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D.1.1.1 National Skills Gaps and Needs Analysis: Bulgaria

06/2024

RAPIV

Versioning and Contribution History

Version	Date	Author/Editor/Contributor	Description/Comments
01_1	23.05.2024	Ralitsa Zhekova and Mariya Zlateva/ RAPIV	Draft Chapter 4 Bulgaria
01_2	04.06.2024	Mariya Zlateva/RAPIV	Draft Chapters 1; 2; 3; 5; 6; 7; 8
01_3	25.06.2024	Miglena Pencheva/ VFU	Interviews with stakeholders under Chapter 7
02	27.06.2024	Ralitsa Zhekova and Mariya Zlateva/ RAPIV	Final version

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Abbreviations and glossary of terms

AI	Artificial Intelligence
AT	Austria
ASP	Associated Strategic Partners
BH	Bosnia and Herzegovina
BG	Bulgaria
CE	Circular Economy
CZ	Czech Republic
DE	Germany
DR	Danube Region
EU	European Union
HR	Croatia
HU	Hungary
i4.0	Industry 4.0
IoT	Internet of Things
LCA	Life Cycle Assessment
LP	Lead Partner
MD	Moldova
NGO	Non-Government Organization
PP	Project Partner
R&I	Research and Innovation
RO	Romania
RS	Serbia
S3	Smart Specialization
SK	Slovakia
SL	Slovenia
SME	Small and Medium Enterprises
SO	Specific Objective
STEM	Science, Technology, Engineering, and Mathematics

1 Executive summary

The National Skills Needs and Gaps Analysis synthesizes the current state of women entrepreneurs in Bulgaria and their specific needs for circular and digital transitions. The analysis employs four methodological approaches to describe the situation and derive policy recommendations and conclusions. The analysis employs four methodological approaches to describe the situation and derive policy recommendations and conclusions: (1) analysis of secondary data from various national and international institutions, (2) quantitative research results based on a survey of women business (co-) owners, (3) qualitative research based on interviews with key stakeholders; and (4) interview-based case studies.

Main conclusions, triangulated by different methods, are as follows:

- The Bulgarian ecosystem for supporting women entrepreneurs is well-developed and includes various organizations offering different types of support. However, most of this support is sporadic, tied to project implementations, and difficult to sustain after project completion.
- Women are more active than men in participating in non-formal training. Although they expressed a need or desire for specific training, many could not attend. The primary obstacles are a lack of free time, high costs for educational programs, and family responsibilities.
- The primary motivations for women entrepreneurs to adopt circular business models include management mindset, know-how, and personal commitment to the green transition, followed by the necessity to reduce raw material costs and meet customer expectations for green products and services. Surprisingly, role models are not indicated as a driver for adopting circular practices. In terms of digital technologies, the main motivations are securing a competitive advantage, improving operational efficiency and quality, and reducing operational costs.
- As expected, the main challenges for women entrepreneurs include access to finance, followed by a lack of information about suitable opportunities and insufficient knowledge and skills in applying circular aspects. In addition to training and finances, they emphasize the need for suitable, understandable, and practical information on the application of circular business models, along with

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simplified and adequate funding procedures tailored to micro and small companies. The primary barriers to adopting advanced digital technologies in female-owned companies are high investment costs, a lack of skilled staff, and insufficient public support in terms of funding and training. Financial support remains the primary missing resource, often linked to the additional time required to work towards Industry 4.0 goals, which may involve hiring new employees or finding suitable resources outside the company.

- Importance of appropriate training for female businesses is noted during and after the times of crisis. They used different types of support to "restart" their businesses, mainly by joining formal/informal communities of (women) entrepreneurs, utilizing business development services, and participating in training, mentoring, or coaching to improve digital skills. Those who did not use specific support expressed regret, acknowledging that such options could have been beneficial for their companies.
- Analyzing the aspects in the success of development and application of circular technology, we can see that the most helpful for women entrepreneurs are mentoring, training, market research, networking and collaboration with experts and peers, as well as attracting financing from public grants, VC, investors.
- The most important topics for training programs for both digital and circular transitions should include: understanding the role of AI in business processes, integrating circular economy principles, process digitization and data analysis, using digital marketing tools, ensuring cybersecurity, developing and adopting digital and circular business models and technologies, learning recycling methods and testing recycled products, optimizing time, resources, and materials, and improving work efficiency. Additionally, training should cover access to finance, application of circular economy in specific sectors (e.g., Food and Agriculture, Textile and Fashion, Manufacturing, etc.), digital skills for circular transition, legal frameworks, fully integrated digital processes, and resource optimization (time, personnel, investments).
- Finally, it is recommended that policymakers should put more effort into providing specific governmental measures to support women entrepreneurs in digital and circular transitions, skill development, and the adoption of circular business models and technologies.

2 Introduction

This National Report for Bulgaria is an integral component of the Transnational Skills Gaps and Needs Analysis, aimed at dissecting the unique barriers and opportunities that lie within Bulgaria's transition to a more circular, innovative, and digital economy. Through a meticulous examination of the current state, this report endeavors to illuminate the path forward, identifying specific needs and proposing strategic interventions to empower women entrepreneurs in the realm of CE, S3, and i4.0.

Amidst the backdrop of a global pandemic and shifting geopolitical landscapes, the urgency for this analysis has never been greater. The resilience and agility of economies hinge on its ability to harness the potential of its female entrepreneurs, equipping them with the skills and knowledge to thrive in an increasingly competitive and sustainable marketplace.

This report synthesizes data collected from a comprehensive survey, stakeholders' interviews, and case studies, offering a nuanced understanding of the skills landscape in Bulgaria. The objective is not only to chart the existing skills gaps but also to forge a roadmap for capacity building, policy intervention, and collaborative action that aligns with the nation's aspirations for economic revitalization and gender equity in entrepreneurship.

As we delve into the findings and recommendations herein, it is our hope that this report will serve as a catalyst for concerted efforts to bridge the skills divide, fostering an environment where women entrepreneurs can lead the charge towards a brighter, more sustainable future.

3 Methodology

Desk research, surveys, stakeholder interviews, case studies, and comparative analysis are used for to ensure a robust and inclusive analysis. By employing a multi-dimensional methodology, a detailed and nuanced understanding of the skills gaps and needs among women entrepreneurs in the Danube Region is aimed to be provided. This approach ensures that the analysis is both broad in its scope and specific in its findings,

providing a solid foundation for the development of effective support strategies for the transition towards a more sustainable, digital, and circular economy.

Table 1: Methodology applied

Approached applied	Description of the performed task
Desk research	Review of recent national statistic data, available strategic programme plans and analysis is made in order to be established a baseline understanding of the current skills landscape for women entrepreneurs in Bulgaria.
Survey among women entrepreneurs	The analysis incorporates results from survey conducted among women entrepreneurs form Bulgaria. It was organized in the period 14/04/2024 – 27/05/2024. 250 of respondents were identified from different sectors and questionnaires were provided to them by SurveyMonkey platform. Additionally, post in social media was shared. The survey provides both quantitative data and qualitative insights to analyze prevailing skills gaps and needs. 33 of responses are collected which is equal to 13.2% responding rate and could be accepted as sufficient for the main goal of the current Analysis.
Stakeholders interview	In-depth interviews with industry experts, policymakers, and academia, for better understanding the broader ecosystem and support structures for WEs are made. 4 types of were contacted and 3 of interviews are done. Through them are explored perceptions and suggestions for facilitating a successful s3 and i4.0 transition under CE aspects of WEs in Bulgaria.
Successful case interviews	One interview with WE who has effectively implemented circular transition is conducted aiming to be identified the motivational and successful factors which helped the WE through this process focusing on obtaining the necessary skills.

To effectively understand the dynamics of the skills gap and needs within Bulgaria, a carefully curated sample of women entrepreneurs and female-led startups has been

selected for this study. This sampling approach is designed to ensure a comprehensive analysis that reflects the diverse sectors and regions within the country. By examining a representative cross-section of businesses, this investigation aims to identify prevalent challenges, opportunities for growth, and specific skills necessary for thriving in the realms of the Circular Economy, Smart Specialization, and Industry 4.0. This methodological step is crucial for deriving actionable insights and tailored recommendations that will empower women entrepreneurs to navigate and succeed in the evolving economic landscape of Bulgaria.

In the following text, a detailed structure of the sample comprising women entrepreneurs who participated in the survey is presented, along with the demographics of the interviewees, and an illustrative case study.

4 Bulgaria

4.1 General presentation of Bulgaria

The Republic of Bulgaria is a country located in South-eastern Europe. It is bordered by Romania to the north, Serbia and Republic of North Macedonia to the west, Greece and Turkey to the south, and the Black Sea to the east. The capital and largest city is Sofia; other major cities are Plovdiv, Varna and Burgas. With a territory of 110,994 square kilometres (42,855 sq mi), Bulgaria is Europe's 16th largest country.

By 31.12.2023[1], the population is 6 445 481 persons. Male population was 3 097 698(48.1%) and female - 3 347 783(51.9%). Males prevail among the population aged up to 55 years.[2] (Figure 1)

[1] National Statistical Institute. (2023) *Population and Demographic Processes in 2023.* https://www.nsi.bg/sites/default/files/files/pressreleases/Population2023_en_ZYBLHGJ.pd

[2] ibid

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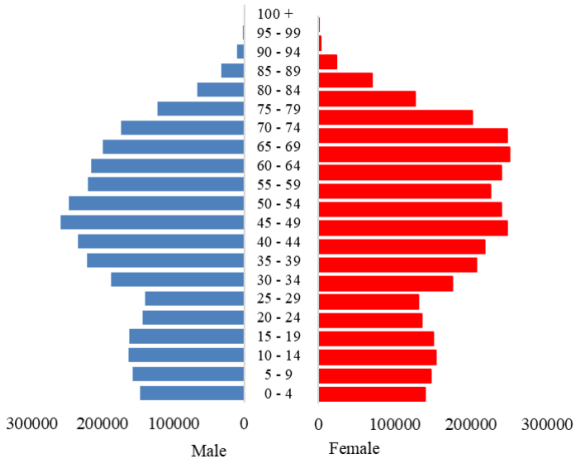

Figure 1. Population of Bulgaria by age and sex

While women enrol and graduate mostly from general education schools, men were in a majority among vocational education. The highest number of persons enrolled in vocational programmes for acquiring a level of professional qualification was found in the field of 'Engineering and engineering trades' where males were considerably more than females. The most common fields of education among women were 'Personal services' and 'Business and administration'.

Furthermore, by 2021 more women (662 600) attended university than men (453 500) and in the last five years more women (192 421) graduated universities that men (124 396). [3]

There were also considerable differences by gender among the enrolled and graduates in the different areas of tertiary education. Men dominated fields were 'Engineering, manufacturing and construction', 'Business, administration and law' and 'Services' while women were the majority among the fields of 'Business, administration and law', 'Health and welfare' and 'Education'.

According to the survey (2022)[4], 637.9 thousand persons (18.9%) aged 25 - 64 participated in at least one non-formal training in the last 12 months.

[3] National Statistical Institute. (2021). Statistical data on monitoring of the labour force. https://www.nsi.bg/bg/content/4018/%D1%81%D0%BF%D0%B5%D1%86%D0%B8%D1%84%D0%B8%D1%87%D0%BD%D0%B8-%D0%BF%D0%BE%D0%BA%D0%B0%D0%B7%D0%B0%D1%82%D0%B5%D0%BB%D0%B8

[4] National Statistical Institute. (2023). Main Results from the Adult Education Survey 2022. https://www.nsi.bg/sites/default/files/files/pressreleases/AES2022_en_H7E93CU.pdf

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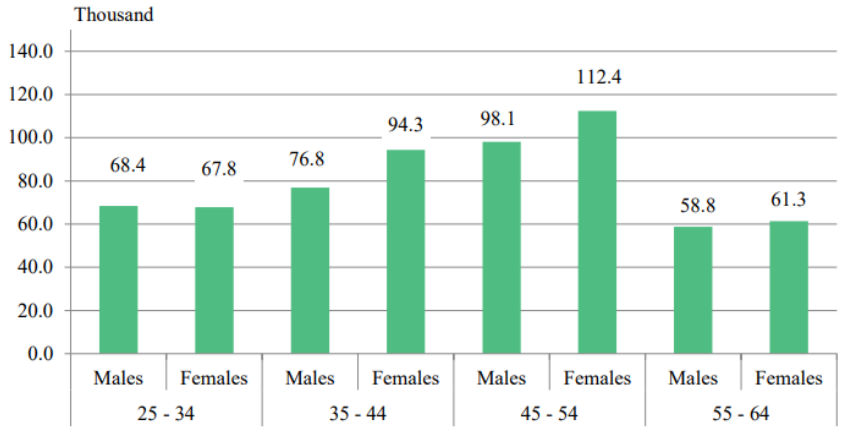

Figure 2. Participants in non-formal education and training by age and sex

Women were more active than men (Figure 2). When it comes to search of information on education and training possibilities, women were more active than men - 8.0% and 5.1%, respectively. From those who searched for information, 84.0% persons have found opportunities for inclusion in education or training. According to the source of the information obtained - the highest share were from educational and training institutions (53.7%) and employers or future employers (40.0%).

According to the results from the survey, 11.8% of the population aged 25 - 64 declared the need or wish for a particular training, but had failed to participate in the last 12 months. The main obstacles for participation in education and training were: lack of free time (36.1%), too high costs for the educational program (22.5%) and family responsibilities (10.4%).

Industry and business size are two of the most important predictors of business outcomes.

In 2021[5], there were approximately 381 457 SMEs operating in Bulgaria, with the vast majority of these (92.8%) being micro-sized enterprises that employed between zero and nine people. The number of persons in the "10 and more employed persons" group constituted 67.1% of the employed, while the share of enterprises in this group was only 7.2% of the total number of active enterprises. The large number of active enterprises in the "0 employees" group (52.2%) forms 8.7% of the total number of employed people in the country.

[5] Национален статистически институт (2022). Демография на предприятията 2021 г. https://www.nsi.bg/sites/default/files/files/pressreleases/BDE2021_B2WX3YK.pdf

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The share of women self-employed in Q.1 of 2024[6] is 39.45% from the total amount of self-employed (191 400). This rate for women-managers of the companies for the same period is a little bit higher - 41%.

Most of SMEs are operating in the wholesale and retail trade sector, followed by professional, scientific and technical activities and manufacturing. The most viable were the enterprises in the following sectors: 'Mining and quarrying', 'Water supply; sewerage, waste management and remediation activities', 'Electricity, gas, steam and air conditioning supply'.

In Bulgaria, women tend to run smaller, younger firms in different industry sectors, relative to the numbers of men doing so.

4.2 Female entrepreneurial ecosystem in Bulgaria

Since Bulgaria joined the EU in 2007, state policies are almost entirely outlined in strategic documents developed at the request of the EC. The European Structural Funds through national operational programs become the main and almost unique source of state-level governance initiatives and become a key factor for the growth of the national economy. A significant number of policy measures in support of SMEs - eJustice and e-government strategies, a new Public Procurement Act and a better regulation program (including the impact assessment and impact assessment guidelines) have been adopted in 2014 and the first quarter of 2015. The gender equality policy is horizontal and unites the actions of the executive at all levels. This policy is conducted via combined implementation of integrated (mainstreaming) approach and temporary stimulation (targeted) measures, requiring an effective national institutional mechanism. Currently there is no specific law, strategic or other policy instrument for women entrepreneurship support. There are some policy attempts to include the gender issues with different measures for support under Operational Programs but it still not enough. The main responsible stakeholders are: Ministry of Economy and Ministry of Labor and Social Policy.

6 National Statistics Institute. (2024). Employed and employment rates - national level; statistical regions; districts https://www.nsi.bg/en/content/3996/employed-and-employment-rates-national-level-statistical-regions-districts

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The promotion of entrepreneurship and in particular women's entrepreneurship is based on the following strategic documents:

- The Single Market Programme and competitiveness of enterprises, including small and medium-sized enterprises 2021-2027.
- National Development Programme: Bulgaria 2030.
- National Recovery and Resilience Plan of the Republic of Bulgaria.
- National Strategy for Small and Medium-sized Enterprises 2021-2027.
- Innovative strategy for smart specialization of the Republic of Bulgaria 2021-2027.
- Programme " Competitiveness and Innovations in SMEs " 2021-2027.
- Programme "Human Resources Development" 2021-2027.
- Program "Research, Innovation and Digitization for Smart Transformation" 2021-2027.

Innovation Strategy for Smart Specialization (ISIS) 2021-2027 defines five thematic areas where Bulgaria has a competitive advantage and capacity for smart specialization and should focus its efforts on their accelerated development:

- Thematic area "Informatics and ICT" (Information and Communication Technologies)
- Thematic area "Mechatronics and Microelectronics"
- Thematic area "Industry for Healthy Living, Bioeconomy and Biotechnology"
- Thematic area "New technologies in the creative and recreative industries"
- Thematic area "Cleantech, circular and low carbon economy"

Digitalisation in the context of Industry 4.0 is included as a horizontal priority and is present in all five thematic areas of smart specialisation.

Bulgaria ranks last among the EU countries in terms of the adoption of digital technologies in enterprises. Only 33% of small and medium-sized enterprises (SMEs)[7] have at least a basic level of digital intensity (compared to an EU average of 60%). Only 8% of Bulgarian SMEs sell online (compared to the EU average of 17%). Only 3% of SMEs make cross-border sales online (compared to 8% in the EU) and only 3% of turnover

[7] Агенция за насърчаване на МСП. (2023). Състояние на малките и средни предприятия в България през 2022 г. Развитие и тенденции във времена на предизвикателства. https://www.sme.government.bg/uploads/2023/03/%D0%94%D0%9E%D0%9A%D0%9B%D0%90%D0%94_%D0%9C%D0%A1%D0%9F-2022.pdf

comes from the online segment (compared to 12% in the EU), and 6% of enterprises use large data sets. Artificial intelligence is relatively widespread, used by 31% of enterprises, compared to an EU average of 25%. Bulgaria scores well in the use of ICT for environmental sustainability. In parallel, the national SME strategy focuses on supporting SMEs that innovate.

Bulgaria is among the least performing member states in the implementation of measures in the area of the circular economy, in accordance with the European action plan for the circular economy. Resource efficiency is usually measured by the "resource productivity" indicator, which leads the formation of the Resource Efficiency Index and indicates the use of material resources in terms of economic growth. In 2020, resource productivity in Bulgaria remains one of the lowest among Member States, as well as compared to the EU average. Despite these low levels, resource productivity in our country in 2020 is growing by more than 30% compared to 2000, but represents 36.7% of the EU average. By all accounts, this growth in resource productivity is insufficient.

The number of enterprises active in the field of **waste collection and disposal** during the period under analysis was just under 600. They employ around 15 thousand people and generate an added value of EUR 172 million with a productivity of EUR 11,3 thousand per employee. The number of employees has remained virtually stable over the period under analysis, with other indicators increasing in the range of 20% to 30%. The other group of enterprises, with the business activity 'Recovery and other waste management services', is significantly smaller, around 65. The average number of employees in the period under analysis was around 900, generating EUR 11 million in added value with a productivity of EUR 12,7 thousand per employee. It is characteristic of this group of enterprises that the strong upward trends in the number of employees and enterprises, as well as in the value added produced, is associated with a reduced labour productivity of 13.6%.[8]

Some of the key actors in Bulgarian ecosystem supporting digitalization, circular transition and women entrepreneurship are presented in Table 1:

[8] Агенция за насърчаване на МСП. (2023). Състояние на малките и средни предприятия в България през 2022 г. Развитие и тенденции във времена на предизвикателства. https://www.sme.government.bg/uploads/2023/03/%D0%94%D0%9E%D0%9A%D0%9B%D0%90%D0%94_%D0%9C%D0%A1%D0%9F-2022.pdf

Table 1: Key actors in Bulgarian ecosystem per types

Type of the actor	Title of the organization
Public institutions	○ Ministry of Innovation and Growth, GD European Funds for competitiveness - OP "Competitiveness and Innovations in SMEs"; OP "Research, Innovation and Digitization for Smart Transformation"; Recovery Plan - Support for the transition to a circular economy in enterprises. ○ Ministry of Labour and Social Works – OP Human Resources Development ○ Municipalities ○ Fund of the Funds ○ Bulgarian Small and Medium Enterprises Promotion Agency
SMEs	○ Zero Wave ○ ONDO ○ Agriffin Ltd ○ Eurotex Ltd, etc.
Investors/ Financial institutions	○ Launch Hub Ventures, Eleven, Neveq, Bright Cap Ventures, Empower Capital, Black Peak Capital, Rosslyn Capital Partners, BBF Angels Club, CEO Angels Club, etc ○ First Investment Bank, Bulgaria
Business support organizations	○ Regional Agency for Entrepreneurship and Innovations – Varna ○ Bulgarian association of women entrepreneurs ○ Bulgarian Chamber of Commerce and Industry ○ ICT Cluster Varna ○ AI Cluster Bulgaria ○ BESCO – Bulgarian start-up Association ○ Selena – Association of women entrepreneurs in Bulgaria ○ Sofia Tech Park
Interested organizations, incl. NGOs	○ Bulgarian Fund for Women ○ Move.bg ○ Bulgarian Association Circular Textile ○ AgroHub ○ Bulgarian Association Circular Economy and Biotechnology ○ F.A.M.E Foundation ○ Institute for Technology Transfer and Innovations ○ Institute for Circular Economy
Academia/ research/ education and training centres	○ Varna Free University "Cherorizets Hrabar" ○ University of Economics – Varna ○ AgriVentures ○ Bulgarian Entrepreneurship Centre ○ Smart Varna Foundation

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Female entrepreneurship support programmes and instruments in Bulgaria can be grouped into funding source and clustered by type of support:

First, one of the potential funding sources can be the governmental institutions that are supporting national, regional and international programmes through various instruments - the main programmes available for female entrepreneurship support are within Programme “Competitiveness and Innovations in SMEs”, Programme “Human Resources Development” and Program "Research, Innovation and Digitization for Smart Transformation". However, it is still not clear whether there will be specific calls for female entrepreneurship support.

Second, there are private initiatives that are usually developed by corporations or by private actors – i.e. banks, VC, business angels, etc. However, none of the VCs and business angels clubs operating in Bulgaria specifically targets women entrepreneurs.

Academy for Women Entrepreneurs (AWE) is a perfect example of a ‘franchise programme’, developed in the US and designed to be able to scale, empower and promote the entrepreneurial spirit of women around the world. It is implemented by the national Embassy based on a national partnership with governments, but usually having a local NGO running it. The Unique Value Proposition (UVP) consist in the online platform DreamBuilder and several months of online training, mentoring, networking, and pitching, culminating in providing EUR 5,000 grant to leading finalists. However, there is a challenge that this program is based on a single project may lack the financial sustainability in the future. Their role is to fill an existing demand, but there is no possibility to foresee their continuation on the long term.

Smart Lady (BG) was launched by the private Bulgarian bank - Fibank in 2018 and is designed for women in business. It combines business and personalized support: credit opportunities, additional health insurance, support when applying for EU funded projects, a loan when the application is successful, reduction of payment during maternity leave, etc. In addition to the funding it provides, this programme manages to offer training programmes. Overall, it has been quite successful, having gathered 350 beneficiaries as of this writing.

The instrument seems to provide a consistent amount of money and to be continuously present on the international markets and enables the creation of a community of

female alumni entrepreneurs. However, they usually suffer from insufficient provision of ecosystem services, which are more related to accelerator programmes.

Third, EU funding covering usually projects and policy instruments specially dedicated to female entrepreneurs. Examples of such projects are: “Promoting entrepreneurship among young women in the Danube region” is the first pilot programme for entrepreneurship training, developed under the project “DTP2-048- 1.2. Women in Business. It is implemented by the Regional Agency for Entrepreneurship and Innovation - Varna (RAPIV). Funding is assured by the EU Danube Transnational Cooperation Programme 2014-20 and project partners are from nine countries in the Danube region. It provides specialised entrepreneurship training, webinars, online mentoring and consultation meetings, access to the Women in Business training platform, and community membership. The period of implementation is three years (from 1 June 2018 to 31 May 2021).

Forth, Higher Education Institutions/Research Performing Organisations (HEI/RPO) implementing programmes where entrepreneurship, innovation and access to infrastructure are intertwined. There are a number of programs implemented, however only the Women Entrepreneurship Center established under DTP project Women in Business in Varna Free University is specifically targeting female entrepreneurs.

Fifth, NGOs – usually such programmes are implemented by organisations that are hosting incubation and acceleration programmes having a governmental mandate or based on public funding; the women entrepreneurship is supported by NGOs such as: Bulgarian Chamber of Commerce through the program MENTORITE, Bulgarian Women’s Fund; Association of Women Entrepreneurs in Bulgaria (Selena); Bulgarian Association of Women Entrepreneurs, RAPIV and others.

5 Analysis of skills gaps and needs of women entrepreneurs for digital and circular transition

A survey was conducted among women entrepreneurs – owners and co-owners of companies located in Bulgaria. The number of received responses is 33. The respondents managed to cover almost all the "main" sectors affected by the circular and digital transition, except for the sectors of "Energy," "Construction and Real Estate," and "Waste and Water Management," which are usually dominated by men.

The largest share of respondents is from sectors typically dominated by women, such as "Textile and Fashion" and "Retail and E-commerce" (15%). They are followed by the sectors "Food and Agriculture," "Technology, Electronics, IT" (12%), and "Consumer Goods" (11%) (Figure 3). The "Other" category includes companies providing services such as consulting, legal services, and education/training.

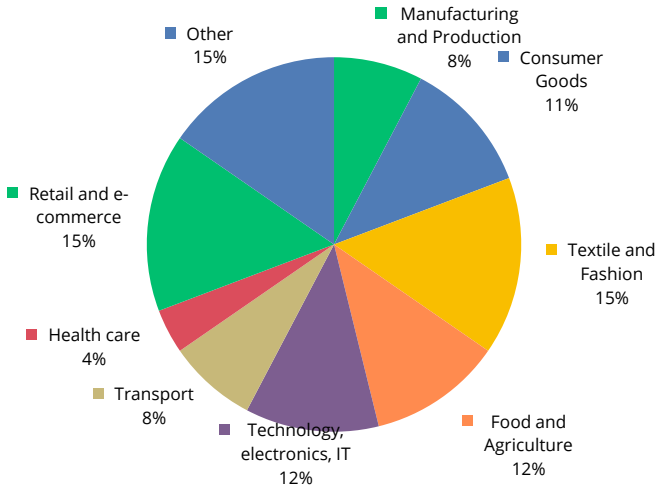

Figure 3. Distribution of responses per sector

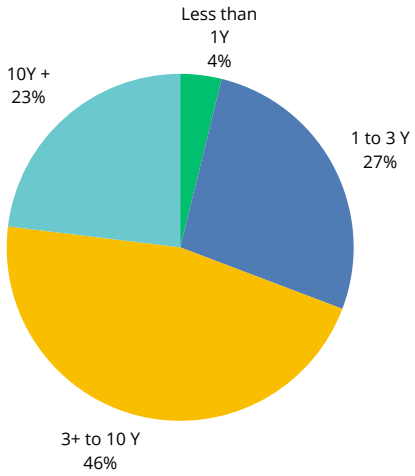

Figure 4. Years on the market

Almost 70% of the participants in the survey have more than 3 years of business experience. Regarding the size of the companies, 88% of them are micro and small (less than 10 employees), and the rest are mid-sized.

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5.1 Circular Economy

When it comes to familiarity with circular economy (CE) principles, it is interesting to note that 83% of the respondents have either a deep understanding (57%) or some awareness (26%) of the general concept of CE.

Women entrepreneurs are most familiar with strategies for keeping products and materials in use for as long as possible through practices like repairing, refurbishing, reusing, and recycling (57% fully; 30% partly), the use of renewable, recyclable, or biodegradable resource inputs to support circular production and supply chains (48% fully; 39% partly), and the concept of designing products and processes in a way that minimizes waste and pollution (43% fully; 35% partly).

On the other hand, they seem to be less familiar with the concept of Product as a Service, where businesses retain ownership of the product while selling the usage or service it provides (13% not familiar and 30% neutral), strategies for recovering and regenerating products and materials at the end of their service life (13% not familiar; 13% neutral), the idea of rethinking business models to encourage the use of products as services (e.g., leasing rather than owning) to maximize resource utilization (9% not familiar; 30% neutral), and the concept of regenerating natural systems, aiming to restore, renew, or revitalize their own sources of energy and materials (9% not familiar; 26% neutral).

No clear co-relation can be identified between different sectors or size of the company and the familiarity of women entrepreneurs with CE aspects.

As a positive sign, it can be noted that 74% of respondents apply some circular technology and/or circular business model. Notably, 87.5% of these respondents selected more than one of the answers. The most preferred option (68.25%) is related to minimizing waste and pollution in product and process design, followed by repairing, refurbishing, reusing, and recycling products (43.75%), and using renewable, recyclable, or biodegradable resources (43.75%) (Figure 5).

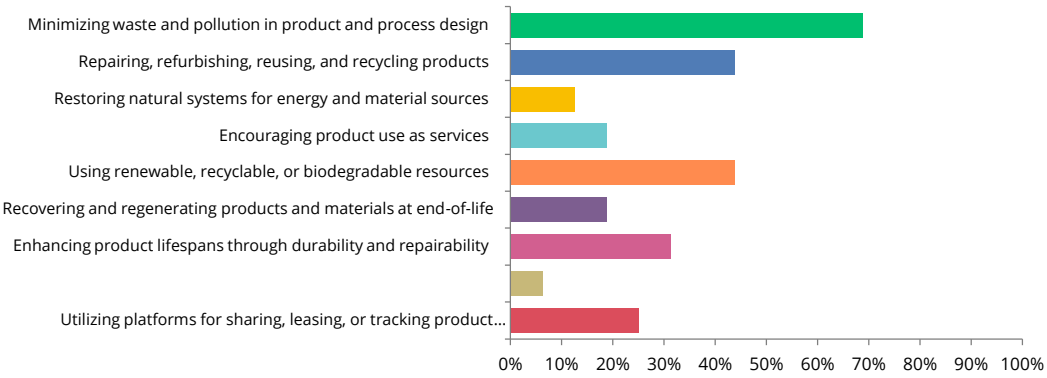

Figure 5. Type of applied circular technologies or business models

The most motivating factors for women entrepreneurs to apply circular business models indicated by respondents are management mindset, know-how, and personal commitment and engagement to the green transition (81.25%). This is followed by the necessity to reduce costs for raw materials, respond to customer expectations for green products/services, and ensure a competitive advantage through the application of digital technologies (50%). Surprisingly, role models are not indicated at all as a driver for the application of circular aspects in business. The reasons for this could be varied and should be further explored. (Figure 6)

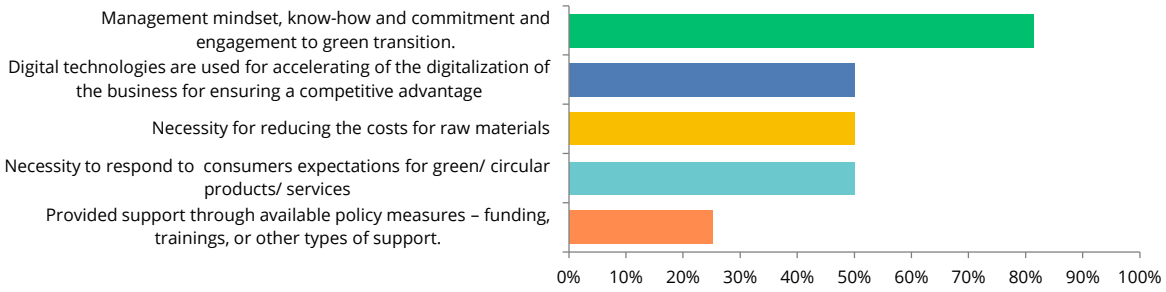

Figure 6. Motivational factor

Although the share of women who has not applied circular models or technologies is not very high, it is interesting to be explored the challenges faced by them. The received answers are quite diverse and cover almost all of the suggested options equally.

Lack of finance is usually one of the main barriers in every entrepreneurial initiative. As expected, the main problem for women entrepreneurs is access to finance, followed by a lack of information about different possibilities that could be suitable for their businesses, and a lack of knowledge and skills about the application of circular aspects.

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Perhaps because most respondents have fewer than 10 employees and the (co-)owner is usually engaged with various tasks, another important barrier indicated is the lack of time due to being overloaded with day-to-day tasks necessary for the survival of the business, as well as with family and home commitments. (Figure 7).

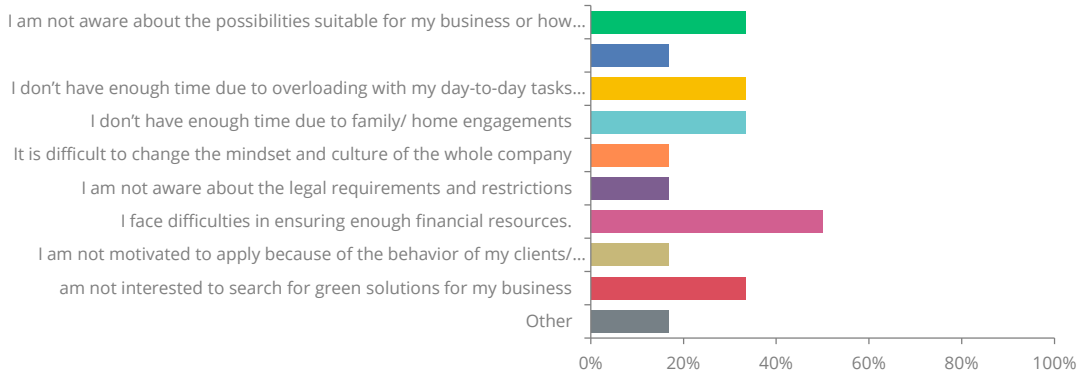

Figure 7. Faced challenges for application of CE aspects in business

In compliance with identified challenges are ranked the most needed topics for trainings by women entrepreneurs (Figure 8):

- Access to finance – 90.91%
- Application of circular economy in specific sectors – 54.55%
- How to use the digital technologies for circular transition – 54.55%
- AI and circular economy – 50%
- Digital skills for circular transition – 50%
- Legal framework

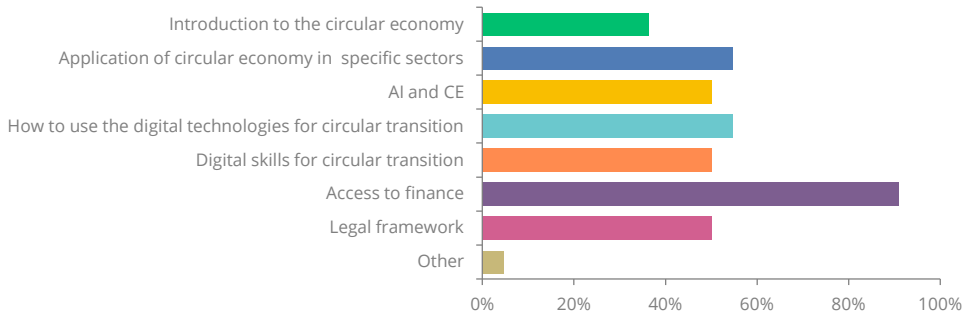

Figure 8. Training needs

When it comes to other types of support needed for the circular transition, besides training, the most frequent answer given by women entrepreneurs is ensuring access to

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financing. They also emphasize the need for suitable, understandable, and practical information on the application of circular business models, along with simplified and adequate funding procedures tailored to micro- and small companies.

5.2 Industry 4.0

To better understand the digital skills needs and gaps, we asked women entrepreneurs a set of questions about the level of digitalization of their businesses and their acceptance of digital technologies.

As a positive sign, 77.27% of respondents apply various digital technologies. Almost all of them (91.67%) use mobile technologies and digital marketing tools. Different platforms for team collaboration, project management, and communication are also quite frequently used (83.34%) to enhance productivity, support remote work, and leverage cloud computing.

The less frequently applied technologies by respondents include adopting blockchain technology for secure, transparent, and tamper-proof record-keeping and transactions (33%), Internet of Things (25%), augmented reality and virtual reality (25%), and digital twin technology (25%).

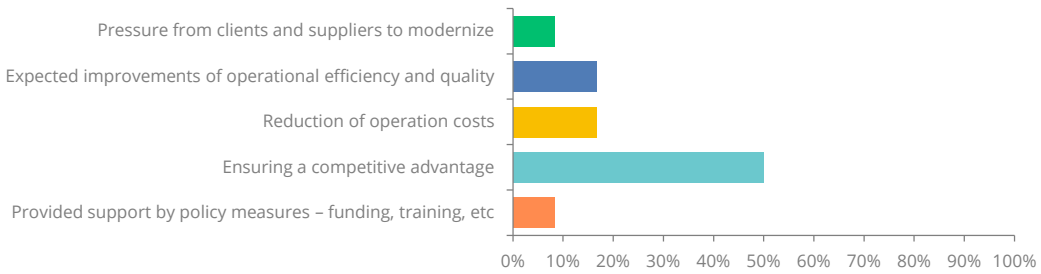

Figure 9. Motivational factors for digital technology application

The main motivation for women entrepreneurs for application of digital technologies is possibility for ensuring of competitive advantage of the business (50%), followed by improvement of operational efficiency and quality and reduction of operational costs. (Figure 9).

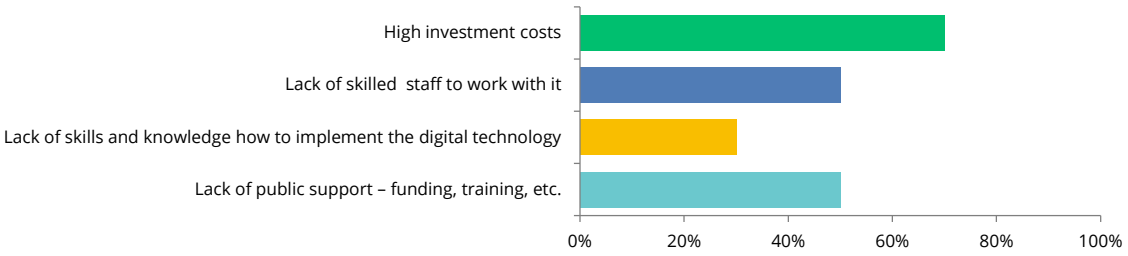

Figure 10. Barriers for adopting of advanced digital technologies

The main barriers to adopting more advanced digital technologies in female-led companies are high investment costs (70%), followed by a lack of skilled staff to work with such technology and a lack of public support in terms of funding and training (50%).

The primary missing resource indicated by respondents is financial support, which is associated with the additional time needed to work towards Industry 4.0 goals. This may involve hiring new employees to achieve these goals and/or finding suitable resources outside the company.

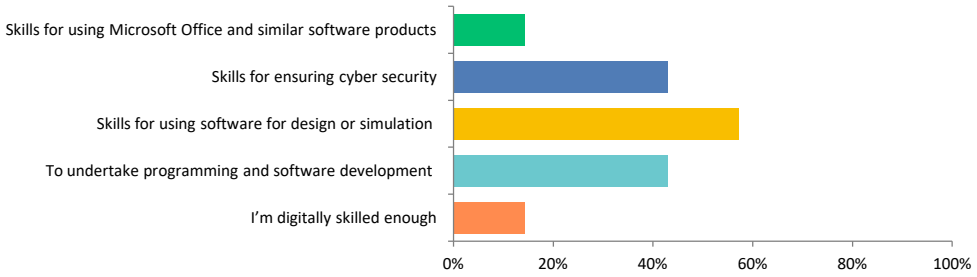

Figure 11. Needed digital skills

When it comes to ranking the most needed digital skills, 72% of women entrepreneurs indicated a need to obtain or improve intermediate-level digital skills according to DigComp 2.2[9] classification. About 60% of them want to acquire or improve skills in using software for design or simulation, followed by skills for ensuring cyber security and undertaking programming and software development (43%). As expected, none of the respondents need to improve or acquire basic digital skills, such as using email, social media, or video calls for business communication, likely because they acquired these skills during the pandemic and are currently applying them in their day-to-day

[9] DigComp 2.2 - The Digital Competence Framework for Citizens. 2022

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activities. The most important topics for training in the field of digital skills and digital transition for female businesses, as identified by respondents, are as follows:

- Development of digital business models / services – 100%
- Digital marketing – 72%
- Using of digital technologies and Internet for business needs – 72%
- Totally integrated digital processes – 57%
- Resource optimization (time, personnel, investments) – 57%

5.3 Smart Specialization Strategy and external impacts

Almost all respondents (90%) are not aware of the Smart Specialization Strategy (S3) in their region. Among those who are aware, only one company, primarily engaged in "Consulting Services," indicates having established partnerships based on S3, working closely with academia and research organizations, and supporting the development of S3 policies.

When evaluating the external impact of the crisis (COVID-19 and the war in Ukraine), it should be noted that 82.35% of the women who responded to these questions indicated that their business activities and strategies are affected. Half of them used various types of support to "restart" their businesses, mainly by joining formal/informal communities of (women) entrepreneurs (36%), utilizing business development services (22%), and participating in training, mentoring, or coaching to improve digital skills (22%). Those who did not use specific support expressed regret, acknowledging that such options could have been beneficial for their companies. Additionally, 21.43% of respondents were not aware of any available support.

Some insights were shared by women who attended such trainings. For example: two-week online training on how to be resilient in time of crisis; online training on cyber security; online training of business planning, etc.

The expectations of women entrepreneurs for the skills needed in the near future concerning circular and digital transition are quite similar. The most common responses include understanding the role of AI in business processes, finding consultants in process digitization and data analysis, using digital marketing tools, ensuring cyber security, adopting circular business models, learning recycling methods and ways to test recycled products, optimizing time, resources, and materials, and improving work efficiency.

6 Successful women entrepreneur

In order to better understand characteristics of women entrepreneurs in Bulgaria we conducted interview with a company successfully applied a circular practice. The company was established 7 years ago. It is a small-sized company, with less than 10 employees. Its main activity is production of bio fertilizers by processing of algae and utilization of waste water. The company is fully owned by a woman, a doctoral student in Synthetic Biology, with many years of experience in agrarian business. Through her professional experience, she managed to create several companies dealing with the offering of services and products in the agricultural sector. Her expertise is in plant biotechnology, synthetic biotechnology and bioengineering. She has extensive knowledge and experience in various DNA/RNA technologies, novel biological systems and computational modeling. She is also skilled in the analysis and purification of biological molecules using high performance liquid chromatography equipment. These skills are in high demand in the biotech industry and can be used in the development of new crops, new drugs and new diagnostic methods.

Her motivation for creating a green solution and transitioning to a circular model is based on a personal desire to introduce new, sustainable, and green practices in fertilizer production. This motivation is driven by a combination of several key factors, including mindset, know-how, and personal commitment and engagement to the green transition.

The main challenges she faced during the development of her business idea included obtaining specific knowledge on how to attract financing, bringing the product to market, and a lack of network with peers and experts. The business environment is changing rapidly, especially in terms of digitalization, making it difficult to stay up-to-date.

To address these challenges, she participated in six-month training and mentoring program for women entrepreneurs in the agrifood sector. She considers that such training programs provide more practical and tailored support for businesses, and offer access to a specific community of women all over Europe, potential clients, partners, and investors.

Obtaining new skills and knowledge throughout one's life is very important. When it comes to acquiring the necessary skills for the circular and digital transition of women entrepreneurs, she admits that she has never heard about such programs. According to her, the most important skills that women should strive for include:

- Skills related to finding and accessing financial instruments;
- Innovation management skills;
- Circular transition and digitalization of specific sectors.

She suggests a special focus on the "Food and Agriculture" sector, as according her it is the most affected by the circular economy and digital transition.

7 Stakeholders Perspectives

The perspective of stakeholders is also very important for better understanding the broader ecosystem and support structures for women entrepreneurs, therefore in-depth interviews with industry experts, policymakers, and academia were conducted:

- The Ministry of Economy and Industry of Bulgaria (MEI) is a leading public institution which organizes, coordinates, and participates in implementing policies for better regulation in business activities and enhancing the competitiveness of the Bulgarian economy; proposes measures for the accelerated adoption of digital technologies in industry, supporting automation, integration, and real-time data exchange in manufacturing processes (Industry 4.0) to promote economic growth; and develops, organizes, coordinates, and implements policies for SMEs and entrepreneurship.
- Varna Free University "Chernorizets Hrabar" is the largest private university in Bulgaria. It is an established academic center that combines the training of Bulgarian and foreign students in priority areas for the country and creates an internationally convertible and competitive scientific and academic product. It teaches over 5000 students in more than 60 bachelor's and master's programs and 29 PhD programs. They have developed capacity in research and teaching circular economy. They have developed and deliver master program and participate in international projects, related to the topic of WE.Circular.
- Agropolychim AD is a leader in Bulgaria and a market factor on the map of the fertilizer production and trade in Southeastern Europe. They invest in

digitalisation, modernization of the technology, equipment replacement, resource management and reduction of emissions. They conduct a consistent and unwavering policy of environmental protection. The interviewed expert is the Head of Environmental Affairs & Climate Action in Agropolychim. She has more than 15 years expertise in environmental issues in the sector.

Currently, there are no specific policy measures to support the transition from a linear to a circular economy specifically for women entrepreneurs or to enhance their digital and circular skills. However, key policy measures necessary for women entrepreneurs' digital and circular transition, as identified by the MEI, include providing support for training, legal services, consulting, and mentoring. Additionally, financing options, loan guarantee schemes, and microcredits should be made available. Furthermore, there is a need for support measures to introduce specific circular and business models, such as reuse, repair, reverse logistics, and industrial symbiosis. MEI suggests that policymakers should also focus on facilitating the transition from selling products to providing services and increasing the share of separately collected and recycled waste on a sectoral basis.

In this regard, MEI plans to develop a National Industrial Strategy for the processing and mining sector 2025 - 2030. This strategy will address critical industrial policy topics, such as reducing the industry's carbon footprint, enhancing digitization in production, improving resource and energy efficiency, introducing circular production models, and attracting investor interest in industrial parks within the country. While the strategy won't specifically focus on women entrepreneurs, all companies operating in the processing industry sector or the extractive industry will still benefit from the planned measures.

It is suggested a special focus on the "Textile and Fashion", "Food and Agriculture" sectors, as according them these are the most affected by the circular economy and digital transition.

From academic point of view, collaboration among policymakers with industry stakeholders and educational institutions is quite a challenge. However, they can combine efforts to research to identify women's entrepreneur needs in industry 4.0, to develop educational materials and to provide that to the public. Artificial Intelligence and Machine Learning are the key technologies driving the processes in Industry 4.0. Augmented Reality and Virtual Reality are emerging technologies that are finding

applications in Industry 4.0. These technologies could be used for various purposes in specific field common for women entrepreneurship like training, product design, and remote collaboration. Specific skills are needed for women entrepreneurs in this direction.

VFU confirms the lack of specific programmes and educational initiatives in the Varna region about circular economy-related skills of women entrepreneurs. It is recommended to be put more efforts on providing topics related trainings and networking opportunities.

Constant improvement of skills for digitalization of the business is the key for the green success from the industry point of view. Therefore, it is recommended special focus to be put on increasing of skills on how to apply and use digital technologies, and raising awareness about benefits that digital technologies could bring to the business. The conservative perception of people towards artificial intelligence is hindered.

She concluded that an appropriate policy framework is also needed for the adoption of digitalization and artificial intelligence from women entrepreneurs.

8 Conclusion

The natural culture in Bulgaria is still not sufficiently supportive of the digital and circular transition of businesses. Bulgaria ranks last among EU countries in terms of the adoption of digital technologies in enterprises and it is among the least performing member states in implementing circular economy measures. Women entrepreneurs, who are still underrepresented, need specific support to improve their skills and business development in digital and circular aspects.

The primary motivation for those who apply circular business models or technologies is based on a personal desire and mindset to introduce new, sustainable, and green practices. This includes the necessity to reduce costs for raw materials and to meet customer expectations for green products and services. For digital technologies, the main motivation lies in the potential to ensure a competitive advantage, improve operational efficiency and quality, and reduce operational costs.

Lack of finance is a significant barrier in every entrepreneurial initiative including for women entrepreneurs, as well as the lack of information about suitable opportunities and a lack of knowledge and skills in applying circular aspects. Additionally, the lack of time due to daily business tasks and family commitments is a critical barrier. High investment costs, a lack of skilled staff, and insufficient public support in terms of funding and training are the main barriers to adopting advanced digital technologies in female-owned companies.

It is crucial to provide suitable, understandable, and practical information on the application of circular business models, along with simplified and adequate funding procedures tailored to female micro- and small companies. Women entrepreneurs are also interested in obtaining or improving their intermediate-level digital skills, including software design or simulation, cybersecurity, and programming and software development.

The expectations of women entrepreneurs for skills needed in the near future for circular and digital transitions are quite similar. They seek to understand the role of AI in business processes, find consultants in process digitization and data analysis, use digital marketing tools, ensure cybersecurity, adopt circular business models, learn recycling methods and ways to test recycled products, optimize time, resources, and materials, and improve work efficiency. Therefore, the most important topics for them regarding circular transition include:

- Access to finance;
- Application of circular economy in specific sectors (e.g. Food and Agriculture, Textile and Fashion, etc.)
- How to use the digital technologies for circular transition
- AI and circular economy
- Digital skills for circular transition
- Legal framework,

Additionally, the most important topics for training in the field of digital skills and digital transition for female businesses are:

- Development of digital business models / services
- Digital marketing
- Using of digital technologies and Internet for business needs
- Totally integrated digital processes

- Resource optimization (time, personnel, investments).

Finally, it is recommended that policymakers should put more effort into providing specific governmental measures to support women entrepreneurs in digital and circular transitions, skill development, and the adoption of circular business models and technologies.

Annexes

Survey questionnaire in Bulgarian

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