The Integration of the Digital Economy and the Green Transition – Opportunities for Small and Medium-sized Enterprises

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Abstract—**Small and medium-sized enterprises (SMEs) play an important role in the development of national economies. The specificity of digital transformation in the conditions of green transition requires the disclosure of the problems and opportunities arising in their practice. Based on a conceptual framework of the digital transformation of SMEs in the context of the green transition, this study outlines some of these issues and opportunities through in-depth interviews with expert managers managing SMEs. The analysis of the results shows: the specificity of the problems of SMEs working in the field of production of organic food and bio products; the role of digitization of activities in the management of SMEs to support the transition to productions with minimal impact on the environment; the need to inform customers about the benefits of consuming products that do not endanger the environment; the need to explore the application of artificial intelligence in the field of ecological production. On the basis of these conclusions, a quantitative study of the problems and challenges faced by SMEs in the digitalization of their activities in the conditions of the green transition can be planned.**

Keywords—*SMEs, digital economy, green transition, in-depth interview*

I. INTRODUCTION

The application of digital technologies, as well as the reduction of the harmful impact of human activity on the environment, is a current topic of the modern economy.Digital skills and competences have an important role in increasing the possibilities of adaptation of human capital to the changing requirements of jobs and the labor market in the conditions of Industry 4.0. [1]. Globalization, changing economic and social conditions, the introduction of innovative digital technologies are some of the factors requiring the need for changes and restructuring of labor markets. Flexicurity is a holistic approach to labor market policy that provides workers with secure jobs the opportunity to quickly find new ones. Flexibility implies a smooth transition of workers to rapidly changing working conditions. Flexibility and security go hand in hand. [2]. In the exceptional difficult conditions in which modern business is to function, Industry 4.0 has become ubiquitous in the following economic areas, characterized by enhanced digital connectivity and mobility of people of active working age, whose existence has become part of the large digital community: [3]

- information and communication technologies;
- cyber-physical systems;
- storage and processing of large-scale data sets (so-called cloud systems);
- systems for modeling, simulating and virtual presentation of information;
- tools for interaction between humans and computing machines.

On the other hand, the role of small and medium-sized enterprises (SMEs) is very important for the development of national economies – within the European Union, SMEs provide employment to more than 100 million people and produce more than half of the GDP in Europe.Micro, small and medium-sized enterprises (SMEs) make up 99% of companies in the EU [4].They provide two-thirds of jobs in the private sector and contribute to more than half of the total added value created by businesses in the EU.In Bulgaria, small and medium-sized enterprises contribute to 75.7% of total employment and to 65.3% of the added value in the

economy in 2018. The combination of digitalization policies and orientation towards ecological sustainability of the economy in the context of the specifics of small/mediumenterprises can lead to a synergistic effect and deserves in-depth study and application of the results in practice.In the current development, a study is planned using the method of in-depth interviews with experts, in order to outline the opportunities and challenges for SMEs in the integration of digital and "green" solutions in their practice.

II.MATERIALS AND METHODS

A. The integration of the digital economy and the green transition

The development of modern economies and societies focuses on two issues: the potential of information and communication technologies (ICT) and the challenge of environmental sustainability."Digital economy" is a relatively new concept in policy development, replacing terms such as "information economy" (1970), "knowledge economy" and "e-economy" (1980), "new economy" (1990) or "network economy" and "Internet economy" (2000s).Although there is no single definition of the digital economy, there is general agreement on some basic principles [5].Digital transformation and in particular the use of information and communication technologies (ICT) is a comprehensive and long-term process that includes: the development of new technologies to improve production processes, which may include cloud computing, big data analysis, IoT (internet ofthings);improvement of business processes, including use of business decision support systems;improving customer service, including improving marketing solutions;building an organizational culture oriented towards digitalization-related changes.It can be said that the implementation of ICT fundamentally changes the way a business works in order to be more flexibly managed and bring more benefits to customers - digital transformation creates a new organizational culture oriented towards innovation and continuous process improvement.In the context of considering digitalization, we cannot ignore the entry of artificial intelligence into all spheres of production and business management.

There is no universally accepted definition of artificial intelligence (AI), but the term generally refers to a manifestation of digital transformation that involves the use of algorithms and machine learning to automate tasks that traditionally require human intelligence.This can include tasks such as speech recognition, text generation, image recognition and creation, and more.AI technologies can be used to automate routine tasks such as data entry or customer service inquiries, freeing up time and human resources for more complex and creative tasks.Automation is a broader category that includes any technology or process that reduces or eliminates the need

for human labor in a task or process.Digital transformation, AI and automation are related concepts, but each has different goals and use cases.By understanding these specifics, managers can make informed decisions about which technologies to implement in the production and management of the company and how to use them to achieve maximum effect.The focus of numerous publications by contemporary authors is the impact of digitalization on sustainable development, part of which is the transition to a green economy and the reduction of the impact of human activity on the environment.

B. Specificity and challenges for SMEs in the context of the digital transformation of SMEs in the conditions of the green transition

There are significant structural differences between SMEs and large enterprises.They become evident in the exploitation of resources, policy-making procedures and the structure of organizations [6].Due to the size of large enterprises (250+ employees), they tend to be bureaucratic, possibly specialized, highly standardized and formalized [7].SMEs, in contrast, tend to have informal procedures that extend to the loss of working relationships and lack of standardization [8].Bureaucratic structures would be less effective for SMEs due to their turbulent environment, which is oriented towards quick results, innovation and flexibility to adapt to new situations [9].Large organizations have several levels of management, resulting in top management being far from the point of delivery.In SMEs, hierarchies are flat and top management is visible to other employees, effective communication is facilitated and it is easier for managers to lead by example [8].The flexible work environment of SMEs, which is associated with flat hierarchies, allows top management to develop strong personal relationships with their employees [7], [8].However, it can also increase the potential for interpersonal conflict.Large organizations have a range of management styles, such as direct, participative or paternalistic.Employees are often evaluated based on their performance, leaving less room for personal relationships [6].The culture of a large organization is usually diversified and inert due to the number of employees, departments and business functions, while the culture of an SME tends to be more unified and fluid [7], [9].Due to limited financial resources and the lack of qualified specialists, SMEs have limited opportunities for staff training and development.Large organizations, on the other hand, plan their staff training on a budget and implement it on a large scale [6].Overall, this leads to a defining difference between the two forms of organizations.

Although large companies are system-oriented, they are also less innovative and responsive to changes in customer demand; take longer to respond to environmental changes, and experience a high degree of resistance to change [9].SMEs, in contrast, are people-

oriented, can more easily respond to market needs, adapt to change, and use their innovative capabilities to meet customer demand [8], emphasizing everything that ensures their competitiveness.Sustainable development is also a serious precondition for achieving high quality. By adopting the principles of sustainable development, enterprises can not only gain a competitive advantage in the market but also promote a positive reputation and increased public prestige [11], p. 383.

One of the challenges for SMEs is the identification and subsequent legal protection of intellectual property objects, which can also create a competitive advantage.These issues are extensively discussed in the available literature. [12], [13], [14], [15].

According to the literature review, the challenges facing SMEs are reflected in the following aspects: (1) Manpower constraints in small businesses, each employee has a key role, sometimes several, resulting in few free resources [16].Allocating employees to a project will leave them with less time for their actual work, a reason why management often views employee training as a waste of time and why a small workforce is considered a critical failure factor for SMEs [8].Smaller firms tend to allocate more of their internal resources to administrative functions than larger firms.(2) Financial constraints The lack of financial resources of SMEs implies that companies cannot afford large investments in technology, sufficient infrastructure and staff training, although these are considered critical for reducing the time to implement continuous improvement methodsand ultimately lead to savings and reduced labor costs [8].(3).SMEs are more dependent on the administrative environment, economic shocks and market contingencies (e.g. the health crisis caused by COVID 19).

The conceptual framework of the digital transformation of SMEs in the conditions of sustainable development, of which the green transition is a part (Figure 1), was presented in a previous publication and was considered in the context of the threats and opportunities determined by the specifics of the functioning of SMEs in the country [17].

In the research area thus delineated, the questions are posed to highlight the main issues and challenges faced by SMEs in this context.To outline these problems and challenges, qualitative studies are suitable, which do not lead to the collection of representative data, but are the basis for revealing possible answers to the questions posed in the researched area.For the purposes of the present study, the method of in-depth interviews with experts from practice was chosen.

C. Research methodology

The in-depth interview method is widely used in the field of marketing research as part of the collection of formative data.This research method belongs to the

qualitative methods, which means that the aim is not to collect representative data and a representative sample is not necessary.The aims here are to uncover personal opinions, motivations and attitudes that can be valuable in planning quantitative research and in particular in generating research hypotheses about the main research questions.
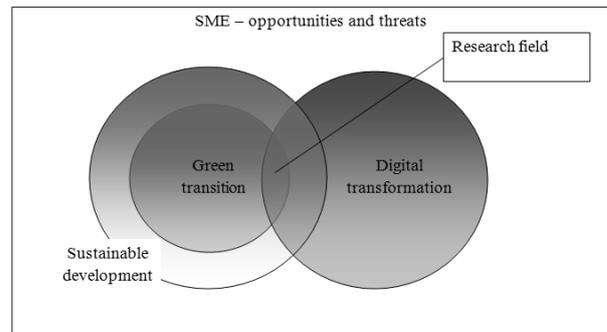

Fig.1. Conceptual framework of the digital transformation of SMEs in the conditions of sustainable development, part of which is the green transition

Advantages of in-depth interviewing:

• The main advantages of qualitative methods – they are creative and can lead to valuable discoveries;give greater freedom to the researcher and do not require a representative sample.

• Advantages of personal contact – interviewers can create a sense of trust in interviewees, resulting in honest responses.

• Interviewers have the opportunity to clarify the meaning of the questions, to deepen the conversation based on the answers already received, as well as to return to already discussed questions to clarify more fully the opinions, motives and attitudes of the interviewees.

• Interviewers can also receive non-verbal information by observing the displayed emotions and characteristic speech of the interviewees, including by observing "body language".

• Possible distractions and deviations from the issues discussed during focus group discussions are avoided.

• They are suitable for researching the opinion of experts in a given field, in this case – managers of small and medium enterprises.

The purpose of the conducted in-depth interviews is to outline the main challenges facing SMEs and the directions in which they achieve results in the field of digitization of their activities in the conditions of the green transition.For this purpose, surveys were conducted using the in-depth interview method with several leading managers of SMEs.The results will be used to plan a quantitative survey among SMEs in certain regions of Bulgaria.

Questions included in the interview:

- *What are the characteristics of SMEs in Bulgarian conditions - advantages and disadvantages? What are the advantages of large companies in the implementation of ICT?*

- *are the advantages of large companies in the introduction of green technologies?*

- *Are there negative impacts due to the physical development of productions as a result of the use of ICT (eg pollution and energy consumption for production and for disposal, etc.)?*

- *What Are there positive impacts due to the opportunities created by the application of ICT to optimize unsustainable pollutant/water consumption processes (ie energy saved by using consumed ICT in applications)?*

- *Are there impacts as a result of replacing some activities with digital task performance, for example avoiding travel?*

- *Are there any impacts on the company, especially on marketing decisions? Is AI being used to improve the site and customer contact?*

- *What are ICTs mostly used for - to improve production processes, to optimize management decisions or to improve customer contacts?*

III. Results and Discussion

A. Analysis of the results of the conducted interviews

Some small companies, whose representatives were interviewed within the framework of the present study, have started their activities in the field of production of organic food and other biological products.One of these managers pointed out that the company operates with a **completelycarbon neutral footprint**, and by digitizing production processes, the impact of production on the environment is taken into account at all times.A medium-sized company points to experience in the digitization of production processes, which leads to a significant environmental effect - **recycling production machines** (including those of competing companies) with 3D printed parts and achieving less production waste.In some industries, waste is recycled into 3D printing material instead of being thrown away and polluting the environment.SMEs in Bulgarian conditions are more flexible and there are no particular restrictions on their activities.A limitation is that they have a smaller financial resource and cannot take advantage of a ready-made development by purchasing it in the form of a patent or license, and own developments require additional investment.

Difficulties in legalizing innovative materials, for example materials from sugarcane and bio plastics, and especially materials intended for use in construction, are an obstacle for both large, medium and small companies.There are also problems to be solved at national and European level - for example the introduction of a digital passport of the material - based on tracking how it was before and after recycling.As a rule, there are no negative influences due to the physical development of productions as a result of the use of ICT.Sometimes there is a need to expend energy to recycle the materials, but these additional needs are offset by renewable sources.The benefit of recycling is greater because it **reduces the use of plastic**, reduces the use of water and energy to produce it, and ultimately makes production cheaper.

The search for ways to avoid environmental pollution and the introduction of waste-free technologies leads to directing the thinking of managers in the direction of greening production processes and minimizing the footprint on the environment.Some of the interviewees indicated that they faced bureaucratic and corruption obstacles in financing.There are also legal and regulatory barriers to the import and production of organic foods.

The lack of consumers preferences towards ecological products, in particular – packaging, is often pointed out.

The low level of consumer awareness of the offer of organic products and products produced using ecological technologies, as well as the insufficient efforts of companies in the field of offering these products has been detected. Some activities are replaced by digital performance of tasks - they rely on online trade, advertising and make contacts with foreign partners and end customers.ICT is used to a large extent to **improve production processes** and to **establish contacts with customers**, relying mainly on online sales.Some of the interviewees have a vision of **using artificial intelligence (AI)** in the field of company management.This can be done in at least two ways:

• **Improving company's site management** and customer service: With the help of AI capabilities, the preferences and rhythm of submitting requests from current customers, as well as trends in the searches of potential customers can be studied.Customers can be assisted in the form of consultation and answering questions through artificial intelligence-based software. The growing number of online customers leads to the need to implement more and more automatic business solutions - these solutions can be in the field of predictive models, optimization methods, language models, etc.;

• **Cyber security management** - regardless of the specifics of their activity, all companies are potentially at risk of breaches in the security of this data, at least through their contacts with various partners.AI-based

software can detect threats to company data, for example by detecting unusual Internet activity.The summarized results of the conducted interviews can be presented schematically, finding the opinions expressed more than once by SMEs, manufactured organic products and SMEs from other industries - table 1.

Table 1. Summary results of the conducted interviews

SMEs	Digitization of the activity	Digitization contributing to greener production	A vision for using artificial intelligence
SME producers of organic products	Digitization of production processes and customer service	Achieving zero impact on the environment through digitization of production processes	-
SMEs in other industries	Digitization of production processes and customer service	Recycling of details and materials	To improve customer service; To manage cyber security

B. Discussion

The results obtained outline certain issues and opportunities that should be addressed further, including quantitative research.One of the problems facing SMEs is the low level of awareness in the markets about the benefits of products, firstly aimed at improving the quality of life of end users (organic food and organic products) and secondly - those whose productionand consumption does not harm the environment.It is necessary to determine how **campaigns to inform consumers about the benefits of these products** affect consumer attitudes and sales volumes.Special attention should be paid to the **market of organic foods and nutritional supplements** and the market results of companies specializing in their production.Such firms should be represented by a **separate quota in the sample in quantitative research.**

As found from the answers of the interviewees, **technologies for material recycling** are entering the practice.It is necessary to investigate the attitude of managers regarding the introduction of waste-free technologies and technologies for recycling materials used in production.This research should take into account, firstly, **the immediate benefits** of the introduction of technologies and secondly, **the impact of this process on the company image.**

Problems and opportunities are also determined by the use of artificial intelligence for the purposes of company management.In the in-depth interviews conducted, some of the respondents indicated that they use the capabilities of artificial intelligence tools that are not specialized for their specific company goals.The

experience of large companies shows that it is possible to develop and use specially developed and company-oriented AI systems.However, this requires resources that SMEs generally do not have.Therefore, SMEs need their **own strategy for using a combination of AI tools** to optimize their results while using limited resources.

AI tools can be used to create digital images of the "ideal customer" and "problem customer" to serve as a basis for segmenting markets and optimizing customer service.

The obtained results are the basis for planning a quantitative study that will discover the most common problems and opportunities facing SMEs in the digitalization of production and management processes in the conditions of transition to a green economy.The questions through which quantitative data will be collected should follow the logic of the questions asked in the in-depth interviews and the possible answers that emerged as a result of them.

IV. CONCLUSIONS

The results of the conducted in-depth interviews show, **first of all,** that SMEs working in the field of bio-food and bio-products production should be considered separately and in more depth, as they have a certain specificity - their very activity is aimed at minimizing harmful effects on consumers and the environment.

Second, the digitization of SME management activities can support the transition to production with minimal (or even zero) environmental impact.

Third, attention must be paid to the challenges in the area of informing customers and the public about the benefits of using products (including packaging) that do not endanger the environment.

Fourth, the application of artificial intelligence in the field of ecological production, which is yet to be developed, should be explored. The outlined main challenges for SMEs in the field of digitization of their activity in the conditions of the green transition will serve to plan a quantitative study in this area.

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