork's back to Thailand from Vietnam or the pork is sold in Vietnam?

[00:10:11]Dinh Do (SMEs in Vietnam): [00:10:11] Right? So because, okay, so the Thai company they, invested. They open factory in Vietnam, so I'm not sure who they sell to, because some they sell in Vietnam some they sell outside. So I am not sure where my product will go.

[00:10:29] UNIDO team : [00:10:29] Okay. And then also you mentioned that the, the national demand is still huge, and that's also one of the reasons why you don't want to right now enter international market. Does that mean that it's like there's some bigger demand that the current supply at the national level in Vietnam for pork meat for example.

[00:10:56] Dinh Do (SMEs in Vietnam): [00:10:56] Uh, yes, because we have, uh, [00:11:00] the disease the, the, pig disease. So, you know, like, uh, many of the traditional fam the pigs die because of the disease. So that's why we'll have a shortage of the pork in Vietnam also, and the price in Vietnam also quite high.

[00:11:17] UNIDO team : [00:11:17] Okay. How did you make sure in your company that the pigs won't get this disease? Can technology help here somehow?

[00:11:34]Dinh Do (SMEs in Vietnam): [00:11:34] Right? So the problem with a disease that this is how, how the, um, the farmer control, you know, like for traditional farm, they, uh, they cannot detect it early. So when, when it become too late, then maybe half of the population already already get effective.

[00:11:55] Uh, but for the the technology that [00:12:00] we use, we can detect the disease earlier. So we get that part in time. We get that part in time and we solve if earlier.

[00:12:12] UNIDO team : [00:12:12] Okay, perfect. And then we, yeah, we were wondering also, uh, what kind of benefits you see from, uh, from introducing yourselves in the international market, for example, for next year, that you are planning to cooperate or work with this partner from France, which could be the benefits, eh, you would expect from this kind of partnership.

[00:12:39] Dinh Do (SMEs in Vietnam): [00:12:39] Right, because the thing is that, uh, um, you know, we, we can not to rely on anyone. We, uh. Like, like in type of business, it's better to be independent. So from my point of view, uh, though we, uh, going oversee is much better. And also the profit margin will be higher [00:13:00] as well.

[00:13:05] UNIDO team : [00:13:05] Okay. Do you maybe have any information, which kind of 4.0 technology, does your French partner already use maybe internet of things or any kind of, uh, artificial intelligence within the, his, uh, business model?

[00:13:26] Dinh Do (SMEs in Vietnam): [00:13:26] Right, right. Um, you know, Agriculture is quite, um, traditional business.

[00:13:33] So I know that, that even in America or Australia 4.0.technology are still not widely used, not widely used. And, uh, so the most popular one, we, will be internet of things. So the idea is that you will have the chip, uh, implanted into the animals, so to, uh, to, to know, uh, the animals [00:14:00] health.

[00:14:00] Currently, uh, you know, uh, they're not, not much technology in this business. Yeah. And for, for my friend, he also not at a 4.0 he, he also at 3.0 we, we, we are at 3.0 we were not 4.0 yet.

[00:14:23] UNIDO team : [00:14:23] Also the cow and milk producers. The two biggest one that you just mentioned, do you think they are also still not using 4.0 related technology, but rather 3.0?

[00:14:35] Dinh Do (SMEs in Vietnam): [00:14:35] They use 4.0. I know, because they, uh, they have a chip implanted onto the cow. They use the 4.0. And, uh, they, um, they have a lot of, uh, I'm not sure if they have the detection for disease or not, but I am for sure that they have the chip, the IoT, yes.

[00:14:57] UNIDO team : [00:14:57] Is there any chance that you [00:15:00] give us the name of that company?

[00:15:03] Dinh Do (SMEs in Vietnam): [00:15:03] Uh, is the, OK. Uh, the spell is V. I. N. A. and milk, all one word. Yep. Vinamilk.

[00:15:15] UNIDO team : [00:15:15] Thanks to very much. Okay. So the way you see the use of 4.0 technology in agriculture is mainly to, uh, ensure health of the, um, animals and to regulate the quality of the product?

[00:15:36] Dinh Do (SMEs in Vietnam): [00:15:36] .Yes, that's correct. Because that's the biggest problem is how to control the disease. Yes. Yes.

[00:15:51] UNIDO team : [00:15:51] Yeah. Actually related to this question some weeks ago, we did another interview too. Delco farm, I don't know if you're familiar [00:16:00] with this business, and they told us that one of the main problems right now in Vietnam was that in terms of quality, they didn't have many official standards in order to differentiate high quality products in agriculture with low quality ones, and that that was a main trade barrier, let's say for them to. To differentiate themselves in international trade, eh, with other Vietnamese products that might be of lower quality. Do you think that is also a problem in the pork industry?

[00:16:29] Dinh Do (SMEs in Vietnam): [00:16:29] Right. So, um, I think when they say that, um, I mean, I mean, okay, uh, you can still use the 3.0 technology, you know, like, um, if you do automation, if you do, um, robotic, then it can solve what is the problem. The problem 4.0. is it is, uh, too advance, I think., I think currently. Um, but yeah., yeah, I think it's a challenge, but, uh, I [00:17:00] think most will face challenge as the traditional way. The one who, you know, like, uh, didn't implement like new technology.

[00:17:11] UNIDO team : [00:17:11] But even if with 3.0 technology, you can improve the quality of the products you produce....

[00:17:19] Dinh Do (SMEs in Vietnam): [00:17:19] Yes, yes 3.0 technology is enough in my opinion.

[00:17:28] UNIDO team : [00:17:28] Okay. And are there some certifications or standards in Vietnam that allow the market to differentiate, which are the high quality products and which the lower quality ones.

[00:17:38] Dinh Do (SMEs in Vietnam): [00:17:38] Oh, right. So in Vietnam, we are talking about a tracing, tracing the, the origin, because you know, like, um, in Vietnam we have a lot of small, small business.

[00:17:54] So the thing is that when you do export, uh, the pros, [00:18:00] uh, the manufacturer, they have to, get the supply from many small farmer. So the problem is that, uh, uh, we need to track who will give the, high quality, who will give the low quality, because you know, like there's a lot of good practice for international market.

[00:18:25] But, uh, the problem is that, uh, we don't know if the supplier the farmer. They use it or they do not use it, sometime use, but sometimes they lie.

[00:18:38] UNIDO team : [00:18:38] Yes. Yeah. Okay. And yeah, so then also. You answered that, uh, your company doesn't currently use a 4.0. technology. I know you were explaining why, but then you also mentioned that, eh, for the future of you work you [00:19:00] considered that it may could be an option. Maybe this is also related to the, uh, partnership with the French company. Or we were wondering what kind of a future plan you

have for this incorporation of 4.0. technology which kind of specific technologies you were planning to incorporate and for which purpose?

[00:19:20] Dinh Do (SMEs in Vietnam): [00:19:20] Right? Right. So the thing is that, um, I think I like to have the IoT thing, the thing that Vinamilk currently use, I think that that technology will be most suitable..

[00:19:36] UNIDO team : [00:19:36] So the, yeah. So you're thinking for the future to the implementation of internet of things for the pigs health, right?

[00:19:45] Dinh Do (SMEs in Vietnam): [00:19:45] Yes. Yes.

[00:19:47] UNIDO team : [00:19:47] What is the reason that your company you're working at and the others are still are right now stuck in 3.0 relating the technologies? Is there a certain [00:20:00] or specific reason you see for that.

[00:20:02] Dinh Do (SMEs in Vietnam): [00:20:02] So can you repeat the question again?

[00:20:07] UNIDO team : [00:20:07] Yes. I was wondering whether there is a specific reason why your company and many others are still stuck in industry 3.0 instead of advancing to 4.0

[00:20:19] Dinh Do (SMEs in Vietnam): [00:20:19] Right, right. Um, okay. I can list out problem. The first problem is that more of the traditional businesses. Yeah. Not even 3.0 they are 2.0. 2.0. means that they don't have any automation. So they do everything manually. So it's about 2.0. or 1.0.. And, um, that's the first problem.

[00:20:43] The second problem is that, um, you know, like, uh, because uh, um. The level of innovation in Vietnam is not high. Uh, we, we are mostly, how should I say it, say [00:21:00] it, like we are, we are outsourcing partner of the manufacturer. So we, uh, we usually, we do, um, you know, like, uh, raw products, and then we export or, we sell.

[00:21:14] But, uh, but in Vinamilk, if you will do the searching, Vinamilk is the biggest, uh, milk producer in South Asia, so they have the scale because they have the scale, they have the, they sort of have the big budget so they can implement 4.0. technology.

[00:21:40] UNIDO team : [00:21:40] Do you think missing knowhow or financial? Um, yeah, enough finance in that case is also a reason.

[00:21:50] Dinh Do (SMEs in Vietnam): [00:21:50] Yes, yes. I think, I think finance and also know how it is also a reason because you know, like a follow up on individual farm. [00:22:00] We don't have, and we don't have the research development department, so we, we only use what been provided.

[00:22:08] UNIDO team : [00:22:08] Ah, and who would need, in terms of the lack of knowhow, who would need it in order to implement better, different technology? From your point of view, does the manager of the company needed it or more like every employee inside the company or would like with external help? Would that be enough?

[00:22:32] Right. I

[00:22:34] Dinh Do (SMEs in Vietnam): [00:22:34] think, I think. From, from my understanding, I think the company could, be the first one to benefit from the knowhow that the technology, the company. Um, I mean, because usually for, for the employee, this employee don't really care, you know, because in this, this business employee, they, uh, they are not [00:23:00] very innovative. Yes. Yes. So mostly company company the most benefit.

[00:23:10] UNIDO team: [00:23:10] But do you think that every employee would have to, eh, will have to incorporate that knowhow?

[00:23:17] Uh, no. No, because you know, most of the employee in this business, in the agriculture business, they have, they are not college educated, so yeah. Yeah. So, so they, usually, uh, it's difficult for them to do, do research and to learn new things, difficult.

[00:23:41] But do you think that for the farm to function with 4.0 technology, it's enough that, uh, just management is very much known in how to use this technology or should also all the employees, the workers [00:24:00] know how this technology work.

[00:24:04] Dinh Do (SMEs in Vietnam): [00:24:04] Oh, right. Because the thing is that. Um, you know, uh, we are still developing country, so, uh, it means that, um, usually, workers, workers, employess they, usually they only care like how much they get paid, what they need to do, they're not very motivated. So the thing is that, is this difficult? I mean, I mean, okay, I study abroad, so I know that in the developed country, you know, like every employee should know a lot but in the developing country is it different, it is different.

[00:24:58] UNIDO team : [00:24:58] Okay, so then [00:25:00] we, yeah. In order to finish with this first part of the questionnaire, we wanted to ask you one last question, and it's about we doing the someone's previous research, going through different papers, we found out that some of, some theory says that, eh, for, for developing countries like Vietnam, could be, uh, industry 4.0. gives the chance to, uh, for this, for these sectors in these countries to leapfrog, like to, uh, advanced, to eh other stages of development. Eh, in order to, yeah, move more further in technology. And we were wondering, because you were mentioning that many companies are still in 3.0 that 3.0 is sufficient. So we were wondering if you agree with this statement that 4.0 could help them, uh, jump to these new advanced technologies, or you, you rather think that, no, like, uh no, agricultural sector in Vietnam should go step by step, [00:26:00] implementing technologies, chronology, and in the end reaching technology 4.0.

[00:26:04] Dinh Do (SMEs in Vietnam): [00:26:04] Right, right. Um, right., I understand what you mean. I think innovation, in one way is what drive the nation. Um, however, because in Vietnam, we still lack a lot of infrastructure, uh, you know, because for 4.0 you need connectivity. So you can talk to cloud or whatever, because now most of the AI technology in the cloud. But the thing is that our infrastructure still very bad. So what I mean is electricity, um, internet wi-fi, we still don't have enough. So that's why it is difficult to go too fast too, yes very difficult.

[00:26:53] UNIDO team : [00:26:53] Yeah. So yeah. What I'm understanding from here is that there's, there's some other need of infrastructure [00:27:00] investment. Do you think that the government should push more like investment towards this area?

[00:27:07] Dinh Do (SMEs in Vietnam): [00:27:07] Uh, yes. Yes. I mean like in developing country we need a lot of infrastructure, because, you know, like because we do not have enough electricity, we don't have, uh, internet and then it's just difficult to do everything.

[00:27:24] UNIDO team : [00:27:24] Okay. Yeah. Makes sense. So now we would like to switch to the other part of the interview that concerns more on your other company, the one that you're the founder of. Uh, so if you could briefly explain the business model of this company more regarding what kind of technology you develop, who are your main clients who are your main suppliers? How did you find the gap in order to create this company? Uh. Et cetera.

[00:27:52] Dinh Do (SMEs in Vietnam): [00:27:52] Yes. Yes. So, so, okay, so this company, we, um, we are doing a, you know, like, uh, [00:28:00] like, um, management process. No, we incorporated with, uh AI, IoT, we uptake the technology. Um, we, uh, so currently we see that in the market, you know, because they are innovation.

[00:28:22] And, uh, we, as we, we aim at, uh, uh, you know, big city, uh, manufacturing. And, uh, and then, uh, so because I think that, uh. Uh, manufacturing in big city they one that's most likely to employ our technology.

[00:28:48] UNIDO team: [00:28:48] So, but you sell, you sell, um, kind of consulting services. in order for these companies to incorporate artificial intelligence and IoT, or you specifically sell the technology to [00:29:00] them?

[00:29:01] Dinh Do (SMEs in Vietnam): [00:29:01] Uh, right. So we do both. We provide it ourselves and we, yeah, we implement also, so yes.

[00:29:07] UNIDO team: [00:29:07] And the do you develop the technology on your own or you buy it and then you sell it to these companies?

[00:29:14] Dinh Do (SMEs in Vietnam): [00:29:14] Right. So we, we, we develop on some platform. Hmm. We develop on platform. There is already something they have and we adjust. We, we, uh, just make it better, uh, more suitable, more suitable.

[00:29:34] UNIDO team: [00:29:34] Okay. And how did you find the gap for these? Like how did you find the need in the market for this kind of a company, for the one that you built?

[00:29:47] Dinh Do (SMEs in Vietnam): [00:29:47] Right, so actually this is not easy. So the thing is that, you know, like, uh, the level of use in Vietnam is [00:30:00] still low. Um, yeah, still not use it a lot. So that's why I'm not like, um, we go through, I go through, um, a conference and a event through to find the clients.

[00:30:17] UNIDO team: [00:30:17] Sorry, can you repeat what you just said? That it's too low in Vietnam they use of...?

[00:30:26] Dinh Do (SMEs in Vietnam): [00:30:26] Yes. The produce of the technology. the use of technology in Vietnam is still low.

[00:30:30] UNIDO team: [00:30:30] Okay. Which would be your typical clients of this company? What kind of companies are starting to apply these technologies?

[00:30:42] Dinh Do (SMEs in Vietnam): [00:30:42] Right, so I think mostly manufacturing and, uh, also a retail retail business

[00:30:54] UNIDO team: [00:30:54] Okay. [00:31:00] And yeah, are these companies bigger ones or, do you also sell to SMEs?

[00:31:07] Dinh Do (SMEs in Vietnam): [00:31:07] Uh, I sell to middle size or big, big clients. SMEs, um, they, they don't have the money. They don't have the budget for these.

[00:31:20] UNIDO team : [00:31:20] And if they did have the budget, do you think that they would benefit from this kind of current incorporation of these kind of technologies?

[00:31:29] Dinh Do (SMEs in Vietnam): [00:31:29] Yes, yes. They could be benefit, but the thing is that, uh, they, the thing is that, okay, the budget is first? But secondly, they don't have the, the management, the, uh, the, the people, you know, because SME, they don't have a lot of people, so, so they don't have the money. Usually if they go with innovation it is someone who had the knowledge or had the time to go through and they don't have [00:32:00] dedicated people or this.

[00:32:03] UNIDO team: [00:32:03] Do you think this is also the reason why the governmental initiatives that that do funding to small and medium sized companies for finding or, yeah, if we're doing innovation or using 4.0 technologies is not that efficient? Because during our research, we found that the Vietnamese government is actually providing funding for those things and also planning initiatives.

[00:32:32] Dinh Do (SMEs in Vietnam): [00:32:32] Right? Uh, yes. They are not efficient. The fourth reason is because of the, um, the government. Those are our government which are not very, how, how should I say, like, not, not very democratic, you know? So usually they get more benefit to friends and, and, uh, uh, life partner. [00:33:00] So, so, actually this SME or the one who did it might not be able to accept it if they don't have the relationship. Uh, secondly, uh, you know, like, um, the thing is that, uh, the, the thing is that, uh, the, the SME, the SME need more education. What I mean is that, um, uh, the SMEs, they don't know. They don't know what technology can help them and how do you apply technology? Yes.

[00:33:53] UNIDO team: [00:33:53] And you said that your, the company's located in Ho Chi Minh, if I pronounce this correctly. [00:34:00] Um, because regarding these governmental initiatives, we also read that the plan is to create more high tech zones, let's call them. Um, is this maybe close to one or do you see an advantage of those zones?

[00:34:17] Dinh Do (SMEs in Vietnam): [00:34:17] actually, um. Uh, uh, one of my business, uh, another business in the industrial zone actually that zone is very good because you know, uh, you have, uh, the tax reduction and the land is cheap and you have a better infrastructure, electricity and everything. So, so those path, uh, those industrial park is very good. Um, the problem, the problem is that, you know, like you, you, you, you need first

the relationship. And secondly, the size, to be able to get it, because, uh, you know, like, [00:35:00] okay. Uh, okay. So, so usually on the, um, people with a certain wealth, a company, company with a Southern budget southern revenue can, can go in . Usually small company can not go in. That it as a problem. Okay.

[00:35:23] UNIDO team : [00:35:23] And yeah. Also considering some questions that you like, some answers that you gave in the questionnaire, we saw that you said that the main challenges that your clients face when implementing industry from material technology, and once that, they're quite resistant to change. Second, the budget, and third, that competition is not too fierce. [00:35:44] What did you mean with this last point? Like they don't have the incentive to play technology because there's not that much competition?

[00:35:52]Dinh Do (SMEs in Vietnam): [00:35:52] Right, right. So when we say that the competition is not that fair because we don't have an open markets like, [00:36:00] like developed countries, open market means that information are very transparent, but in Vietnam, information is not transparent.

[00:36:09] So small business, medium business can survive. I have the relationship. So you know, like, okay, those hotel went information not available. It means that you don't need to be very efficient. You survive. Yeah. So that's, that's why it's like competitive, not fair, because there's not enough information to decide which are better.

[00:36:37] UNIDO team : [00:36:37] Okay. Interesting. And. Good. Also regarding your company's technology on the service you provide to your clients, do you think that this can help them increase their capabilities in international trade?

[00:36:57]Dinh Do (SMEs in Vietnam): [00:36:57] Um, [00:37:00] okay. So, so most of my clients, uh, focus in the domestic market, so or the international trade. I think it can help and it can help to, uh, to, to, uh, help them proceed clients faster to be more efficient.

[00:37:29] UNIDO team : Sorry. Could you give us a specific problem and the solution that your, um technology provides like a concrete example, maybe just for me to understand it a bit better.

[00:37:46] Dinh Do (SMEs in Vietnam): [00:37:46] Right, right. So, okay. So even though I say technology but it not anything very fancy. So we, um, for example, we have the warehouse customer [00:38:00] and we do, em, we, we, we connect with the barcode scanner, the ID scanner. So they have the tracking of their products - it is good, better.

[00:38:15] UNIDO team : [00:38:15] Uh huh. So you are more in the area of eCommerce?

[00:38:21]Dinh Do (SMEs in Vietnam): [00:38:21] Um, currently, uh, yes. E-commerce, yes.

[00:38:30] UNIDO team : [00:38:30] So you're mainly, your technology will allow your clients to be more efficient in the, for example, not that you said in the warehouse and the logistics. Um, are we right? And with this efficiency they could be more competitive in international markets.

[00:38:50] Dinh Do (SMEs in Vietnam): [00:38:50] Yes. Yes.

[00:38:51] UNIDO team : [00:38:51] Okay. Okay. Perfect. But do, do you see that the, your technology also has a place in the [00:39:00] agricultural sector, or as you said, more in manufacturing and the textiles?

[00:39:07] Right, right.

[00:39:08] Dinh Do (SMEs in Vietnam): [00:39:08] Because every culture in Vietnam has to not developed industry. So there's not much innovation agriculture. And, um, so that's why we are more at the logistic and manufactory. Yes.

[00:39:30]UNIDO team : [00:39:30] But in the future, do you think that you will also, expand to the agriculture or the, if the agriculture will develop that, it will also give it a chance for your company to, um, trade with them?

[00:39:48] Dinh Do (SMEs in Vietnam): [00:39:48] Right. Right. So one challenge for agriculture in Vietnam is because, you know, like, um, we, we have many, many farmer, [00:40:00] but they operated on very small land. When the land is small, it means that they don't have a lot of automation because no, like, uh, it's not like in America where you have big tractors, uh, where you could use airplane to put all the pesticides or, yeah. Now many farmer, but each farmer has very small land.

[00:40:26] UNIDO team : [00:40:26] Yes. Yeah. So you think this sector lacks economies of scale in order to incorporate more technology.

[00:40:35] Dinh Do (SMEs in Vietnam): [00:40:35] Yes, yes, yes, that's correct. So the thing is that now we actually have a problem, which is we, it very difficult to buy big land, you know, like the big block of land. Very difficult. Right? And so that's, that's one of the challenges for us to improve technology.

[00:40:59] UNIDO team : [00:40:59] And what ways [00:41:00] is still difficult to have a big plot of land?

[00:41:03] Dinh Do (SMEs in Vietnam): [00:41:03] Right. Because traditionally, traditionally we, uh, we split up the land. The land to too many people. So, you know, you know, because we, we traditionally, we are communist, so communist means that everyone will have some land. Yeah. So that's why it's very difficult to get the big plot of land.

[00:41:29] UNIDO team : [00:41:29] Okay. And yeah. Now going back to your actual clients and to the, yeah. To the companies you sell your products to, you told us that there are some challenges during the incorporation and implementation of these technologies, and we were thinking of how do you think these challenges or these problems could be reduced.

[00:41:52] Dinh Do (SMEs in Vietnam): [00:41:52] All right. Right. So the thing is, you know, personally we need [00:42:00] more time. Vietnam is quite, we are, uh, uh, only at peace from 1990. So we are only, um, so we, we had so many work and so we thought them. We only had our first generation of, um, capitalists, only are the first generation. That's the first thing we need, more time. And secondly, um, I think we would need more transparent...

[00:42:34] UNIDO team : [00:42:34] I'm sorry to interrupt. Could you maybe repeat what you need more? I did not understand. I'm sorry.

[00:42:40] Dinh Do (SMEs in Vietnam): [00:42:40] All right. Right, right, right. Uh, so more, more time.

[00:42:48] UNIDO team : [00:42:48] Okay. I see. Thanks to you. Because we, um, for example our neighbor, neighbor country like Thailand [00:43:00] or Malaysia, Indonesia, they have the they already have the four or five generation of business men. We only have the first generation. Yes, yes, yes.

[00:43:16] So you need culture of developing businesses out of entrepreneurship.

[00:43:22] Dinh Do (SMEs in Vietnam): [00:43:22] Yes. Yes. We, we need more, you know, like, yeah. Second generation or third generation people who.

[00:43:33] UNIDO team : [00:43:33] Okay. Yeah. So that was the first problem. And the second one you were mentioning was?

[00:43:37] Dinh Do (SMEs in Vietnam): [00:43:37] The second one is that we need a more transparent, more open. Yes. Yes.

[00:43:48] UNIDO team : [00:43:48] And transparent in which sense, for example, in the information asymmetry is that you were mentioning before.

[00:43:54] Dinh Do (SMEs in Vietnam): [00:43:54] Uh, right. Because, you know, um, okay. [00:44:00] So, so, uh, like you mentioned that there, there are a lot of schemes to support our SME right. But the thing is that, that those schemes are not open to the public, and it's not easy to get. So that's why we require everything to be more open. Okay. Yeah. Yeah.

[00:44:27] UNIDO team : [00:44:27] Perfect. So following, continuing now, um, yeah. Also continuing with the trade trends within international markets, as we were talking now at, do you think that your companies, uh, somehow benefited from now, uh, trade Wars between China and the United States?

[00:44:50] Dinh Do (SMEs in Vietnam): [00:44:50] Uh, right, right. In term of the technology, there is not a clear effect? [00:45:00] So in terms off my new factory, uh, in term of, uh, the whole, I mean, I mean, no, the trade world doesn't have a clear effect. No. Some industry got benefited, but, but some, that doesn't have many things, so, so it's not to big.

[00:45:21] UNIDO team : [00:45:21] But before we were like in the first part of the interview, talking about the pork industry, you did say that you, you found some effects there, right?

[00:45:31] Dinh Do (SMEs in Vietnam): [00:45:31] Oh, that's on agriculture. And that's how the pig, because for the big, for the pork. They are shortage on pork. So, so that's why the price of the pork is very high now. But you know, because of the trade war, our, our financial, our, um, industry is having a lot of problems because the, the whole, the whole world is not very [00:46:00] stable. So that's why how I can get the system with big trouble now.

[00:46:07] UNIDO team : [00:46:07] Yeah, so the, the price of pork went up, if I understood correctly, because China is not longer selling to the United States, and then, so you are kind of substituting in that display, right?

[00:46:20]Dinh Do (SMEs in Vietnam): [00:46:20] Uh, China actually, imported pork from the US.

[00:46:23] UNIDO team : [00:46:23] Aaaa the other way around. And now is buying from Vietnam.

[00:46:30] Dinh Do (SMEs in Vietnam): [00:46:30] Yes, yes, yes. Okay.

[00:46:39] UNIDO team : [00:46:39] Okay. So now regarding the effects new technology has on, um, on the, on your clients, you were mentioning before, the efficiency effects. And we were wondering, apart from this efficiency focusing on logistics and um, yeah, in the logistics area, if there [00:47:00] were some other effects in terms of maybe these companies are producing more or producing higher quality, or maybe they're, image, is now a better in the market because they're viewed as more modern companies? Or is it just pure efficiency in terms of logistics?

[00:47:19]Dinh Do (SMEs in Vietnam): [00:47:19] In term of more quality, uh, uh, quality control, uh, our technology doesn't, it doesn't help with that, but they have a technology and other people doing that, for example, the camera, when they do, um, like detection. Like everybody takes 10 or something like that. So couple of company, they do that.

[00:47:48]UNIDO team : [00:47:48] Okay. Perfect. Yeah. So we're coming to an end now, but just more a couple of questions. And you also answered in the questionnaire that sometimes the benefits, [00:48:00] uh, or somethings that first effects were negative and some things were benefits and that the, this dependent, dependent on like different factors. And could you give an example of this? For example, what did you, what did you mean with the benefits.

[00:48:14]Dinh Do (SMEs in Vietnam): [00:48:14] Right. Can you repeat the question again?

[00:48:16] UNIDO team : [00:48:16] Yeah, yeah. In the questionnaire, we asked if the first direct effects of the implementation of this technology on your clients, eh, were either positive or negative, and just you answered that.: It depends. And we were wondering like what are the factors that these depends on.

[00:48:32] Dinh Do (SMEs in Vietnam): [00:48:32] Oh, that effect of implementation. Right, right. Because the client, they are resistant to change. You know, like the level, the level of, um, of, of, know how would be a low, very low. So sometimes if you know, like, okay, so for example, if you give a tool to the right person, [00:49:00] you have to do even better. But if you give the same tool to a person without a know how, if they don't, don't know how to use it, it's a waste of time. Yes. Yes. So, so that's what I mean.

[00:49:16]UNIDO team : [00:49:16] Okay, perfect. Makes a lot of sense. Okay, so. How do the clients actually come to you? Is it via a recommendation maybe of clients you had before, or is it really that they are struggling with the, with a certain need that you can deliver?

[00:49:47]Dinh Do (SMEs in Vietnam): [00:49:47] Right, actually. Um, my, my company, uh, our level of innovation is not that high. So actually, it's mostly recommendation and an [00:50:00] introduction from friends.

[00:50:07] UNIDO team : [00:50:07] So networking.

[00:50:08] Dinh Do (SMEs in Vietnam): [00:50:08] Yes. Because you know, uh, actually now, uh, for this. Um, okay. So, so currently we, okay. In innovation. There's, there not as many, uh, because from the technological perspective, um, we don't have a lot of innovation nowadays. I mean, I mean, uh, like making novation, we, we

okay. So we might have like a new cool app. Um, we have, uh, a new way of, of, of, uh, a sharing economy, but, but it's, innovation is not that different, if you see what I mean.

[00:50:53] Yeah. Okay. Yeah. Yes, yeah. And right now, as far as just like final [00:51:00] question, you said two things that you would suggest for the government policies or policies that UNIDO could recommend - you want to give more finance and also more knowhow. And we were wondering, um, if you have any suggestion on, how could this to be encouraged? That is like, um. How would you increase financing to these SMEs in order to incorporate technology and then how would you increase the know how?

[00:51:27] Okay. So firstly about finance, like I told you earlier, Currently only people with relationship or a very big company can get access to the finance.

[00:51:40] So which mean that most SMEs, they don't have access. Yeah. Yeah. Yeah.

[00:51:48] UNIDO team : [00:51:48] And just to make sure when you when you say these access to the finance, you mean either public or private finance? Both of them only works on networking.

[00:51:58] Dinh Do (SMEs in Vietnam): [00:51:58] Okay. So, [00:52:00] so you know like, for example, we, we have a lot of ODA, we have a lot of funding from, from Japan, from America, but can the, SMEs [00:52:15] access to that or not? It is a question. So, so even though they are available in the market, but not, okay., so the, the normal, the normal people cannot get it, so that's the problem.

[00:52:30] UNIDO team : [00:52:30] Yup. Yeah. Okay. Terrific. But regarding the know how part.

[00:52:38] Dinh Do (SMEs in Vietnam): [00:52:38] Yes, the knowhow, you know, okay., so for example, I can communicate with you in English. But most of the people, most of the farmers are, you know, like, uh, like, like normal people in Vietnam, they, they don't know how to speak English. Uh, they, they, they very shy to, to get information. [00:53:00] They, uh, they, they just don't have access to any knowhow. Yes. Yes. Like for example, for myself, I have to read the English literature to, to get the, know how understanding. I'm fine with that. Yeah.

[00:53:23] UNIDO team : [00:53:23] Perfect. Yeah. So regarding the questions, this was all like, it was just that we, yeah, we wanted to dig a big deeper in some of the answers you gave through the questioners, and we're like really, really thankful that you took this time to answer out questions. Yes.

[00:53:41] Dinh Do (SMEs in Vietnam): [00:53:41] You're welcome.

[00:53:43] UNIDO team : [00:53:43] Yeah, no, we were wondering in order to, yes, finish the interview. I'm wondering if maybe, um. Some of your clients or some of your contacts, here in agriculture or like sectors related to our topic of research maybe [00:54:00] if you think that any of them would be willing to answer the questionnaire that we provided to you.

[00:54:05] Dinh Do (SMEs in Vietnam): [00:54:05] Mmm. I'm not sure. Let me check. And I will respond yes.

[00:54:12] UNIDO team : [00:54:12] Okay. Yeah. Yeah. It's already great that you had time to answer this question because it was quite easy quite hard for us to reach out to people in this sector in Vietnam and so yeah, thank you so much for this. And if you think that some of your partners or your friends in the sector or clients or suppliers would be willing to also help us here, that would be great.

[00:54:41] Dinh Do (SMEs in Vietnam): [00:54:41] Okay. I understand.

[00:54:43] UNIDO team : [00:54:43] Um, just the, the last question, I didn't catch up. The name of your company that provides a, um, technology. Sorry.

[00:54:56] Dinh Do (SMEs in Vietnam): [00:54:56] It is [00:55:00] DCD.

[00:55:03] UNIDO team : And for the pork farm, [00:55:07] the name of your company in the pork industry, sorry?Pork industry. Pork farm.

[00:55:20] Dinh Do (SMEs in Vietnam): [00:55:20] Oh, right, right, right, right. Um, I will, um. This is a difficult name, i will send you the name later.

[00:55:35] UNIDO team : [00:55:35] So yeah, this, this will be all for us. Thank you again so, so much for your time and your help, if you want, once we are done with our research we will for sure send you our conclusions or findings.

[00:55:54]Dinh Do (SMEs in Vietnam): [00:55:54] Yes, please. Thank you.

[00:55:57]UNIDO team : [00:55:57] And we wish you a lot of success in your [00:56:00] businesses in the future.

[00:56:02] Dinh Do (SMEs in Vietnam): [00:56:02] I hope that you all have a good time.

[00:56:09] UNIDO team : [00:56:09] Thank you. Thank you all. Oh, the goodbye. [00:57:00]

### 10.3 Questionnaire for 4IR related technology providing SMEs

We really appreciate your willingness to take part in this research project. In the following lines, you will find a questionnaire regarding some aspects of your company, divided in different sections (General questions, clients, technology...). We estimate that finishing the questionnaire will take you approximately 25-30 min.

Data treatment and confidentiality: Your comments and responses during the questionnaire will be gathered for the unique purpose of the development of a UNIDO research paper on "Increasing trade capacities among developing country SMEs in the advent of the Fourth Industrial Revolution". Your answers will be kept either credited to you (or the company you are representing) or anonymously, per your preference. Should you wish to keep all or a subset of your comments anonymous, please let us know via email as soon as you finished the questionnaire.

General Questions about your company:

1. How long has your company been actively producing Industry 4.0 related technologies?

0-1 years

2-3 years

4-6 years

7-10 years

More than 10 years

2. Where is your company located? (City, region)

\*

3. Number of employees working for your company:

\*

Less than 10

11-50

51-250

251 and more

4. Approximate annual revenue in Vietnamese Dong:

Less than 3 billion

Between 4 and 50 billion

Between 50 and 300 billion

Other ...

5. What is your company's mission and vision?

\*

6. Please rate the level of innovation within your company:

Very low technological innovation

1

2

3

4

5

Very high technological innovation

7. How would you describe your usual client? (In terms of sector, size, business model)

\*

8. Are your sales based on few and large clients or rather several and small ones?

Several and small clients

1

2

3

4

5

Few and large clients

9. Why should small and medium-sized enterprises implement your technology in their business model?

\*

10. How do your clients finance the purchase/implementation of your technology?

Through their own financial resources

Our company provides financing conditions such as regular payments, etc.

They ask for private loans (e.g. from banks)

They ask for governmental support

Other ...

11. What are the main challenges your clients face when implementing Industry 4.0 technologies in the agriculture sector in Vietnam?

\*

12. What is the main purpose of your technology?

\*

13. How can your company's technology facilitate foreign trade?

\*

Which are the specific obstacles that this technology can eliminate/reduce regarding the trading capacities of your clients, if any?

14. Do you only manufacture the Industry 4.0 related technology or also help small and medium-sized enterprises to implement it?

\*

Only manufacture (continue to section a)

Manufacture and help to implement it (continue to section b)

Other ...

If your previous answer was "only manufacture", please fill in section A (below); otherwise continue to section B

A15. How do you find your customers to sell the technology?

A16. How do you deliver your product

A17. Do you have an external business partner that helps with implementation? If so, who?

A18. Do you believe that the technology that you are providing need an additional assistance with implementation?

Yes

No

Other ...

If, instead, you answered "both" please fill in section b (below)

B15. What is your implementation plan for your customers?

E.g. Only installing, testing after installation, long-term follow up...

B16. How long does the implementation process usually take?

Less than 1 month

2-6 months

7 months - 1 year

2-3 years

More than 3 years

B17. Have you experienced any of the following challenges when helping clients with the implementation?

Lack of necessary infrastructure at client's working spaces

Lack of client's knowledge on implemented technology and/or misunderstandings between implementation team and client

We experienced no challenges

Other ...

Effects of your technology's implementation

19. Your clients usually notice the first direct effects...

\*

Right after the implementation

After 1-3 months

After 4-6 months

After 7 months - 1 year

After more than 1 year

Other ...

20. Your clients would estimate that the effects/changes after the implementation are...

None (extremely small)

1

2

3

4

5

Fundamental (extreme)

21. Are the first direct effects your clients notice rather positive or negative?

\*

Please provide some explanation for your answer in terms of why first effects are either positive, negative, or something in between.

22. What are the positive effects mainly on...?

You will find different categories of potential effects. Please do not answer if you have not noticed any positive effect in the assessed category.

Efficiency and resources

Time saving

Less workers required

Reduced amount of raw materials needed

Reduced amount of energy/water needed

Reduced amount of pesticides needed

Other ...

Product

Increased quantity

Enhanced quality

Increased variety

Other...

Financial situation

Increased sales

Increased net revenues

Tax reduction

Other ...

Market and clients (of your customers)

Increased number of customers

Increased sales volume (due to increase of purchase volume per customer)

Increased Customer satisfaction/loyalty

Increased customer segmentation regarding sector

Increased customer segmentation regarding geographical market

23. Have your clients seen an increase in its trading capacities, either nationally or internationally?

\*

24. In how many years do you estimate that the investment in Industry 4.0 technology can become profitable for your average client?

\*

25. What main challenges do your clients face when using Industry 4.0 technologies?

\*

26. Do you consider your company's technology to contribute to the sustainable development in agriculture? If so, how?

\*

Impressions and additional documentation

27. How advanced do you think Vietnam is regarding the implementation of Industry 4.0 technology in agriculture?

\*

Not advanced at all

1

2

3

4

5

Very advanced

28. Which is the main problem you see in the lack of implementation of Industry 4.0 technologies in the Vietnamese agriculture?

\*

29. Could you think of any suggestions for your government or UNIDO on how to help agricultural companies implement the Industry 4.0 technologies in Vietnam?

\*

Thank you very much!

We highly appreciate your collaboration.

Additional Documentation

If possible, please attach any additional documentation or information regarding your company that could have useful information regarding the implementation of the Industry 4.0 technology in small and medium-sized enterprises in the agriculture sector in Vietnam. It could be a performance assessment done regarding the effects

of your technology's implementation in Vietnamese agriculture, or any other similar either formal or informal document. We would highly appreciate any extra information on the matter.

General information about the employee answering the Questionnaire

30. What is your position in the company?

\*

31. What is your gender?

\*

Male

Female

Drugo ...

32. How old are you?

\*

20 - 30

31 - 40

41 - 50

51 - 60

61 - 70

Drugo ...

Additional Documentation

If possible, please attach any additional documentation or information regarding your company that could have useful information regarding the implementation of the Industry 4.0 technology in small and medium-sized enterprises in the agriculture sector in Vietnam. It could be a performance assessment done regarding the effects of your technology's implementation in Vietnamese agriculture, or any other similar either formal or informal document. We would highly appreciate any extra information on the matter. If you happen to have any document of this kind, please forward it via email to any of the following addresses: [leire.sarasola@opendeusto.es](mailto:leire.sarasola@opendeusto.es), [majos.stanisic@gmail.com](mailto:majos.stanisic@gmail.com), [Catherine.mirkes@hotmail.de](mailto:Catherine.mirkes@hotmail.de).

Thank you very much!

We highly appreciate your collaboration.

## 10.4 Questionnaire for agricultural SMEs

We really appreciate your willingness to take part in this research project. In the following lines, you will find a questionnaire regarding some aspects of your company, divided in different sections. We estimate that finishing the questionnaire will take you approximately 25-30 min.

Data treatment and confidentiality: Your comments and responses during the questionnaire will be gathered for the unique purpose of the development of a UNIDO research paper on "Increasing trade capacities among developing country SMEs in the advent of the Fourth Industrial Revolution". Your answers will be kept either

credited to you (or the company you are representing) or anonymously, per your preference. Should you wish to keep all or a subset of your comments anonymous, please let us know via email as soon as you finished the questionnaire.

Which position do you hold within the company?

\*

Gender:

\*

Female

Male

Other ...

Age:

\*

20-30

31-40

41-50

51+

General questions about your company

1. Which sector does your company operate in (within agriculture)?

\*

2. How long has your company been active in this sector?

\*

0-1 years

2-3 years

4-6 years

7-10 years

More than 10

3. Where is your company located? (City, region)

\*

4. Number of employees working for your company:

\*

Less than 10

11-50

51-250

251 or more

5. Approximate annual revenue in Vietnamese Dong:

Less than 3 billion

Between 4 and 50 billion

50 billion or more

6. Level of technological innovation of your company (1 if your company follows a purely traditional way of agriculture, 5 if you usually implement modern technologies?)

\*

Purely traditional

1

2

3

4

5

Wide use of modern technologies and techniques

7. Principal client of the company: are your sales based on few & big clients or rather small & several ones? (1 if you only sell to a few number of big clients, 5 if you sell to multiple small clients)

\*

Few big clients

1

2

3

4

5

Several small clients

8. Principal supplier of the company: are your supplies based on few & big suppliers or rather small & several ones? (1 if you only buy from a few number of big suppliers, 5 if you buy from multiple small suppliers)

\*

Few big suppliers

1

2

3

4

5

Several small suppliers

Trade

9. Do you sell internationally?

\*

Yes

No

Other ...

If your previous answer was "No", please fill in section A (below); otherwise continue to section B

A10. What are the main reasons why you only sell nationally?

Lack of productive capacity

Lack of ways to reach out to customers in the international market

Logistical problems (lack of transportation or warehouse facilities required when participating in the international market)

No interest in expanding the market

Other ...

A11. Is your company planning on expanding your market internationally? (or nationally to other regions). Why/why not?

A12. Do you see any benefits in potentially being part of international trade?

A13. Do you see any drawbacks?

A14. Does globalization and the rapid spread of new technologies seem an opportunity or a challenge for your company?

Purely a challenge

1

2

3

4

5

Purely an opportunity

B10. How many years has your company been selling internationally?

0-1 year

2-3 years

4-6 years

7-10 years

More than 10 years

B11. How has the trend of your exports been during these years?

Regularly and steadily increasing

Overall increasing but not in a regular way

Neither increasing nor decreasing

Regularly and steadily decreasing

Overall decreasing but not in a regular way

B12. Which are the principal countries or regions you export to?

B13. Is your company planning on expanding your position on the international market? Why/why not?

B14. Which are the benefits you perceive from being part of the international market?

B15. Which are the drawbacks?

B16. Does globalization and the rapid spread of new technologies seem an opportunity or a challenge for your company?

Purely a challenge

1

2

3

4

5

Purely an opportunity

Technology

Throughout this section, we will address questions regarding Industry 4.0 related technologies. This concept could be defined in relation to emerging technologies: advancements in Internet of Things (IoT), big data and data analytics, robotics, autonomous systems, sensors and automation, and production methods, such as 3D printing. We will thus refer to these technologies as I4.0 related technologies.

17. Does your company use I4.0 related technologies?

\*

No

Yes

Other...

If your previous answer was "No", please fill in section A (below), if instead it was "Yes", please fill in section B.

A18. What are the reasons why you do not use I4.0 related technologies?

Lack of financial resources to purchase these technologies

We find the implementation process of these technologies difficult

We do not have the knowledge/skills to use these technologies even once implemented

We do not find these technologies interesting for our business model

Other ...

A19. Is your company planning on investing in any of them? Why/why not?

A20. What are the potential benefits you see from implementing these technologies?

A21. What are the potential drawbacks you see from implementing these technologies?

A22. Is your company planning on investing in any new technology not related to the ones addressed in the previous questions? (technologies not related to I4.0 technologies). If yes, which ones?

B18. Which technology within the spectrum of I4.0 technologies do you specifically use?

Internet of Things

Artificial Intelligence

Robotics

Big data & Data Analytics

Other ...

B19. In which areas do you use I4.0 related technologies?

Cultivation

Harvesting

Processing of the vegetables/fruits

Other ...

B20. How long have you been using these technologies?

0-1 year

2-3 years

4-6 years

More than 7 years

B21. What are the reasons why you decided to implement them?

To increase the productive capacity of the company

To make the production process more efficient and thus save in costs

To increase the quality of the output

Other ...

B22. Which company is the supplier of the I4.0 related technology implemented in your business?

B23. How did you finance the technology?

Savings from our company

Through a loan given by a private financial institution

Through a loan given by a public institution

Through a grant given by the government

Other ...

Regarding the implementation process of this technology/technologies...

B24. How long did the implementation of the technology take?

Less than 1 month

2-6 months

7-12 months

More than 1 year

We are still in the process of implementing it

B25. How easy was the implementation in terms of knowledge required?

Extremely easy

1

2

3

4

5

Extremely hard

B26. What are the major challenges you had to face during the implementation?

Effects of the technology after having been implemented:

B27. Where the first affects you noticed rather positive or negative?

Completely negative

1

2

3

4

5

Completely positive

Apart from these first effects, have you noticed effects on...

B28. Efficiency (time saving, number of employees required, ...). Please specify what were the specific effects on efficiency, if any, and whether they were positive or negative.

B29. Product outcome (quality, quantity, variety produced, ...). Please specify what were the specific effects on product outcome, if any, and whether they were positive or negative.

B30. Supplies needed (amount of needed raw materials, water, energy, pesticides...). Please specify what were the specific effects on supplies, if any, and whether they were positive or negative.

B31. Financial situation of the company (sales, income, profits, tax reductions, ...). Please specify what were the specific effects on the financial situation, if any, and whether they were positive or negative.

B32. Market and clients:

B32.1. Did you notice effects on the number of customers?

B32.2. Did you notice effects on the volume bought by each customer?

B32.3. Did you notice effects on the customer satisfaction or loyalty?

B32.4. Did you notice effects on customer segmentation, meaning geographical location of the customers? If so, did you notice effects on your capacity to sell internationally?

B33. From all these effects noticed, which were the most important or noticeable ones?

B34. What are the main challenges that your company faces regarding the use of Industry 4.0 technologies?

Understanding the technology

Introducing the technology to the company's employees

Maintenance of the technology

Other ...

B35. If you noticed positive impacts, in how many years do you estimate that the investment in I4.0 related technology will become profitable for your company?

0-1 years

2-3 years

4-6 years

7-10 years

More than 10 years

B36. How do your customers/consumers feel about the fact that you are using digital technology on your farms?

Overall positive

Overall negative

Indifferent

Other ...

Impressions & suggestions

37. Which is the main problem you see in the lack of implementation of I4.0 technologies in agriculture in Vietnam?

38. Would you have any specific suggestion for your government or UNIDO on how they could help you implement the Industry 4.0 technologies?

Additional Documentation

If possible, we would highly appreciate it if you could attach any additional documentation or information regarding your company that could have useful information regarding the implementation of the I4.0 technology in SMEs in agriculture sector in Vietnam. It could be, for example, a document regarding the implementation process, the tasks require for it, extra costs that the company need to consider regarding the usage of I4.0 related technologies, customer feedback towards the use of these technologies, etc. If you happen to have any document of this kind, please forward it via email to any of the following addresses:

leire.sarasola@opendeusto.es , majos.stanasic@gmail.com , Catherine.mirkes@hotmail.de .

Thank you very much for your cooperation.

We highly appreciate you having taken the time to go through this questionnaire.