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WE.Circular

National Skills Gaps and Needs Analysis: Croatia

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Technology Park Varaždin

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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

Croatia, particularly its northern regions, has been focused on fostering innovation and economic growth through initiatives such as the Smart Specialization Strategy (S3) and Industry 4.0 (I4.0). While businesses, including those led by women entrepreneurs (WEs), have shown interest in adopting advanced technologies and aligning with sustainability goals, challenges remain, particularly in digitalization and circular economy transitions. The economic disruptions caused by the COVID-19 pandemic and the war in Ukraine have further highlighted the need for resilient, innovative business practices.

Main findings from the Survey among Women Entrepreneurs (WEs)

The survey among WEs revealed key challenges related to skills acquisition, digitalization, and circular transition:

- **Digital skills gaps:** Many WEs lack advanced digital skills, particularly in areas such as programming, cybersecurity, and the use of design or simulation software. Basic digital tools like Microsoft Office are widely used, but more specialized knowledge is needed for the I4.0 transition.
- **Barriers to technology adoption:** High investment costs and a shortage of skilled staff are the biggest obstacles to adopting advanced technologies. A lack of public support and technical guidance was also identified as a challenge for WEs.
- **Circular transition needs:** WEs expressed a need for education and financial resources to help them transition toward circular economy practices, indicating that support in these areas is currently insufficient.

Main findings from interviews with stakeholders

Interviews with stakeholders revealed critical gaps in the support and training offered to women entrepreneurs:

- **Need for targeted training:** Stakeholders identified a gap in the availability of training programs focused on advanced digital skills and circular economy practices. WEs need access to training on how to implement digital technologies and sustainable business models effectively.
- **Lack of awareness:** Many women entrepreneurs are unaware of the opportunities available through programs like S3 and I4.0. Stakeholders suggested that raising awareness of these initiatives could encourage more businesses to participate.

- **Support for financial and technical resources:** Stakeholders highlighted the need for financial aid, such as grants or low-interest loans, to help WEs overcome the high cost of technology investments. Technical support for integrating these technologies into their businesses was also seen as crucial.

Main findings on motivation factors and support measures

Motivational factors for successful WEs, as identified in interviews, include:

- **Financial support:** Grants and public funding programs have been important in helping businesses invest in digitalization and circular economy projects.
- **Mentorship and networking:** Successful WEs emphasized the importance of mentorship and access to innovation hubs or networks, which provided guidance and collaboration opportunities.
- **Innovation as a competitive advantage:** Many successful women entrepreneurs were motivated by the opportunity to gain a competitive edge through innovation, particularly in adopting I4.0 technologies.

Recommendations

1. **Enhance awareness and accessibility of S3 and I4.0 programs:** Conduct targeted campaigns to raise awareness of the benefits of S3 and I4.0 programs for women entrepreneurs, including specific sector opportunities and innovation strategies.
2. **Provide tailored training programs:** Develop comprehensive training programs that focus on critical digital skills (programming, cybersecurity, design software) and circular economy practices.
3. **Increase financial and technical support:** Offer financial incentives such as grants and low-interest loans to address high investment costs, and provide technical support to guide the implementation of advanced digital technologies.
4. **Foster collaboration and innovation networks:** Create opportunities for WEs to collaborate with universities, innovation centers, and industry clusters to co-innovate and align with regional strategies.
5. **Highlight success stories:** Promote success stories of women entrepreneurs who have adopted I4.0 technologies or circular economy practices to inspire others and demonstrate practical applications.

These measures aim to empower women entrepreneurs by providing the necessary skills, resources, and networks to successfully navigate the digital and circular transitions.

2 Introduction

This National Report for Croatia is an integral component of the Transnational Skills Gaps and Needs Analysis, aimed at dissecting the unique barriers and opportunities that lie within Croatia's transition to a more circular, innovative, and digital economy. Through a meticulous examination of the current state, this report endeavours 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 their ability to harness the potential of their 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, stakeholder interviews, and case studies, offering a nuanced understanding of the skills landscape in Croatia. 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 Government and Policy Documents such as Croatian National Development Strategy 2030 made by the Ministry of Regional Development and EU Funds, Republic of Croatia; Croatian Smart Specialization Strategy (S3) from the Official Website of the Ministry of Economy and Sustainable Development and National Gender Equality Policy made by Office for Gender Equality, Government of the Republic of Croatia, ; Academic Publications such as Studies on Women Entrepreneurship in Croatia - Kersan-Škabić, I., & Zubin, C. (2021). "Women Entrepreneurs in Croatia: Obstacles and Prospects," <i>Economic Thought and Practice.</i> , Ljiljana Božić (2020). "Entrepreneurial Intentions of Women in Croatia: A Case Study of Students," <i>Entrepreneurship and Innovation Management Journal.</i> than Research on Skills Gaps in the Digital Economy "Digital Skills and Competences in Croatia: A Study of the Current Landscape," <i>Croatian Economic Survey.</i> Industry Reports and Surveys EU Reports on Digital Economy and Society by Digital Economy and Society Index (DESI) Report for Croatia. Global Entrepreneurship Monitor (GEM) Reports 2023/24: Croatia; Case Studies and Best Practices: Success Stories of Women Entrepreneurs Women Entrepreneurs in Croatia: Case Studies and Insights; International Best Practices OECD. (2021). "Empowering Women in the Digital Age: Policy Recommendations and Best Practices," <i>OECD Digital Economy Papers.</i> and Additional Resources: UN Women Reports - UN Women in Croatia; European Commission Gender Equality Strategy - Gender Equality Strategy 2020-2025 is made to be established a baseline understanding of the current skills landscape for women entrepreneurs in Croatia. .
Survey among women entrepreneurs	The analysis incorporates results from survey conducted among women entrepreneurs form Croatia. It was organized in the period 15/04/2024 – 31/07/2024.

	110 of respondents were identified from different sectors and questionnaires were provided to them by SurveyMonkey platform. The survey provides both quantitative data and qualitative insights to analyze prevailing skills gaps and needs. 52 of responses are collected which is equal to 47% responding rate and could be accepted as quite sufficient for the main goal of the current Analysis.
Stakeholders interview	In-depth interviews with industry experts, policymakers, academia, and support organizations for better understanding the broader ecosystem and support structures for WEs are made. Three types of stakeholders were contacted and 3 (three) 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 country.
Successful interviews case	Successful case 1 interview with WE who have effectively implemented circular and/or digital transition are 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 Croatia, 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 Croatia.

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 CROATIA

4.1 General presentation of Croatia

Croatia: Country overview

Location

Geographic position: Croatia is located in Southeast Europe, bordered by Slovenia to the northwest, Hungary to the northeast, Serbia to the east, Bosnia and Herzegovina to the southeast, Montenegro to the south, and the Adriatic Sea to the west .

Population

Total population: Approximately 3.9 million (2024 estimate) .

According to the most recent census conducted in 2021, Croatia has approximately 3,871,833 inhabitants, of which women make up 51.8% of the population (Croatian Bureau of Statistics, 2021). Regarding entrepreneurship, women entrepreneurs constitute about 30% of all entrepreneurs in Croatia. Although the number of women entrepreneurs is on the rise, they still face various challenges that limit their full potential, including access to financing, markets, and the information necessary for transitioning to sustainable business models such as the circular economy (Croatian Chamber of Economy, 2023).

Distribution per gender

Gender	Population (in thousands)	Percentage
Male	1,895	48,2%
Female	2,005	51,8%

Source: Croatian Bureau of Statistics

Age structure per gender

Age Group	Male (%)	Female (%)
0-14	14	13
15-24	11	10
25-54	39	38
55-64	13	13
65+	23	26

Source: Eurostat

Location and population

Croatia is a country in Southeast Europe with a population of approximately 3.9 million people. It is part of the European Union and has a diverse geography, including a long Adriatic coastline and mountainous regions.

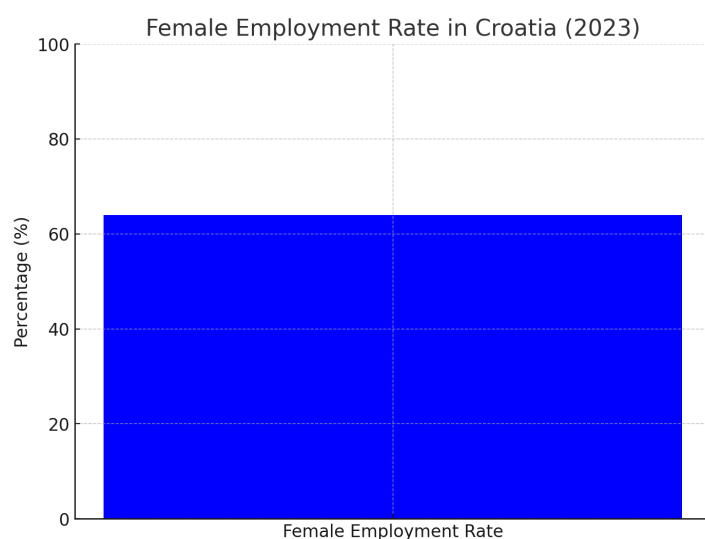
Gender distribution and age structure

The population distribution is slightly skewed towards females, who make up 51% of the total population. The age structure indicates a significant proportion of the population in the working-age group (25-54 years), which is crucial for economic activity and entrepreneurship. The age distribution highlights the potential labour force available for economic activities, with a balanced representation of males and females across different age groups.

Education Level	Male (%)	Female (%)
Primary Education	18	16
Secondary Education	57	59
Tertiary Education	25	25

Source: OECD

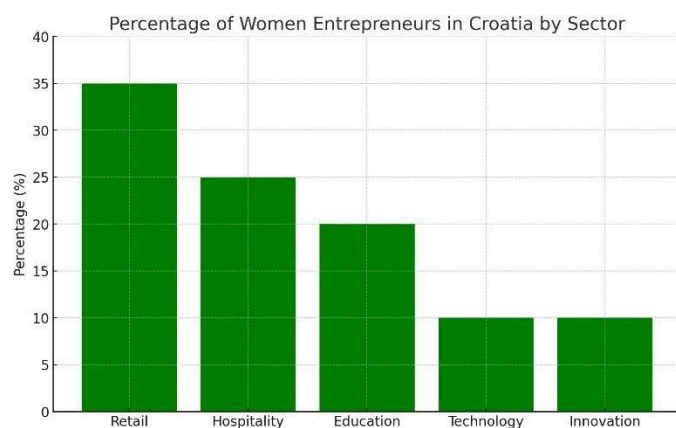
Graph 1: Female Employment Rate in Croatia (2023)



Source: OECD Economic Surveys: Croatia 2023.

In terms of entrepreneurship, according to the Global Entrepreneurship Monitor (GEM) 2022/2023 report, women constitute about 30% of the total entrepreneurs in Croatia. This percentage is consistent with global trends, though it highlights ongoing challenges such as access to resources and business networks for women entrepreneurs (GEM Global Entrepreneurship Monitor, 2023).

Graph 2: Percentage of women entrepreneurs in Croatia by sector

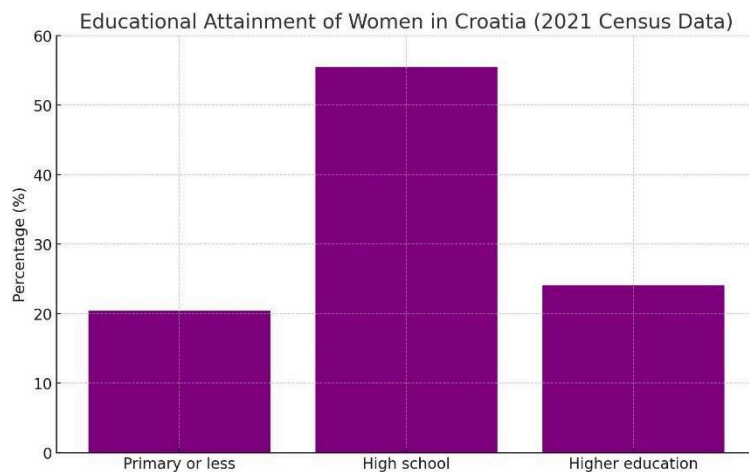


Source: GEM 2022/2023

Regarding sectoral distribution, Croatian women entrepreneurs are predominantly active in the services sector, particularly in retail, hospitality, and education. However, there is a growing presence of women in more diverse fields such as technology and innovation, although these sectors are still largely male-dominated (GEM Global Entrepreneurship Monitor, 2023).

Educational levels

Graph 3: Educational attainment of women in Croatia (2021 Census Data)



Source: Total Croatia News (2023)

Education plays a significant role in shaping the skills landscape. The data shows a relatively equal distribution of educational attainment between males and females, with secondary education being the most common level achieved. Both genders have similar participation rates in tertiary education, which is essential for fostering innovation and entrepreneurship.

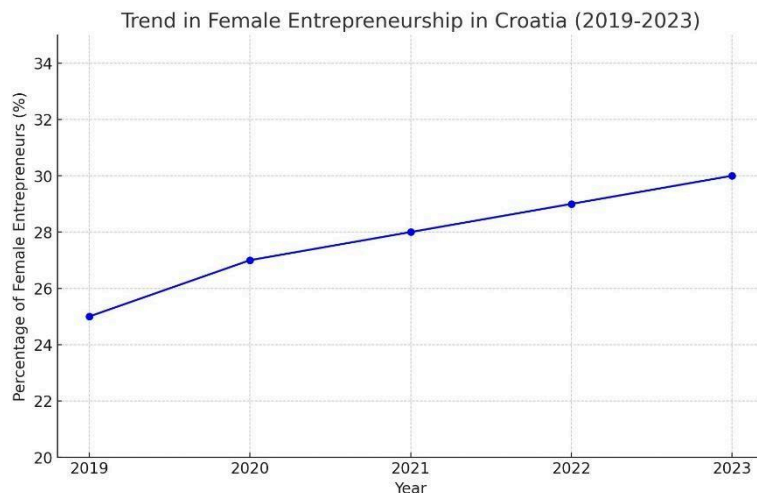
When it comes to educational attainment, data from the 2021 census show that women in Croatia lead in higher education across all age groups except those over 60. Approximately 24.1% of the population aged 15 and above have completed higher education, with women representing a significant portion of this group. The increase in the percentage of women with higher education degrees reflects broader trends in educational attainment, which is crucial for fostering entrepreneurial growth among women (Total Croatia, 2023).

Company ownership

The data on company ownership reveals a gender gap, with men owning a higher percentage of companies compared to women. Women own 32% of businesses, indicating the need for targeted interventions to support female entrepreneurship. This

gap presents both a challenge and an opportunity to enhance the participation of women in the entrepreneurial ecosystem .

Trend in Female Entrepreneurship in Croatia (2019-2023)



Source: OECD Economic Surveys CROATIA 2023.

Here is a graph illustrating the trend in female entrepreneurship in Croatia from 2019 to 2023. The data shows a steady increase in the percentage of female entrepreneurs over these years, indicating positive growth in women's participation in entrepreneurial activities.

This trend suggests gradual progress towards greater gender parity in entrepreneurship, although further support and resources may be needed to sustain and accelerate this growth.

To further advance women in entrepreneurship, it is very important to implement measures that will facilitate a smoother transition to a circular economy, not only to reduce environmental impact but also to open new business opportunities, and thus empowering women entrepreneurs.

Implications for skills development and policy

1. **Focus on youth and women:** With a significant portion of the population in the youth and working-age categories, policies should focus on equipping these groups, especially women, with the skills necessary for the digital and circular economy .
2. **Educational and training initiatives:** Programs that encourage higher educational attainment, particularly in STEM fields, can help bridge the skills gap and promote gender equality in entrepreneurship .
3. **Support for female entrepreneurs:** Addressing the gender gap in company ownership requires targeted support for women entrepreneurs, including access to finance, mentorship, and networking opportunities .
4. **Policy and economic impacts:** Understanding the demographic and educational landscape is critical for formulating policies that promote economic growth and gender equity in the entrepreneurial sector .

This overview provides a foundational understanding of the current skills landscape for women entrepreneurs in Croatia and highlights areas for potential intervention and support .

4.2 Female entrepreneurial ecosystem in Croatia

Conducting a desk research review to establish a baseline understanding of the current skills landscape for women entrepreneurs in Croatia requires a systematic approach to identify and analyse relevant documents and sources. This involves gathering data from government reports, academic publications, industry studies, and other credible sources. Here is a detailed analysis based on the research findings.

Desk research review

1. Government and policy documents

Croatian National Development Strategy 2030: This document outlines Croatia's strategic priorities, including the transition to a digital economy and the promotion of gender equality. It highlights the need for innovation and digital skills to foster economic growth.

Croatian Smart Specialization Strategy (S3): This strategy focuses on innovation-driven development, emphasizing the importance of aligning skills development with Croatia's economic priorities. It identifies key sectors for growth, such as information technology, biotechnology, and environmental technologies, which are crucial for the circular economy (CE) and Industry 4.0 (i4.0).

National Gender Equality Policy: This policy framework aims to promote gender equality in all areas, including entrepreneurship. It identifies barriers to women's participation in the economy and proposes measures to increase their involvement, particularly in high-growth sectors.

Academic publications

Studies on Women Entrepreneurship in Croatia: Academic research provides insights into the challenges and opportunities faced by women entrepreneurs. Common barriers include access to finance, limited networking opportunities, and societal attitudes towards female leadership.

Research on Skills Gaps in the Digital Economy: Several studies highlight the need for digital literacy and technical skills among entrepreneurs, particularly women, to compete in a rapidly evolving market.

3. Industry reports and surveys

EU Reports on Digital Economy and Society: These reports assess Croatia's digital readiness and the integration of digital technologies across industries. They often highlight the skills gap in digital competencies and the need for targeted training programs.

Surveys on Entrepreneurial Ecosystems: Surveys conducted by organizations like GEM (Global Entrepreneurship Monitor) provide data on the entrepreneurial landscape in Croatia, including the role and impact of women entrepreneurs.

4. Case studies and best practices

Success stories of Women Entrepreneurs: Case studies of successful women-led businesses in Croatia offer valuable insights into effective strategies and the impact of supportive ecosystems.

International Best Practices: Reviewing successful initiatives from other countries can provide models for enhancing women's participation in CE, S3, and i4.0 sectors.

Analysis of findings

Skills gaps and barriers

Digital and technical skills: There is a significant gap in digital skills among women entrepreneurs, which hampers their ability to leverage new technologies for business growth.

Access to finance and resources: Women entrepreneurs often face challenges in accessing financial resources and investment opportunities, limiting their capacity to innovate and scale their businesses.

Networking and mentorship: Limited access to professional networks and mentorship opportunities is a barrier to women's entrepreneurial success.

Cultural and societal barriers: Traditional gender roles and societal attitudes can discourage women from pursuing entrepreneurial ventures, particularly in male-dominated industries.

Opportunities and strategic interventions

Targeted training programs: Developing training programs focused on digital literacy, technical skills, and entrepreneurship can empower women to participate more fully in the economy.

Policy support and incentives: Government policies that provide incentives for women-led businesses and support initiatives that promote gender equality in entrepreneurship can create a more inclusive business environment.

Collaborative ecosystems: Building ecosystems that facilitate collaboration among government, industry, and academia can enhance support for women entrepreneurs, providing them with the resources and networks needed to succeed.

Role models and champions: Promoting successful women entrepreneurs as role models can inspire and motivate other women to pursue entrepreneurial paths.

Recommendations

1. **Develop comprehensive training programs:** Focus on enhancing digital skills and technical knowledge to equip women entrepreneurs with the tools needed for success in CE, S3, and i4.0 sectors.

2. **Enhance access to finance:** Implement financial instruments and support programs specifically designed for women entrepreneurs to overcome barriers to accessing capital.
3. **Promote networking and mentorship:** Establish mentorship programs and networking events to connect women entrepreneurs with industry leaders and potential collaborators.
4. **Foster inclusive policies:** Advocate for policies that support gender equality in entrepreneurship and create an enabling environment for women to thrive in high-growth industries.
5. **Leverage international Best Practices:** Learn from successful international initiatives to implement proven strategies for empowering women entrepreneurs in Croatia.

This analysis serves as a foundation for strategic planning and intervention, aimed at bridging the skills gap and fostering a more inclusive and sustainable entrepreneurial landscape in Croatia. By addressing the identified barriers and leveraging opportunities, Croatia can enhance the participation of women entrepreneurs in its transition to a circular, innovative, and digital economy.

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

At the beginning, 53 people participated in the survey; however, only 33 respondents completed it. These respondents all worked in companies where women own more than 30% of the business.

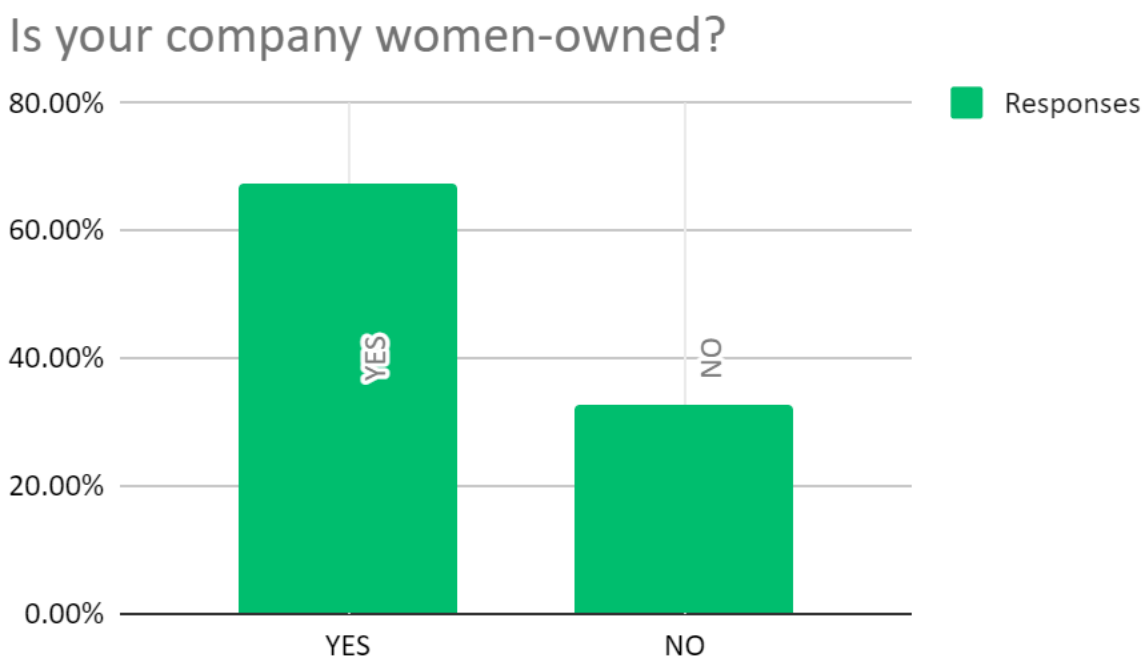
Initial participation vs. Final completion: Out of 53 initial participants, only 33 (approximately 62%) completed the survey. This dropout rate (around 38%) could indicate various factors such as survey length, relevance to the participants, or engagement levels.

Gender ownership focus: The final group of respondents worked in companies where women own more than 30% of the business, highlighting the focus on gender diversity

in business ownership. This demographic data could be crucial in understanding trends and challenges faced by businesses with significant female ownership.

Key insights:

- The completion rate (62%) shows a notable engagement with the survey topic among the target group, but also suggests room for improvement in ensuring higher completion rates.
- Focusing on businesses with significant female ownership (30% or more) may provide insights into gender dynamics in business leadership and how these businesses are navigating the market.



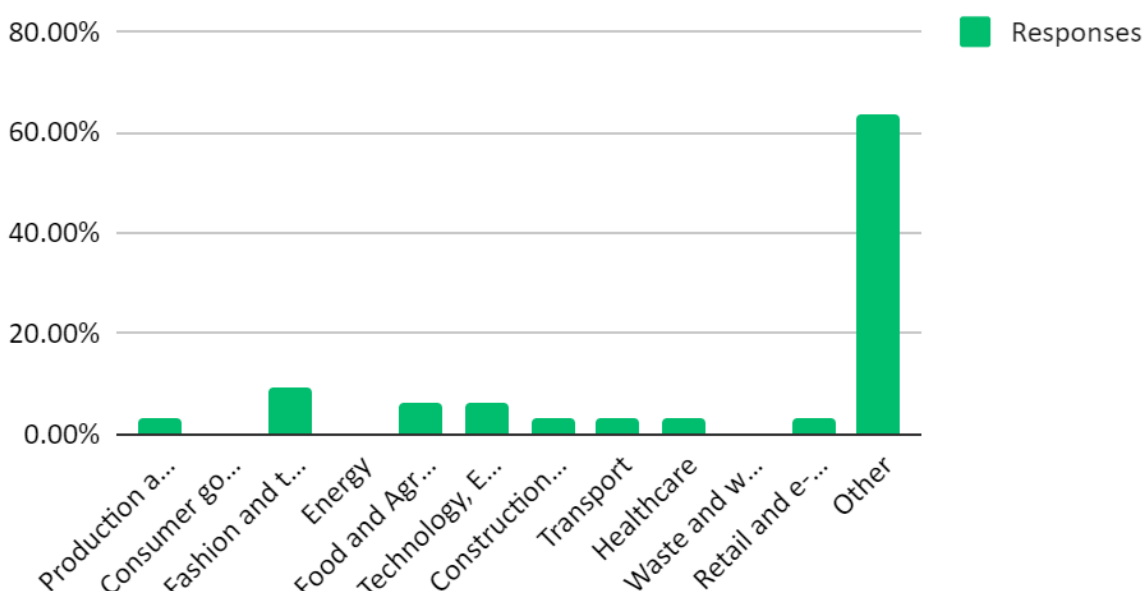
Graph 1- Is your company women-owned; Source: own research.

The data indicates that the majority (67.31%) of respondents operate in women-owned businesses. This suggests that there is a significant presence of female entrepreneurship among the respondents. The remaining 32.69% represent businesses

not owned by women, showing that while female ownership is substantial, there is still a notable portion of businesses where women are not the primary owners.

The figures could indicate positive trends in gender equality within business ownership, but they also highlight the gap that still exists, as over a third of the companies are not women-owned. This information can be valuable for analyzing the landscape of female entrepreneurship and understanding areas where support or policies may be needed to encourage more women into business ownership.

What is the primary sector of your business?



Graph 2 - Primary sector of business; Source: own research

The data on the above graph shows the distribution of responses to the question about the primary sector of business. Here is the breakdown:

- **Production and manufacturing:** 3.03% (1 response)
- **Consumer goods:** 0.00% (0 responses)
- **Fashion and textile:** 9.09% (3 responses)

- **Energy:** 0.00% (0 responses)
- **Food and Agriculture:** 6.06% (2 responses)
- **Technology, Electronic, and IT:** 6.06% (2 responses)
- **Construction and real estate:** 3.03% (1 response)
- **Transport:** 3.03% (1 response)
- **Healthcare:** 3.03% (1 response)
- **Waste and water management:** 0.00% (0 responses)
- **Retail and e-commerce:** 3.03% (1 response)
- **Other:** 63.64% (21 responses)

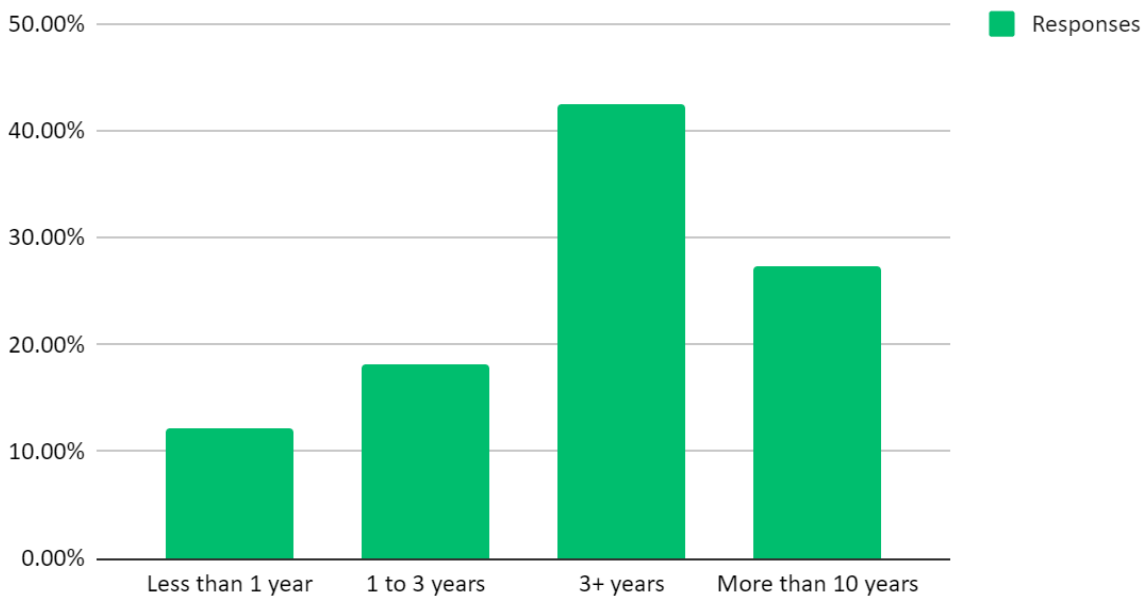
The "Other" category, representing 63.64% of responses, is clearly the largest, suggesting that a wide range of industries outside the predefined categories are represented. The second most significant sector is Fashion and Textile at 9.09%, indicating a notable presence of this industry among respondents.

In the "Other" category, personal or business consulting services, accounting, and legal services make up the majority. These services, though diverse, all belong to the professional services sector, indicating the broad scope of this category. The presence of consulting suggests a growing need for specialized knowledge, while accounting and legal services highlight the demand for expertise in compliance and financial management, particularly for SMEs.

The additional 20 responses under "Other" suggest the presence of niche industries or emerging fields that aren't captured in the predefined options. Further analysis could reveal growing sectors like digital services, sustainability-related offerings, or specialized IT and educational services. Identifying these could uncover opportunities in innovative areas that might be undervalued or rapidly developing.

Understanding the specifics of these responses can help pinpoint trends in niche markets or new industries, offering insights into potential business opportunities and innovation.

"How long have you been running the business? (in years)"



1. **Less than 1 year:** 12.12% (4 responses)

- o A small percentage of the respondents are in the early stages of their business. This group likely consists of start-ups or new ventures.

2. **1 to 3 years:** 18.18% (6 responses)

- o This group is past the initial setup phase but still relatively young. Businesses at this stage may be in a period of growth, refining their offerings, and establishing a customer base.

3. **3+ years:** 42.42% (14 responses)

- o The largest percentage of respondents falls into this category. These businesses have likely passed the critical early years and are more established. They may be more stable and sustainable, having already dealt with many of the challenges that new businesses face.

4. **More than 10 years:** 27.27% (9 responses)

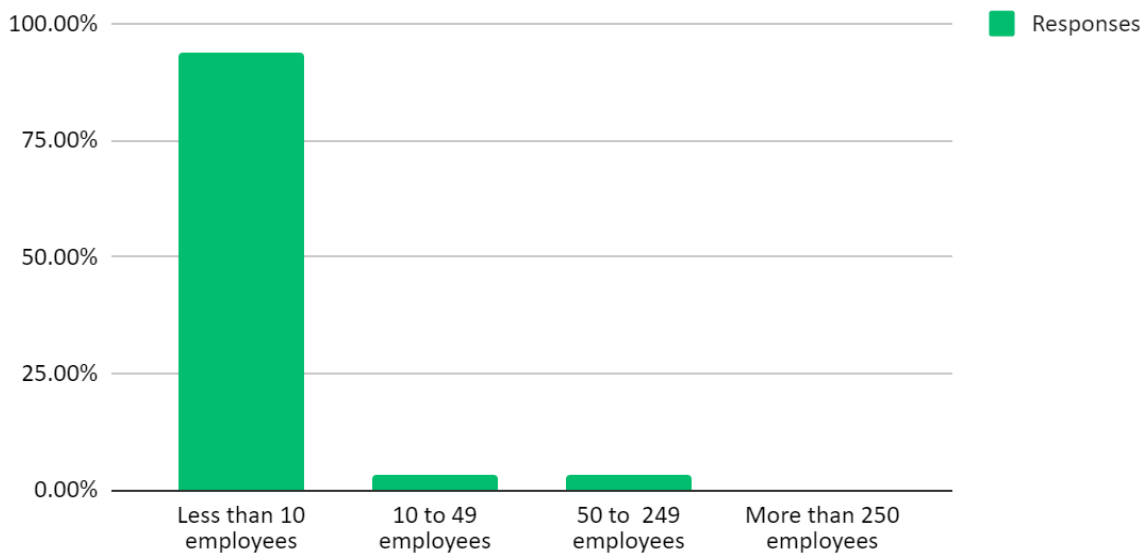
- o A significant portion of respondents have long-standing businesses, reflecting maturity and stability. These companies may have more robust

processes and a strong market presence, as surviving more than a decade suggests they have overcome various business cycles and challenges.

- **Key Insights:**
- **Maturity of respondents' businesses:** The majority of businesses (69.69%) have been operating for more than 3 years, with 27.27% running for over a decade. This indicates that most respondents are experienced and likely more resilient, having survived critical periods of business development.
- **Early-stage businesses:** Around 30.3% of respondents (those operating less than 3 years) represent newer businesses. These might still be in the process of establishing themselves in the market, facing early-stage challenges like acquiring customers, securing funding, or scaling operations.
- **Business stability:** With almost 70% of businesses running for more than 3 years, this group likely possesses more stability and operational efficiency compared to the early-stage ventures. They are probably less vulnerable to market shifts and have more developed business strategies.

The data shows a good mix of both newer and more established businesses. Most of the respondents are entrepreneurs with significant business experience, but a lot of them is still in the growth phase, which might indicate a diverse range of challenges and opportunities within the group. This balance suggests a dynamic environment with a mix of stability and innovation.

What is the size of your business according to the number of employees?



1. **Less than 10 employees:** 93.94% (31 responses)

- o The majority of businesses are small enterprises with fewer than 10 employees. This suggests that most respondents operate micro-enterprises, which are typically characterized by limited staff and resources, often requiring multi-tasking and versatility from employees and owners.

2. **10 to 49 employees:** 3.03% (1 response)

- o A small percentage represents small businesses that have moved beyond the micro stage but still maintain a lean structure. These businesses may be in a growth phase, gradually increasing their capacity while maintaining a tight-knit team.

3. **50 to 249 employees:** 3.03% (1 response)

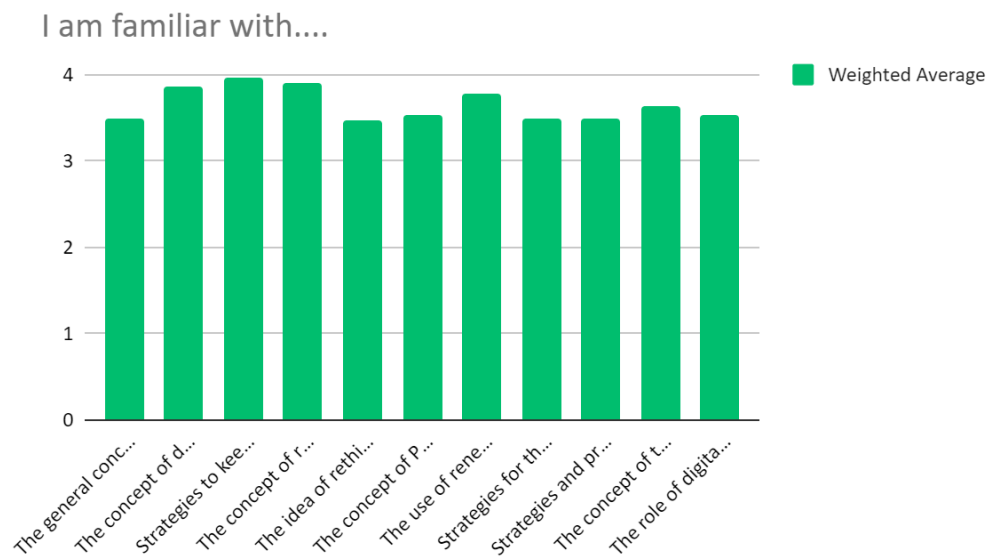
- o One respondent represents a medium-sized business, which is more structured and possibly more stable with a formal hierarchy and distinct roles across the organization. Businesses of this size are likely to have more formal processes and a stronger market presence.

4. **More than 250 employees:** 0% (0 responses)

- o No large enterprises (with over 250 employees) are represented in this sample, indicating that the survey predominantly attracted smaller businesses, which might suggest that the majority of respondents are operating in sectors or markets that are typically composed of smaller businesses.
- **Dominance of Micro-Businesses:** The majority (93.94%) of the businesses in this survey are micro-enterprises with fewer than 10 employees. This highlights the prevalence of small-scale businesses in the respondent group, likely reflecting industries or markets where small teams are common, such as service-based sectors, small retail, or creative industries.
- **Limited Presence of Medium-Sized Businesses:** Only 6.06% of respondents (two businesses) employ more than 10 people. This limited representation of medium-sized companies suggests that the respondent pool may not include businesses in industries that typically scale to larger teams, such as manufacturing or tech companies.
- **No Large Companies:** The absence of large enterprises (250+ employees) indicates that the survey either didn't reach these businesses or that large companies are simply less represented in this sample. This could suggest that the focus or target group of the survey was more relevant to smaller businesses.

The data shows that micro-enterprises dominate this group of respondents, with 93.94% having fewer than 10 employees. This highlights the importance of understanding the challenges and needs of small businesses, which may include limited resources, flexibility in operations, and a greater focus on day-to-day survival and growth. The lack of larger enterprises could indicate that the survey was tailored toward or more attractive to smaller businesses.

5.1 Circular Economy (CE)



Here's an analysis of the data regarding familiarity with different concepts related to the circular economy:

Respondents rated their familiarity on a scale from 1 (Completely disagree/Not familiar) to 5 (Completely agree/Very familiar).

- **Key Findings:**

1. **The general concept of Circular Economy (CE):**

- o 43.33% are very familiar with the general concept (rating 5).
- o The weighted average is 3.5, indicating a moderate level of familiarity overall. While many understand the concept, there's a significant portion (23.33%) that has low familiarity (rating 1).

2. **Designing products and processes to minimize waste and pollution:**

- o 53.33% are highly familiar (rating 5).
- o The weighted average is 3.87, suggesting strong familiarity, with only 13.33% having low familiarity (rating 1).

3. Strategies to extend product/material life (repair, reuse, recycle):

- o 56.67% are very familiar (rating 5), the highest percentage in the survey.
- o The weighted average is 3.97, the highest among all categories, indicating that this is the most familiar concept among respondents.

4. Restoring natural systems (renewal, restoration, revitalization):

- o 50% are highly familiar (rating 5), while 30% have low to moderate familiarity (ratings 1-3).
- o The weighted average is 3.9, showing strong understanding but room for improvement in awareness.

5. Rethinking business models to encourage service use (leasing instead of ownership):

- o Only 30% are highly familiar (rating 5), and 46.67% fall in the low-to-moderate familiarity range (ratings 1-3).
- o The weighted average is 3.47, the second lowest, indicating lower familiarity with this concept compared to others.

6. Product-as-a-Service (companies retain product ownership while selling its use or service):

- o 33.33% are very familiar (rating 5), while 46.66% are in the low-to-moderate range (ratings 1-3).
- o The weighted average is 3.53, indicating moderate familiarity.

7. Using renewable, recycled, or biodegradable resources:

- o 46.67% are very familiar (rating 5), while 36.66% fall in the low-to-moderate range.
- o The weighted average is 3.77, indicating strong familiarity.

8. Renewal and regeneration of products at the end of their life cycle:

- o 36.67% are highly familiar (rating 5), with 43.33% having low-to-moderate familiarity.
- o The weighted average is 3.5, showing moderate awareness.

9. Increasing product lifespan through durability, repairability, and upgradeability:

- o 36.67% are highly familiar (rating 5), with a similar distribution as the previous category.
- o The weighted average is also 3.5, reflecting moderate knowledge in this area.

10. The sharing economy (reducing ownership, increasing product utilization through sharing):

- o 36.67% are very familiar (rating 5), while 40% are in the low-to-moderate familiarity range (ratings 1-3).
- o The weighted average is 3.63, suggesting moderate to strong understanding.

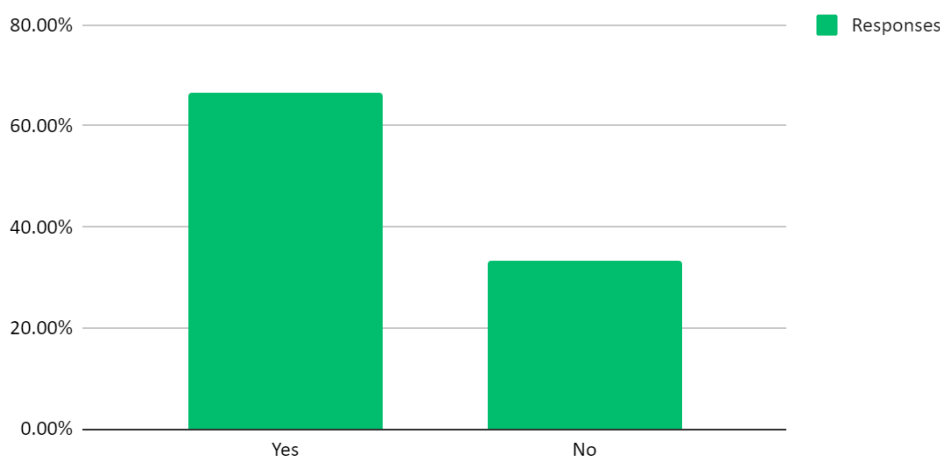
11. The role of digital technology in enabling the circular economy:

- o 30% are highly familiar (rating 5), while 46.67% have low-to-moderate familiarity (ratings 1-3).
 - o The weighted average is 3.53, reflecting moderate familiarity with the role of technology.
- **Highest familiarity:** Strategies to extend the useful life of products and materials (reuse, repair, recycle) scored the highest weighted average (3.97). This suggests that respondents are most comfortable with practical, hands-on approaches to the circular economy.
 - **Lower familiarity:** Concepts like rethinking business models (leasing vs. ownership) and Product-as-a-Service had the lowest averages (3.47 and 3.53), indicating these are less understood or adopted concepts.

- **Moderate awareness across most categories:** The weighted averages across the concepts range between 3.47 and 3.97, suggesting respondents have a fair understanding of most aspects of the circular economy but could benefit from more education, particularly around newer business models and the role of digital technology.
- **Conclusion:**

While there is solid familiarity with some practical aspects of the circular economy, particularly in waste minimization and lifecycle extension strategies, there is room for growth in understanding more innovative business models (like leasing vs. ownership) and the role of technology in supporting these systems. Educational or awareness campaigns could focus on these areas to help bridge the knowledge gap.

Do you apply any circular economy technologies or models in your business?



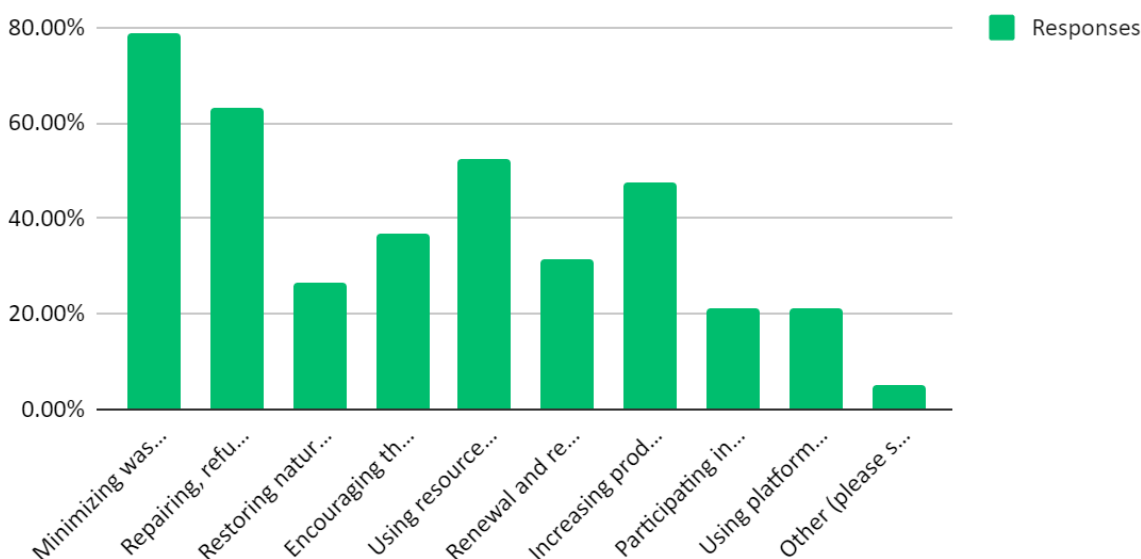
Two-thirds (66.67%) of respondents indicated they are applying circular economy (CE) technologies or models in their business. This suggests that a significant portion of the businesses surveyed are actively incorporating sustainable practices. It could reflect growing awareness of the benefits of circular economy principles, such as reducing waste, maximizing resource use, and enhancing sustainability. One-third (33.33%) of businesses are not yet applying any CE technologies or models. This could indicate barriers such as lack of awareness, insufficient resources, or the perceived complexity

of implementing circular practices. For these businesses, there may be opportunities for education, support, or incentives to help transition towards more sustainable practices.

For the 33.33% not yet engaged in CE practices, it might be helpful to explore what obstacles they face. These could include financial constraints, lack of knowledge or skills, or the nature of their business not aligning easily with circular models. Understanding and addressing these challenges could foster greater adoption. With 66.67% of businesses already applying circular technologies, the data indicates that circular economy models are becoming increasingly mainstream. Businesses are likely recognizing not only the environmental benefits but also the potential cost savings and efficiency improvements associated with CE practices.

The data shows that a majority (66.67%) of respondents are already engaged with circular economy practices, which is a positive sign of growing awareness and implementation of sustainable business models. However, there remains a significant minority (33.33%) that has yet to adopt these practices. Efforts could be made to understand and reduce barriers to adoption, potentially driving further engagement in circular economy models across all businesses.

If the answer is yes (previous question), please specify which (multiple answers can be selected):



Total Respondents: 19 (answered), 34 (skipped). Respondents could select multiple options related to the circular economy technologies or models they apply in their business.

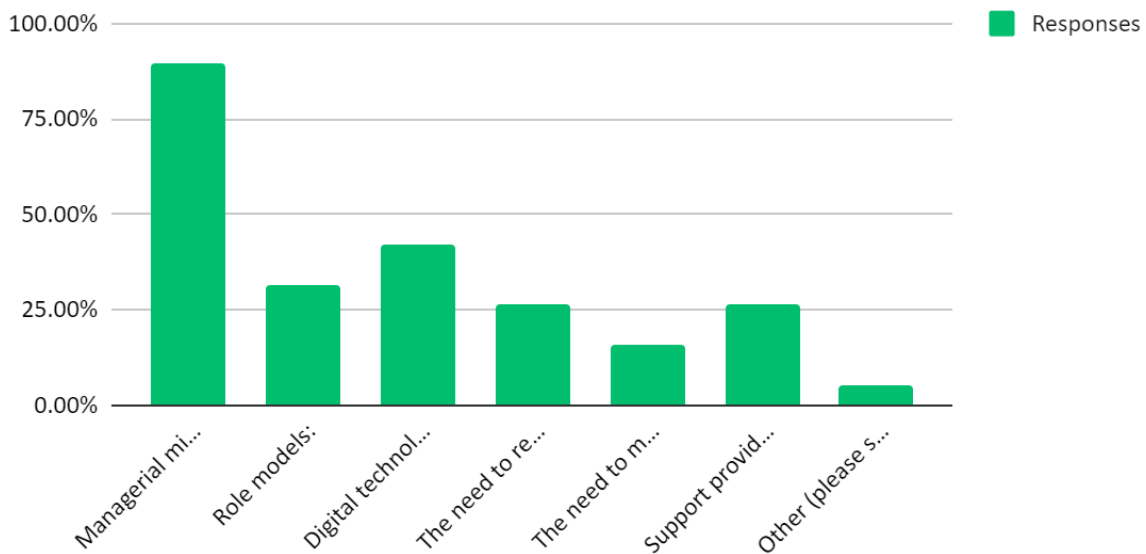
The most commonly implemented practice, 78.95%, suggesting that businesses are focusing heavily on designing their processes and products to reduce waste and pollution. This could involve optimizing manufacturing processes, using cleaner technologies, or designing products that generate less waste. A majority of respondents, 63.16%, are involved in extending the lifecycle of products through repair, reuse, or recycling. This reflects a commitment to keeping materials in use for as long as possible, which is a core principle of the circular economy. Fewer businesses, 26.32%, are actively engaged in restoring natural systems. This could involve activities such as reforestation, water restoration, or using renewable energy sources. The lower percentage suggests that this may be a more complex or resource-intensive strategy, requiring specific infrastructure or long-term planning. A fair number of businesses, 36.84%, are shifting toward service-based models where customers pay for the use of a product (such as leasing) rather than ownership. This indicates a growing trend in maximizing product usage, aligning with the circular economy's goal of resource efficiency. More than half of respondents, 52.63%, use sustainable materials. This demonstrates that businesses are aware of the importance of material choice in supporting circular practices, whether through renewable energy sources, biodegradable materials, or recyclable inputs. Some businesses, 31.58%, are engaged in end-of-life regeneration strategies, where materials and products are repurposed or regenerated rather than discarded. This reflects the effort to close the loop in the product lifecycle, but it may require more advanced logistics or partnerships to implement. Nearly half of respondents, 47.37%, are focusing on designing products to last longer, through enhanced durability and repairability. This supports the circular economy by reducing the need for frequent replacements and minimizing waste. A smaller number, about 21.05%, of businesses are involved in sharing economy models, such as car-sharing or equipment-sharing platforms. This suggests that while the sharing economy is gaining attention, it may not yet be widely adopted across all industries. Similarly, a smaller proportion, 21.05% of businesses are using digital platforms to facilitate sharing, leasing, or material tracking. This could reflect an emerging area where digital tools play a key role in enabling more efficient resource use and transparency in supply chains. One respondent provided an additional or unspecified circular economy practice, showing that there may be other niche strategies not captured in the predefined options.

- **Strong focus on waste minimization:** The majority of respondents (78.95%) are prioritizing waste and pollution reduction in their product and process design, indicating a core interest in sustainability at the design phase.
- **Lifecycle extension:** Many businesses (63.16%) are also focused on extending product lifecycles through repair, reuse, and recycling, a practice closely aligned with circular economy principles.
- **Less engagement in sharing models:** Only 21.05% of respondents are participating in the sharing economy or using platforms for sharing and leasing, suggesting that these more innovative, collaborative models may not yet be widely adopted across industries, likely due to market or structural barriers.
- **Material choices and durability:** Over half of the respondents (52.63%) are opting for renewable or recyclable materials, and nearly half (47.37%) are emphasizing product durability and repairability, reflecting efforts to reduce waste and increase efficiency throughout product lifecycles.

Conclusion:

The data suggests that while businesses are actively adopting various circular economy practices, the most common strategies are focused on minimizing waste and designing for sustainability. However, there is still room for growth in more advanced circular strategies, such as restoring natural systems, participating in the sharing economy, and using digital platforms for leasing and tracking materials. As businesses continue to embrace circular models, there may be opportunities to further explore and expand the adoption of these innovative practices.

What were the main factors for you to apply circular economy technologies or models? (you can select more than one answer...)

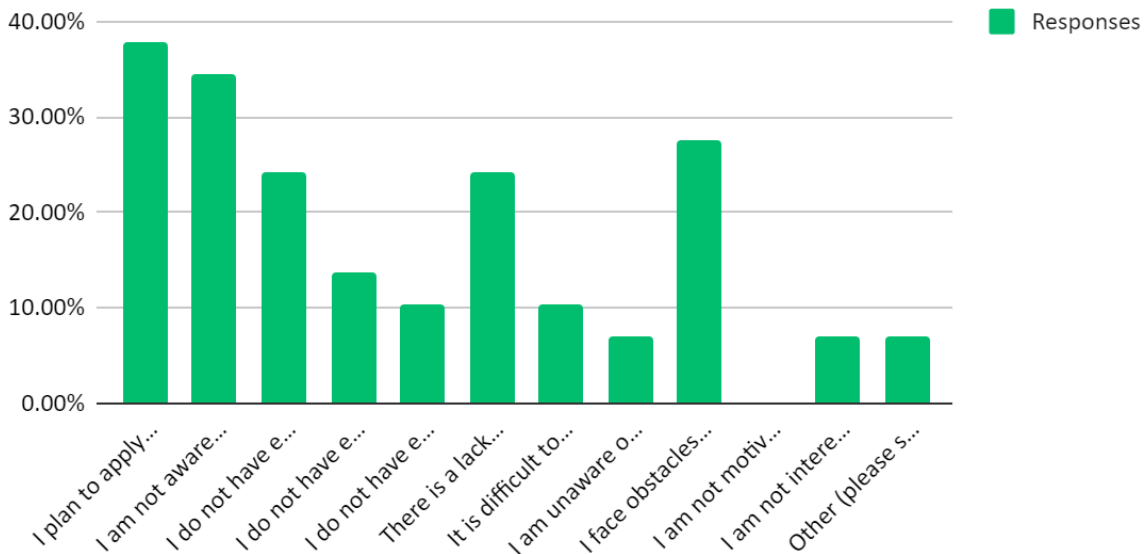


Managerial Mindset, Skills, and Commitment to Green Transition is the most significant factor, with nearly 90% of respondents citing leadership's mindset and dedication to sustainability as the primary driver for adopting circular technologies. This suggests that internal leadership plays a crucial role in implementing circular models, as these practices often require a shift in strategic focus and company culture. Digital tools and technologies were a key factor for over 40% of respondents. This highlights the importance of technology in enabling and accelerating circular economy practices, whether through improving efficiency, enabling tracking, or offering new business models like sharing platforms. Around one-third of respondents mentioned that role models, whether businesses or individuals, inspired them to adopt circular practices. This implies that seeing successful examples of circular business models can encourage others to follow suit, showcasing the importance of peer influence and success stories. Around one-third of respondents, (31.28%), mentioned that role models, whether businesses or individuals, inspired them to adopt circular practices. This implies that seeing successful examples of circular business models can encourage others to follow suit, showcasing the importance of peer influence and success stories. A quarter of respondents, (26.38%) were motivated by the need to cut costs associated with raw materials. This indicates that economic factors, such as resource scarcity or fluctuating material prices, can drive businesses to seek more efficient, circular alternatives. A

smaller percentage (15.79%) of respondents cited meeting consumer demand for sustainable products as a key factor. While this is a lower figure, it suggests that a growing but still niche group of consumers is actively seeking out circular products and services. Government funding, training, and other support measures were also a motivating factor for about a quarter of respondents (26.32 %). This highlights the role of public policy in facilitating the adoption of circular economy practices, particularly through financial incentives and training programs. One respondent selected “Other,” indicating there may be additional, unique motivations not captured in the predefined options. The dominant influence of managerial mindset and commitment shows that leadership plays a main role in driving the adoption of circular models. Without strong leadership backing, it’s unlikely that a business will successfully transition to a circular economy model. Digital technologies are a major enabler, underscoring the importance of tools like data analytics, tracking platforms, and digitized processes in implementing circular practices and gaining a competitive edge. The motivation to reduce raw material costs and respond to consumer demand for green products shows that both cost-efficiency and market expectations are relevant, though they seem to be secondary factors compared to leadership and technology. Policy support through grants, funding, or training plays a vital role in helping businesses adopt circular models, especially for those that might lack the internal resources to make this shift independently.

So, the primary drivers for adopting circular economy technologies and models are rooted in strong leadership and the use of digital technologies, supported by economic factors like cost reduction and policy incentives. However, the relatively lower influence of consumer demand suggests that while sustainability is gaining traction, it’s not yet a dominant market force for most businesses in this group.

What are the main reasons? (you can select more than one answer)?



37.93% of respondents plan to implement circular technologies or models in the upcoming year, showing a strong interest and readiness among a significant portion of businesses. This indicates a positive outlook for circular economy adoption in the near future. **34.48%** of respondents are not aware of suitable options or how to implement circular practices. This highlights a significant gap in knowledge and indicates the need for more education or resources to inform businesses about circular economy opportunities. **24.14%** of respondents lack knowledge about how Industry 4.0 technologies (such as IoT, automation, AI) can support circular economy efforts. This suggests that technological advancements are not fully understood or utilized in supporting circular strategies, indicating a need for more technical training or awareness. A considerable number of respondents (**13.79%**) feel overwhelmed with daily business operations and do not have time to explore or implement circular models. Similarly, **10.34%** cite family or personal duties as limiting their ability to focus on circular initiatives. These time constraints highlight the operational challenges smaller businesses face in implementing new models. **24.14%** of respondents report a lack of skilled or qualified staff to work with new technologies, suggesting that workforce development is a barrier to adopting circular practices. Training and upskilling employees in circular economy models and technologies could be a key area for development. **27.59%** of respondents face difficulties in securing financial resources

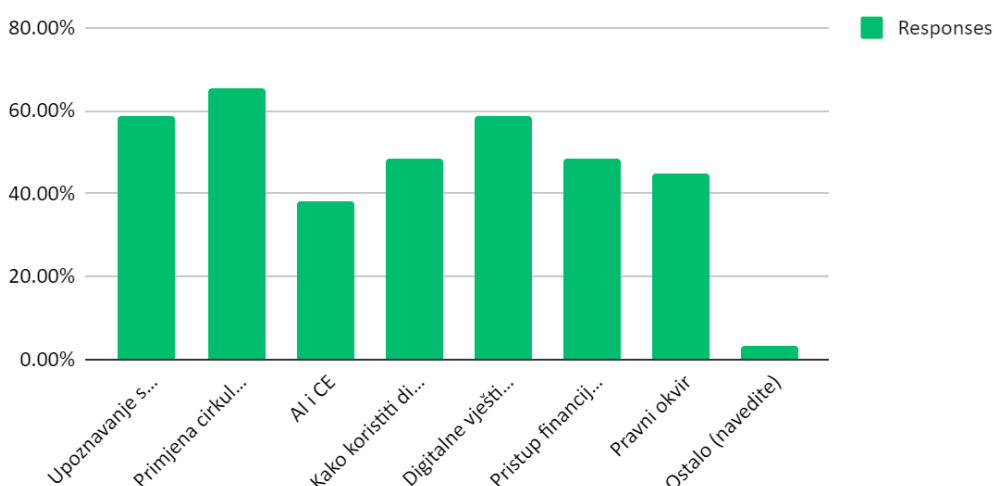
necessary for circular initiatives. This underscores the financial challenges of transitioning to circular models, which may require significant upfront investments in technology, training, or infrastructure. 🏢 **10.34%** of respondents find it difficult to change the mindset and culture of their entire company. This shows that internal resistance to change can be a major obstacle in adopting circular practices, often requiring leadership to actively manage cultural shifts. A smaller percentage of respondents (**6.90%**) are unaware of legal requirements or limitations, and the same percentage are not interested in exploring green solutions for their business. Additionally, no respondents mentioned lack of customer interest as a reason for not applying circular models, which may indicate that businesses do not see consumer resistance as a major barrier.

- **Widespread interest, but knowledge and resource gaps:** While there is significant interest in adopting circular models, knowledge gaps and a lack of awareness about how to implement these practices are common. Addressing these through education, awareness campaigns, and technical support could greatly enhance circular economy adoption.
- **Time and resource constraints:** Operational challenges, including time and financial constraints, are critical barriers. Smaller businesses, in particular, may struggle to allocate the necessary resources to explore and adopt circular models.
- **Skills and workforce development:** The shortage of skilled staff to implement and manage circular technologies suggests that investing in training and workforce development will be essential for scaling circular practices across industries.

Conclusion:

There is a clear willingness among businesses to embrace circular economy technologies, with many planning to implement them in the near future. However, barriers such as lack of awareness, knowledge gaps in advanced technologies, time constraints, and financial challenges are holding some businesses back. Addressing these through targeted support in education, funding, and skills development will be crucial to accelerating circular economy adoption.

What training topics would be most useful to encourage the circular transition for women entrepreneurs? (you can select m...



The top choice among respondents, with 65.52% prioritizing sector-specific training. This shows that women entrepreneurs are most interested in practical applications of the circular economy tailored to their industry. This also indicates a need for specialized knowledge rather than just general theory. Regarding Introduction to the Circular Economy and Digital Skills for the Transition both topics are equally important to 58.62% of respondents. Training on the basics of the circular economy is still necessary, indicating that there's a wide audience needing foundational understanding. Additionally, the demand for digital skills highlights the importance of technology in driving the circular transition, suggesting a growing need for entrepreneurs to become tech-savvy. Nearly half of the respondents (48.28%) are interested in learning how digital technologies can help facilitate the transition to circular models, showing the growing intersection between technology and sustainability. Moreover, access to finance with the same percent (48.28%) remains crucial for implementing circular

economy initiatives, indicating that funding is a significant barrier for many entrepreneur. Artificial Intelligence (AI) in relation to the circular economy is of interest to nearly 38% of respondents. While not the top priority, this shows a rising interest in how AI can support circular models, especially in terms of process optimization and resource efficiency. Understanding the legal framework for circular practices is another important topic, with 44.83% expressing interest. This reflects the need for clarity around regulations, compliance, and legal challenges related to circular business models. A small percentage (3.45%) chose "Other," indicating there may be additional, niche topics of interest that are not covered by the predefined options.

The shows that majority of women entrepreneurs are seeking training that is directly applicable to their industry. This suggests that while general education on circular economy concepts is useful, practical, industry-specific solutions are in higher demand. The interest in both digital skills and using digital technologies for the circular transition shows that digitalization is seen as a key enabler of the circular economy. This highlights the need for training that combines both sustainability and digital expertise. With 48.28% of respondents prioritizing training on securing funding, financial constraints remain a significant challenge for women entrepreneurs seeking to implement circular models. Addressing these financial barriers through education and support could help unlock more widespread adoption of circular practices. The demand for understanding legal frameworks indicates that regulatory challenges could pose obstacles for businesses attempting to transition to circular models. Clarifying these requirements through training could mitigate risks and improve compliance.

Conclusion:

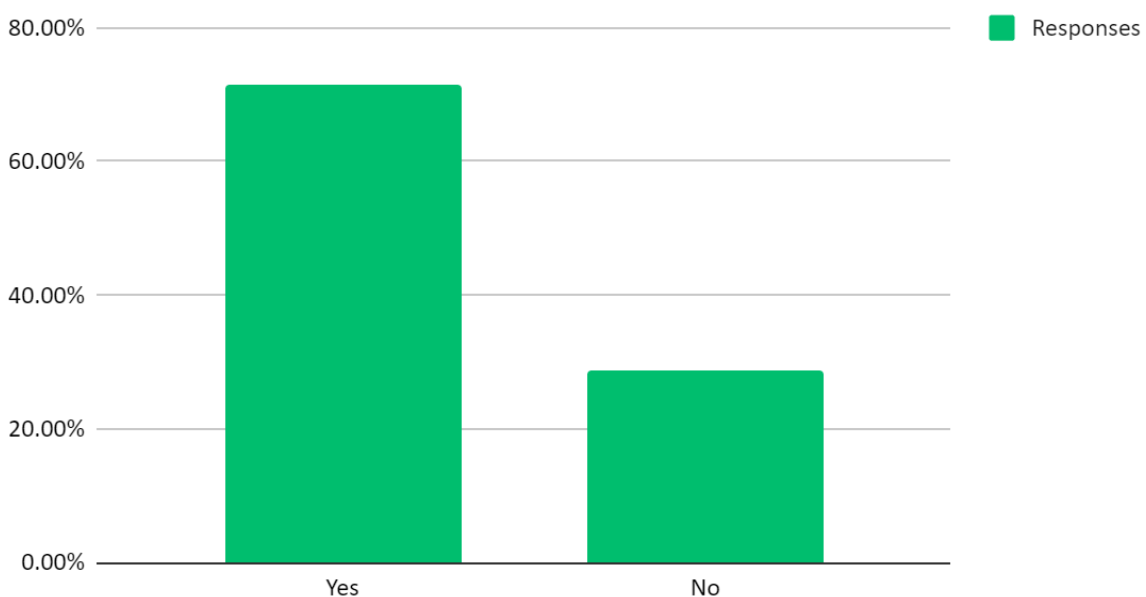
Training that is tailored to specific sectors, alongside enhancing digital skills and understanding of how to leverage digital technologies, would be most beneficial to encourage the circular transition for women entrepreneurs. Additionally, addressing access to finance and providing clarity on legal frameworks would further support the shift toward circular business models. As interest in AI grows, this could be an emerging area of focus in future training programs.

In response to the open-ended question **about the most beneficial type of support for transitioning to a circular economy**, the predominant theme was the need for **government financial assistance**. Many respondents expressed that direct funding or subsidies would significantly ease the transition process. Additionally, there was a

strong demand for **clarification of the legal framework**, which would help businesses navigate regulatory requirements more effectively. **Education and mentorship** were also highlighted as critical areas where support could foster better understanding and practical implementation of circular economy practices.

5.2 Industry 4.0 (i4.0)

Do you believe your business has adopted digital technologies?

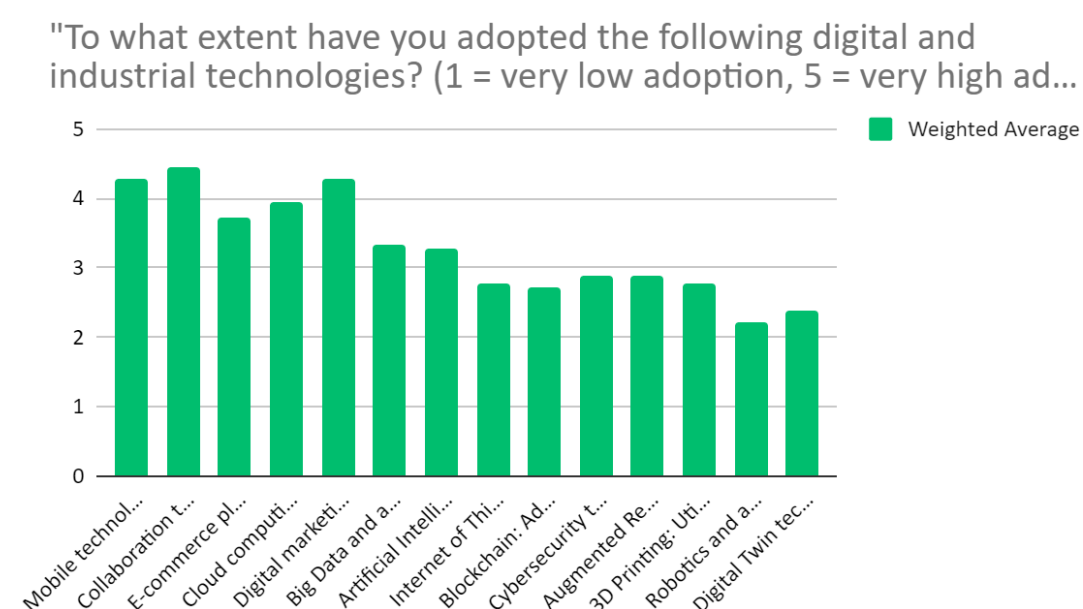


A significant majority of respondents (71.43%) believe their business has adopted digital technologies. This indicates that digital transformation is well underway for most businesses in the survey, likely helping to improve efficiency, competitiveness, and innovation in their operations.

Despite the high adoption rate, a notable portion of respondents (28.57%) have not yet integrated digital technologies into their business. This could be due to various factors, such as limited resources, lack of knowledge, or hesitation to embrace new technologies. These businesses may be missing out on the benefits that digital transformation can bring, such as streamlined processes, enhanced customer experience, and increased scalability.

For the businesses that have not adopted digital technologies, potential barriers could include cost, skills gaps, or resistance to change. These companies may need targeted support, such as access to digital training, funding for technological upgrades, or consulting on how to integrate digital tools effectively.

While a strong majority (71.43%) of businesses report having adopted digital technologies, almost 30% still have not, indicating there is room for growth in digital transformation. Providing resources, training, and support to these businesses could help them leverage digital tools to boost their competitiveness and efficiency. This data suggests a divide between digitally transformed businesses and those lagging behind, which could widen without intervention.



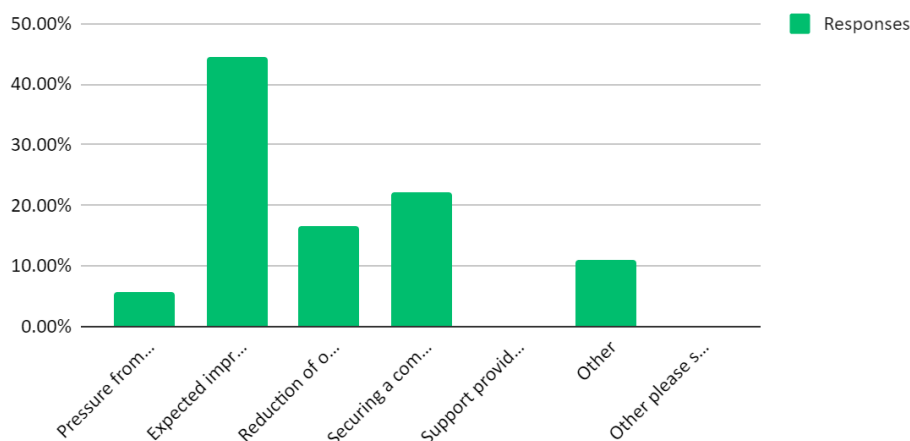
Mobile technologies and collaboration tools have the highest adoption, with weighted averages of 4.28 and 4.44, respectively. This reflects the growing importance of remote work and communication tools in modern businesses, especially post-pandemic. **Digital marketing tools** also show strong adoption (4.28), as businesses recognize the need for targeted marketing and customer engagement through online platforms.

E-commerce platforms (3.72) and **cloud computing** (3.94) are moderately adopted, suggesting that businesses are making significant moves towards digitalization in sales, storage, and flexible business operations. **AI and ML** (3.28) and **Big Data and analytics** (3.33) have also seen a moderate level of adoption, indicating that some businesses are starting to explore advanced technologies for automation, data analysis, and predictive planning. **Internet of Things (IoT)** (2.78), **Blockchain** (2.72), and **cybersecurity technologies** (2.89) show lower adoption rates, suggesting that many businesses are still hesitant or lack the resources to integrate these more complex and specialized technologies. **Robotics and automation** (2.22) and **Digital Twin technology** (2.39) are the least adopted, indicating that these technologies are likely viewed as either too expensive or unnecessary for many respondents.

Conclusion:

There is strong adoption of basic digital tools like mobile and collaboration platforms, cloud computing, and digital marketing. However, advanced technologies like AI, IoT, blockchain, and robotics are still in the early stages of adoption, likely due to their complexity, costs, or industry-specific relevance. This data suggests that while digital transformation is advancing, there is still a significant gap in the implementation of cutting-edge industrial technologies.

What motivated you the most for the Industry 4.0 transition of your business?



The most common motivator for businesses transitioning to Industry 4.0 (44.44%) is the expected improvements in **operational efficiency and quality**. This indicates that

most businesses are motivated by the potential for enhanced processes, increased productivity, and improved output quality through advanced technologies. **Securing a competitive advantage** ranks as the second most significant motivator (22.22%). This shows that businesses are aware of the benefits of adopting Industry 4.0 technologies to stay ahead in a competitive market by leveraging innovation and cutting-edge processes. Some businesses are motivated by the opportunity to **reduce operational costs (16.67%)**. This suggests that cost-saving potential through automation, optimization, and other efficiencies is a key driver for transitioning to Industry 4.0. A small percentage of businesses (5.56%) feel **pressure from clients and suppliers** to modernize. This indicates that external demands for modern practices and technologies are less of a driving force for most businesses, though they do exist for some. Interestingly, **none** of the respondents cited **policy measures, such as funding or training, as a motivation**. This could suggest that current policy support is either insufficient or not well-promoted, and businesses may not be fully aware of or taking advantage of such resources. Some respondents cited **other (11.11%)** reasons not captured in the predefined options. This highlights that there may be additional, unique motivations that are specific to individual businesses or industries.

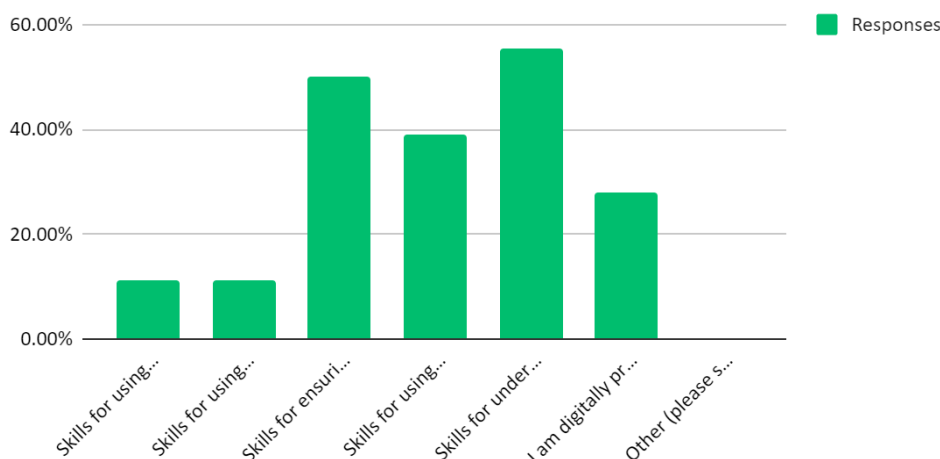
Most businesses are internally motivated by the tangible benefits of improved efficiency, quality, and cost reduction. These factors outweigh external pressures, such as client demands or policy support. The absence of responses indicating motivation from policy measures suggests a potential disconnect between government initiatives and business awareness or utilization. This highlights an opportunity for better communication or more specific support from policymakers. A significant number of businesses are transitioning to Industry 4.0 to maintain or gain a competitive advantage, indicating that modernization is seen as critical for staying relevant in the marketplace.

Conclusion:

Most businesses are motivated to transition to Industry 4.0 by the potential for increased efficiency, improved quality, and cost savings. Competitive advantage is also a significant factor. However, the lack of influence from policy support suggests that businesses are not utilizing available resources, which could be an area for further exploration and development.

In response to the open-ended question, "**What resources or support do you need to integrate Industry 4.0 technology into your business? What measures would help women entrepreneurs to enhance/improve their digital skills for the transition to Industry 4.0? /Briefly describe/**", most respondents indicated that **education** is the primary need. A smaller portion of respondents mentioned the need for **financial incentives**.

What digital skills do you need to acquire or improve? Select all that apply.



Over half of the respondents (55.56%) indicated that they need to improve or acquire **programming and software development skills**, showing a strong demand for technical expertise in this area. This is critical for businesses transitioning to Industry 4.0 technologies that involve automation, AI, and digital solutions. Half of the respondents (50 %) recognized the importance of **online security skills**, which is increasingly relevant as businesses adopt more digital platforms and face cybersecurity threats. This highlights a clear need for security awareness and protection against digital risks. A significant portion of respondents (38.89%) expressed the need for **design or simulation software skills**, likely indicating a growing focus on digital prototyping, product development, or process simulation within Industry 4.0. Only 11.11% of respondents noted the need to improve skills for Microsoft Office and business communication tools (email, video calls). This suggests that most respondents are already proficient in these more basic digital tools, focusing their skill development on more advanced technologies. A notable percentage (27.78%) of respondents believe

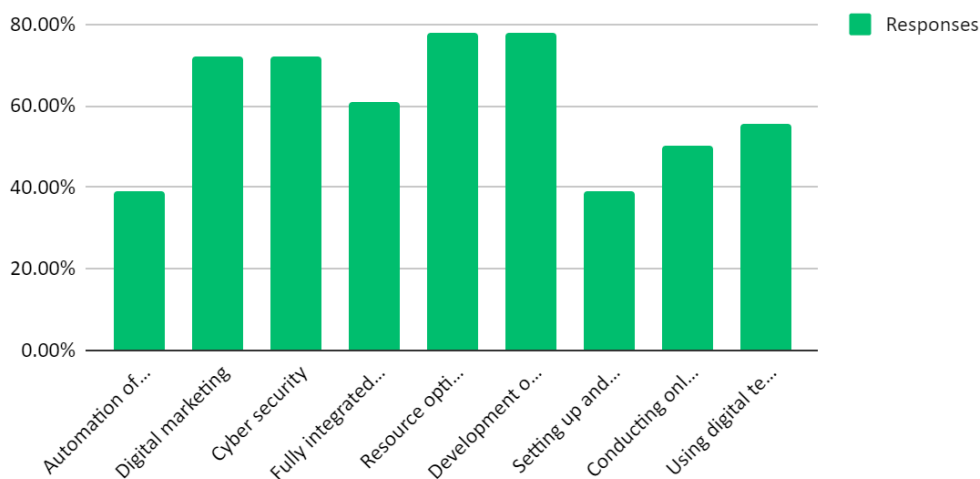
they are **digitally proficient enough**, implying they do not feel the need for further improvement in digital skills. However, this still leaves the majority feeling there is room for growth in their digital capabilities.

Most respondents are seeking to improve **advanced digital skills**, such as programming, software development, and online security, which are essential for leveraging Industry 4.0 technologies. With 50% of respondents identifying the need for online security skills, this suggests that businesses recognize the increasing importance of protecting their digital operations from cyber threats. The relatively low demand for improving basic business software skills suggests that most respondents are already comfortable with essential tools, allowing them to focus on more complex digital competencies.

Conclusion:

The data shows a clear need for advanced technical skills, particularly in **programming, software development**, and **cybersecurity**, as businesses prepare for the digital and technological demands of Industry 4.0. The relatively lower interest in basic digital tools implies that many respondents have already achieved foundational digital proficiency, focusing their efforts on more specialized and complex technologies.

Which of the following ICT areas are most needed for the training of women entrepreneurs? Select all that apply.



The most critical training needs identified by respondents are **resource optimization and development of digital business models and services**, with 77.78% expressing

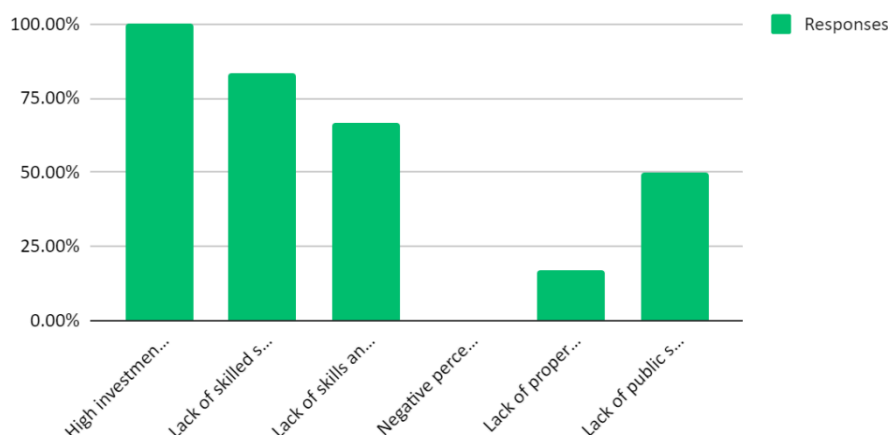
interest in both areas. This reflects a strong desire among women entrepreneurs to enhance efficiency, manage resources effectively, and innovate through new business models. **Digital marketing** and **cybersecurity** were highlighted as key areas by 72.22% of respondents. This indicates that entrepreneurs recognize the importance of leveraging online platforms for marketing and securing their businesses against cyber threats, both of which are essential in the digital era. A significant portion of respondents (61.11%) identified the need for **fully integrated digital processes**. This suggests that businesses are seeking to streamline operations by adopting end-to-end digital workflows, which can improve productivity and reduce inefficiencies. **Using digital technologies for business needs** (55.56%) and **online market research** (50.00%) also emerged as important training areas, showing that entrepreneurs want to utilize digital tools for better market understanding and operational support. **Automation of production** and **setting up and maintaining online stores** were noted by 38.89% of respondents, reflecting more specialized needs. These areas may be less universally relevant depending on the type of business or industry.

The top areas for training—**resource optimization** and **digital business model development**—indicate that women entrepreneurs are primarily focused on optimizing their businesses and exploring new, innovative services through digital platforms. The high demand for **digital marketing** and **cybersecurity** training demonstrates the importance of both promoting businesses online and protecting digital assets in today's business environment. The interest in **fully integrated digital processes** highlights a shift toward holistic digital transformation, where businesses aim to fully digitize their operations for greater efficiency.

Conclusion:

Women entrepreneurs show a clear need for training in **resource optimization, digital business models**, and essential digital skills like **cybersecurity** and **digital marketing**. As businesses seek to become more efficient and innovative, these areas will be key to their successful transition to more digital and automated processes.

What are the main barriers to adopting more advanced digital technologies in your business? (Select all that apply)



All respondents identified **high investment costs** as the main barrier to adopting advanced digital technologies. This indicates that financial constraints are the most significant factor preventing businesses from integrating these technologies. Most respondents (83.33%) cited the **lack of skilled staff** as a major obstacle. This suggests that there is a shortage of qualified employees who can effectively implement and manage advanced digital systems, highlighting the need for training and upskilling in digital competencies. **66.67%** of respondents noted a **lack of knowledge and skills** on how to implement digital technologies. This barrier points to the need for education and support in understanding how to integrate these technologies into business operations. Half of the respondents indicated a **lack of public support**, such as funding or training programs, as another barrier. This highlights the need for more accessible governmental or institutional support to help businesses overcome financial and educational obstacles. Only 16.67% respondents reported a **lack of planning** as a barrier. This suggests that most businesses have strategies for adopting digital technologies but struggle with execution due to financial and staffing constraints. None of the respondents reported **negative perceptions of technology** as a barrier, indicating that businesses generally have a positive attitude toward adopting digital solutions but face practical challenges in doing so.

High investment costs are the most significant barrier, suggesting that without financial support or incentives, businesses may struggle to adopt advanced technologies. The lack of skilled staff and knowledge to implement digital technologies is another major barrier. Half of the respondents indicated that more public support in the form of

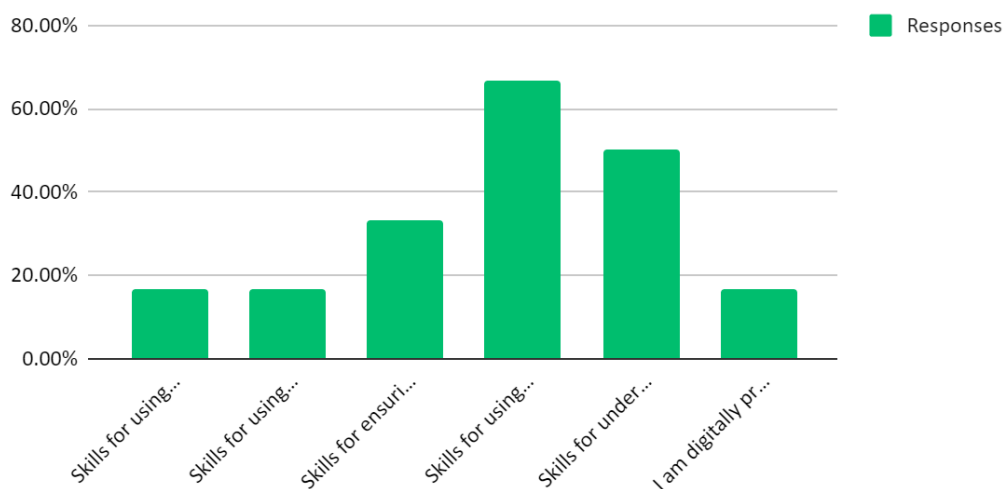
funding or training is necessary. This could be addressed through government initiatives aimed at helping businesses invest in and adopt digital technologies. This points to the need for training and upskilling programs to build a workforce capable of handling advanced digital systems.

Conclusion:

The main barriers to adopting advanced digital technologies are **high investment costs**, **lack of skilled staff**, and **lack of knowledge** on how to implement these technologies. Addressing these barriers through financial support and targeted training programs could significantly enhance the digital transformation of businesses.

In response to the open-ended question, "**What resources or support do you need to integrate Industry 4.0 technology into your business? What measures would help women entrepreneurs enhance/improve their digital skills for the transition to Industry 4.0? /Briefly describe/**", respondents equally cited **education** and **financial resources** as the two main needs.

What digital skills do you need to acquire or improve? Select all that apply.



Most respondents (66.67%) indicated the need for skills in **design or simulation software**, suggesting that women entrepreneurs are keen to engage in digital tools related to product development, prototyping, or process simulation. Half of the respondents expressed interest in improving their **programming and software development skills**, showing that there is a strong demand for technical skills to

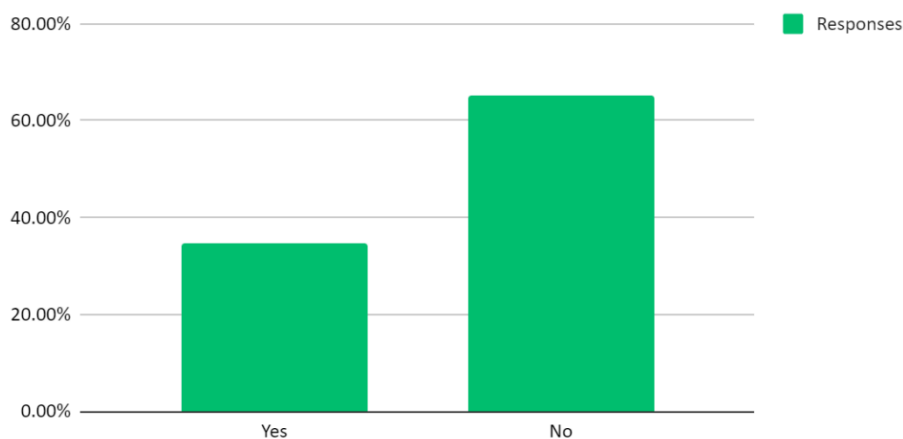
support software-related tasks, automation, and custom digital solutions. A significant portion (33.33%) pointed to the need for **online security skills**, reflecting the growing importance of cybersecurity in safeguarding digital operations and business data. Only 16.67% of respondents identified the need to improve skills related to **Microsoft Office** and **business communication tools**, suggesting that most respondents feel comfortable with basic digital tools and are instead focusing on more specialized or advanced skills. 16.67% respondents indicated that they are already **digitally proficient enough**, implying that a portion of the participants feel confident in their current skill set. The data shows a strong focus on acquiring advanced and specialized digital skills, particularly in areas like **design or simulation software** and **programming**. This indicates that respondents are looking to enhance technical capabilities that are more aligned with Industry 4.0 technologies. A notable percentage of respondents recognize the need for **online security skills**, which highlights the importance of protecting digital assets in today's increasingly connected business environment. With only 16.67% selecting basic skills like **Microsoft Office** or **email and video calls**, it appears that most respondents have already mastered these tools and are aiming to acquire more advanced digital competencies.

Conclusion:

The data highlights that women entrepreneurs are primarily seeking to develop more advanced digital skills, especially in **design/simulation software** and **programming**, while also recognizing the need for **cybersecurity**. Basic digital skills, on the other hand, are less of a priority, as most respondents feel proficient in those areas.

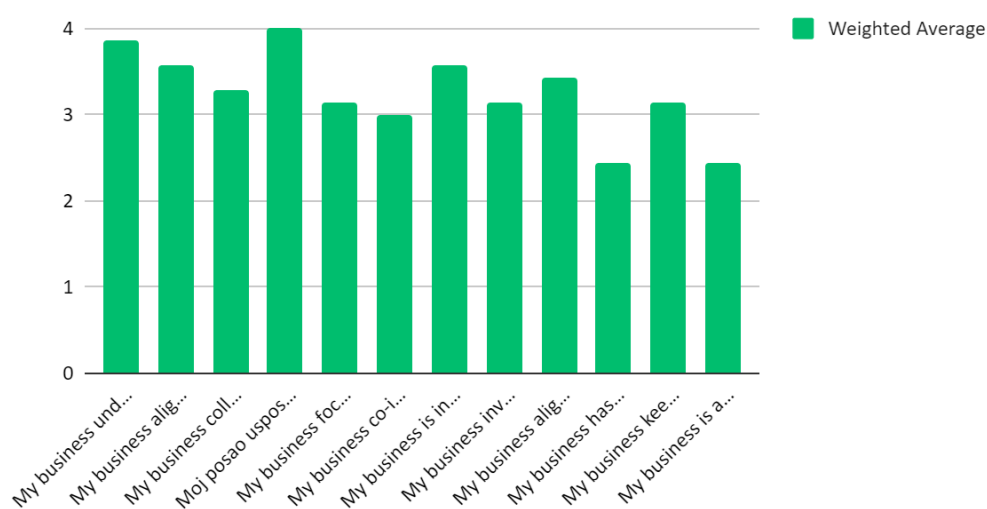
5.3 Smart Specialization (S3) and external impacts

Are you aware of the Smart Specialization Strategy (S3) in your area?



When asked about their awareness of the **Smart Specialization Strategy (S3)** in their area, **34.78%** of respondents indicated that they were aware of it, while **65.22%** were not. This suggests a significant gap in awareness of S3, which could hinder the adoption of regionally focused innovation and development strategies. Given that S3 plays a key role in fostering innovation, there may be a need for increased outreach and education efforts to better inform businesses about how they can leverage this strategy for growth and competitiveness in their sectors.

Please list the ways in which you align with the S3 in your area.



Businesses show a moderate to high alignment with S3 priorities, especially in areas like **understanding the sectors, technologies, and challenges** (3.86) and **establishing partnerships based on S3 priorities** (4.00). These scores indicate that many businesses are aware of and are aligning their strategies with S3 goals, particularly in collaboration and partnership efforts. Although some businesses collaborate with **local clusters, innovation centers, and research institutions** (3.29) and **co-innovate with universities** (3.00), these areas show room for improvement. Increased engagement with the broader S3 ecosystem could enhance innovation and growth. Engagement in **regional, national, and EU funding programs** related to S3 is relatively strong (3.57). However, ensuring that more businesses are aware of and take advantage of these opportunities could further support the alignment with S3 objectives. The need for **workforce upskilling** (3.14) and the focus on **sustainability goals** (3.43) are emerging priorities. More investment in skills training and sustainability practices could accelerate progress toward S3 objectives. Businesses show lower levels of participation in **S3 discussions and consultations** (2.43) and few consider themselves **S3 success stories** (2.43). This suggests a need for greater involvement in shaping and contributing to the S3 strategy.

Conclusion:

While many businesses align with S3 goals in terms of partnerships and funding, there is room for increased engagement in co-innovation, workforce development, and participation in S3 discussions. Greater awareness and involvement could help businesses maximize their contribution to the Smart Specialization Strategy and leverage its benefits for growth and innovation.

6 Successful women entrepreneurs

Business sectors, size of the company, years on the market, type of applied CE technology/business model:

- Ivana Biočina operates in the textile industry through the **Sustainable Fashion Institute (IOM)**, located in Koprivnica. The IOM was established in October 2020. It applies various circular economy technologies, such as **zero textile waste**, **upcycling** (repurposing old items and materials), and the use of **biodegradable materials**. All materials are naturally dyed with seasonal plants from the local region of Podravina, promoting local and ecological production.
- **Main motivator for application of CE practice:**
- The main motivator for applying CE practices at IOM is **sustainability**, environmental responsibility, and the desire to reduce waste in the textile industry. Ivana Biočina promotes the idea of sustainable business to educate consumers, especially women, and to drive change in the fashion industry. Her work raises awareness of the harmful effects of traditional fashion on the environment and the need for transformation through sustainable practices.
- **What worked well and what did not through the process of implementation of the CE practice and digital transition:**
- **Successful aspects:**
 - **Local production** and the use of natural materials (seasonal plants from Podravina) have yielded positive results in reducing emissions and supporting the local economy.
 - **Upcycling** has helped reduce textile waste and create unique, sustainable products, aligning with circular economy principles.
- **Challenges:**
 - The implementation process required a high level of **consumer education**, which is a time-consuming process as many are still unaware of the environmental impact of fashion.
 - **Digital transition** and the shift to online sales and marketing channels can be challenging, especially in traditional industries like textiles, where the focus is on physical production and materials.
- **What skills were needed?:**

- Successful implementation of CE practices at IOM required a combination of skills, including:
 - **Technical skills** in textile technology and engineering to properly apply sustainable production methods.
 - **Managerial skills** to run a small business focused on local production with global impact.
 - **Educational and communication skills** to raise consumer awareness about the benefits of sustainable products.
 - **Digital skills** to adapt the business to digital channels, marketing, and online sales.
- **What kind of support was sought and what was received?:**
- **Support sought:**
 - Ivana Biočina sought support in terms of **networking with local and international organizations** that support sustainable fashion.
 - Financial support was also necessary to start and develop eco-friendly production.
- **Support received:**
 - Ivana received support through international projects and recognitions, including grants like the one from the **Robert Bosch Foundation**, which enabled her to further research and develop sustainable practices.
- **What could be recommended for better support of women entrepreneurs for circular and digital transition:**
- Recommendations for better support include:
 - **Education and mentorship** for women entrepreneurs to better understand circular economy and the digital tools needed for successful transitions.

- o **Financial incentives and subsidies** for businesses that focus on sustainable practices, with special programs for women entrepreneurs.
 - o **Access to technology and digital tools**, as well as training on using these tools in day-to-day operations, especially for small businesses entering the digital world.
- **Stakeholders' Perspective:**
- **Insights from interviews with key stakeholders (e.g., industry leaders, educators, policy makers):**
 - o Key stakeholders, including **industry leaders and educators**, such as emphasize the need for comprehensive education on circular economy and sustainability at all levels. It was highlighted that education should start in educational institutions to create a culture of sustainability among young people.
 - o **Policymakers** stressed the importance of creating **policies and regulations** that would encourage businesses, particularly women entrepreneurs, to apply circular business models.
- **Recommendations and proposed actions from stakeholders:**
 - o Increasing **financial incentives** for projects involving circular economy, as well as **facilitating access to digital tools** for businesses undergoing digital transformation.
 - o Developing **networked platforms** that would enable entrepreneurs, especially women, to exchange experiences and resources related to the implementation of sustainable and digital practices.

This analysis demonstrates how Ivana Biočina and IOM's example illustrates the successful use of circular economy in business while identifying key challenges and needs in terms of digital transition and support for women entrepreneurs. Collaboration with key stakeholders and increasing financial and educational resources are crucial for further development of sustainable business practices.

7 Stakeholder Perspectives

Three responses were collected in total, representing industry, policymaking, and academia. Each of these stakeholders provided insights regarding their roles and perspectives on facilitating CE and i4.0 transitions for women entrepreneurs.

Distribution per type of stakeholder:

- o **1 Industry Leader** (private sector representative with direct experience in CE and i4.0)
- o **1 Policymaker** (focused on regulatory frameworks that support circular economy and digital transformation)
- o **1 Academic Expert** (focused on research and educational strategies related to CE and Industry 4.0)

Description of the experience of the stakeholder with regard to CE and i4.0 transition:

- o **Industry Leader:** This stakeholder has been involved in **digital transformation efforts** and implementing **circular business models** for over a decade. Their company has successfully navigated the transition to Industry 4.0 by adopting automation and data analytics while minimizing waste through CE initiatives.
- o **Policymaker:** With experience in developing national strategies for **sustainable development**, the policymaker has been involved in drafting legislation that encourages both **green technologies** and the **digital transition** of industries. The focus has been on creating incentives for businesses, including women-led businesses, to embrace these transformations.
- o **Academic Expert:** This stakeholder has been deeply involved in researching the **intersection between sustainability and digitalization**. The expert has worked on academic projects aimed at **educating entrepreneurs**, particularly women, on integrating i4.0 technologies like

artificial intelligence, the Internet of Things (IoT), and automation into their CE-driven businesses.

Industry Leader:

- o **Key Insight:** Women Entrepreneurs often **lack access to the latest digital tools** and resources needed to successfully implement CE and i4.0 models. This is especially true for small to medium-sized businesses, where funding and technology access are limited.
- o **Challenges Identified:** WEs face additional challenges such as **finding specialized talent** for digital technologies like automation and data analytics, which are central to i4.0. There is a **knowledge gap** around CE practices, especially in traditionally male-dominated sectors like manufacturing and technology.

Policymaker:

- o **Key Insight:** There are still **regulatory barriers** that prevent a smooth transition for women-led businesses into i4.0 and CE models. Existing policies are not always geared toward **smaller enterprises** or tailored to women-specific challenges, such as balancing business and caregiving roles.
- o **Challenges Identified:** While support programs exist, **awareness** and **access** to these resources remain limited. There's also a need for more **incentives and subsidies** aimed specifically at fostering digital and sustainable transformations for WEs.

Academic Expert:

- o **Key Insight:** Education and training remain **critical gaps**. Women entrepreneurs often struggle to access **high-quality training** that integrates both CE principles and i4.0 technologies. Educational institutions are starting to fill this gap, but more **collaborative efforts between academia and industry** are needed to provide practical, real-world training.

- o **Challenges Identified:** Many training programs still focus on **theoretical knowledge** without practical, hands-on application. Women in certain regions may lack **networks or mentors** who can guide them through these complex transitions.

Identified Gaps in the Support Provided to Women Entrepreneurs (WE) for s3 and i4.0 Transition:

There is a notable **lack of access to tailored financial support** for WEs looking to adopt CE and i4.0 models. Investment in green technologies and digital transformation is capital-intensive, and many female entrepreneurs struggle to secure the necessary funding.

While some progress has been made, the **skills gap** in digital literacy and CE principles is still a significant barrier. Many WEs don't have access to **specialized training** on Industry 4.0 technologies like automation, AI, and IoT, as well as CE practices like waste minimization and resource efficiency.

Policies supporting the green and digital transition exist but are often **difficult to navigate** or poorly communicated to women entrepreneurs. More outreach and **simplification of procedures** are needed to ensure that WEs can access available programs and incentives.

Women entrepreneurs often lack access to **mentorship programs** and **professional networks** that can support their transition to CE and i4.0. A network of support is critical for learning best practices and accessing industry connections.

Recommendations and Proposed Actions from Stakeholders:

Increase Tailored Funding and Incentives: Governments should create **funding streams specifically aimed at women-led businesses** adopting CE and i4.0 practices. This could include low-interest loans, grants, or tax incentives for green and digital transformations.

Develop Specialized Training Programs: Industry and educational institutions should collaborate to develop **practical training programs** that target women entrepreneurs and offer real-world applications of CE and i4.0 technologies. These programs should

emphasize **hands-on experience** with tools like automation, data analytics, and resource management systems

Strengthen Policy Frameworks: Policymakers need to **simplify access** to existing programs and incentives, making them more user-friendly for WEs. Additionally, policies should be **gender-sensitive**, recognizing the specific challenges that women face, such as limited time and access to networks.

Create Mentorship and Networking Opportunities: Establish **mentorship programs** where experienced female entrepreneurs in the CE and i4.0 space can guide those just starting out. Additionally, industry associations should facilitate **networking events** and platforms that connect WEs with industry leaders and experts in sustainability and digital transformation

Promote Collaborative Ecosystems: Encourage the creation of **cross-sectoral partnerships** between industry, academia, and policymakers to foster innovation and collaboration in CE and i4.0. These ecosystems should be designed to support women entrepreneurs with access to **shared resources**, technical expertise, and a collaborative environment for testing new ideas.

Conclusion:

In order to successfully support Women Entrepreneurs in their transition to CE and i4.0, a **multifaceted approach** is required, involving increased financial support, targeted training, streamlined policy access, and stronger mentorship and networking structures. Each stakeholder group brings unique insights and recommendations, all of which are crucial to creating an ecosystem that enables WEs to thrive in a sustainable and digital future.

8 Conclusion

1. Awareness of Smart Specialization Strategy (S3):

- o A significant portion of respondents (65.22%) are unaware of the S3 strategy in their region, suggesting a need for increased education and

outreach regarding how businesses can align with regional innovation goals.

- o Businesses that are aware of S3 tend to align with its priorities, especially in understanding the sectors and technologies identified by the strategy. However, only a few businesses fully collaborate with innovation centers, clusters, or participate in S3-related discussions.

2. Adoption of Industry 4.0 (I4.0) Technologies:

- o Many respondents show moderate adoption of basic digital technologies like mobile and collaboration tools, but the adoption of advanced technologies like AI, robotics, and digital twins remains low. The main barriers to adopting I4.0 technologies are high investment costs and a lack of skilled staff.
- o While businesses recognize the potential for operational efficiency, security, and competitive advantage through I4.0 technologies, they are limited by resource constraints and knowledge gaps.

3. Digital Skills Development:

- o The top digital skills women entrepreneurs need to acquire or improve include programming, cybersecurity, and design/simulation software, highlighting the technical expertise necessary for the I4.0 transition.
- o There is a strong demand for digital marketing, cybersecurity training, and support for developing digital business models and services. These areas are seen as essential for driving business innovation and growth in a post-pandemic, digitally-driven environment.

4. Key Barriers to the Digital and I4.0 Transition:

- o High investment costs (100% of respondents) and a lack of skilled personnel (83.33%) are the most significant barriers to adopting advanced digital technologies. Additionally, many respondents lack knowledge of how to integrate these technologies, emphasizing the need for training and resource access.

5. Main Recommendations and Proposed Actions:

1. Increasing Awareness and Engagement with S3:

- o Develop targeted campaigns to raise awareness of S3 and its benefits for women entrepreneurs. These campaigns should highlight specific sectors and technologies where businesses can align with regional innovation goals.
- o Encourage participation in S3-related discussions and networks by offering incentives or creating accessible platforms for collaboration with local clusters, innovation centers, and research institutions.

2. Tailored Training for I4.0 and Digital Skill Development:

- o Design training programs that focus on critical areas like programming, cybersecurity, and the use of digital tools (e.g., design and simulation software) that support Industry 4.0 integration. These programs should include practical applications of the technologies to help women entrepreneurs address real business challenges.
- o Training on digital marketing and the development of digital business models should be prioritized to help women entrepreneurs expand their market reach and optimize business processes for a competitive advantage.

3. Financial and Technical Support for Digital Transformation:

- o Offer financial incentives, such as grants or low-interest loans, to reduce the high investment costs associated with I4.0 technologies. This will help businesses overcome the biggest barrier to technology adoption.
- o Provide technical support and advisory services to guide women entrepreneurs in effectively integrating digital technologies. This could include mentorship programs or partnerships with technology providers.

4. Focus on Collaboration and Innovation Networks:

- o Foster a collaborative environment where women entrepreneurs can co-innovate with universities, research centers, and other industry players. This could be done through organized innovation hubs, business incubators, or sector-specific clusters.
- o Highlight success stories of businesses that have successfully adopted I4.0 technologies or aligned with S3 priorities to inspire others and provide practical examples of implementation.

5. Development of Comprehensive Training Programs for Women Entrepreneurs:

- o The training programs should include not only technical skills but also leadership, resource management, and sustainability practices aligned with the Circular Economy (CE). The programs can be structured to guide women entrepreneurs in their I4.0 and S3 transitions, focusing on sustainability goals and fostering innovation.

By implementing these recommendations, women entrepreneurs will be better equipped with the skills and resources needed to successfully transition into I4.0 while aligning with the S3 strategy and embracing the principles of the Circular Economy. These initiatives will contribute to creating a more resilient and innovative entrepreneurial ecosystem.

❖ Annexes

Survey Questionnaire

Interview Guides

List of Interviewees

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