Survey Insights: Readiness and Challenges in Digital Industrial Symbiosis

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Agenda

1. Digital Symbiosis Framework
2. Understanding Industrial Symbiosis
3. Survey Insights
4. Interview Insights
5. General Conclusions

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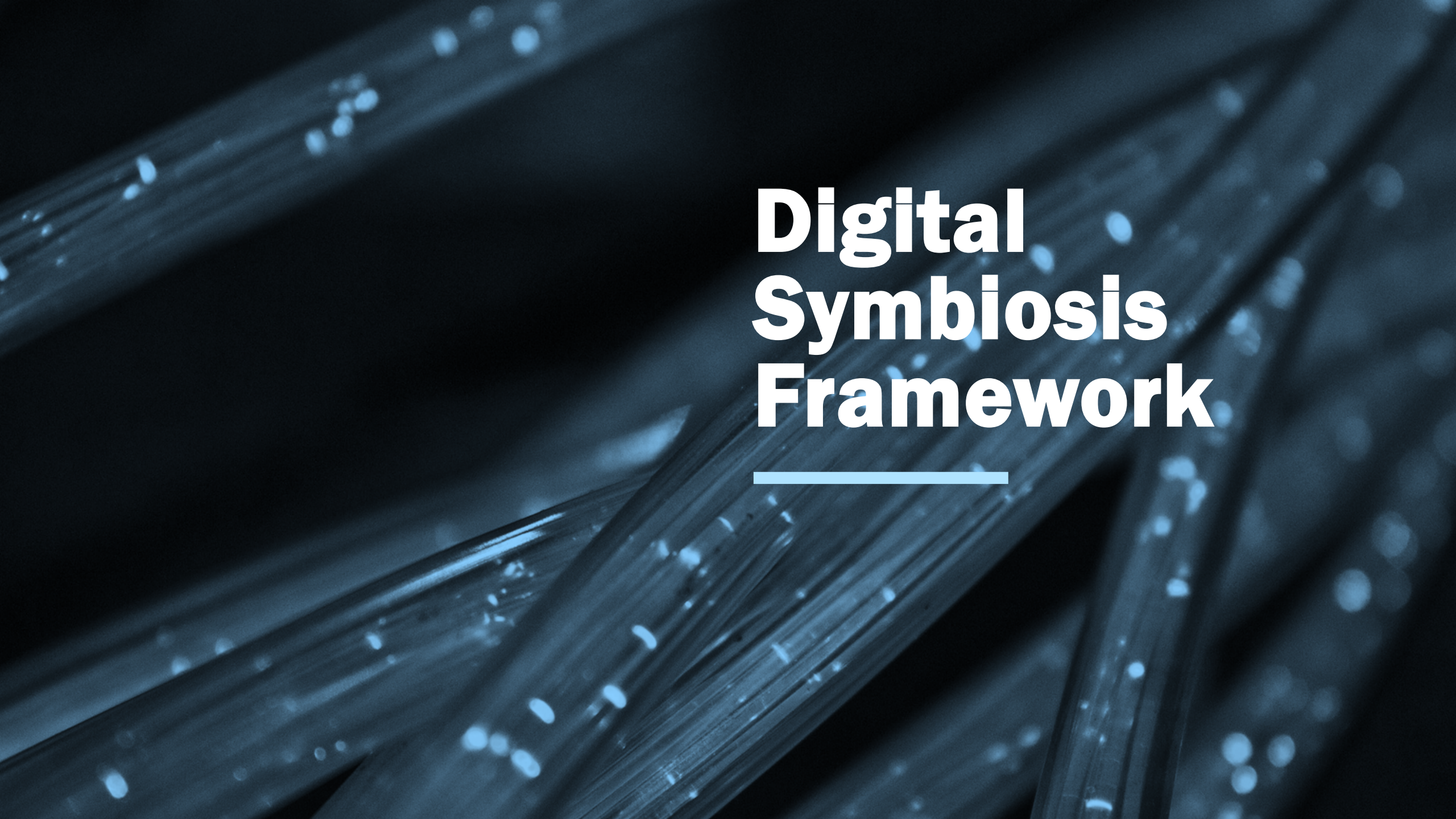
Digital
Symbiosis
Framework

Key Highlights of the Digital Industrial Symbiosis (DIS) Report

- Examines the state, potential, and challenges of digital industrial symbiosis (DIS) across Europe.
- Focuses specifically on small and medium-sized enterprises (SMEs).
  - Based on a combination of:
  - Desk research
  - Cross-country surveys
  - Interviews
  - Case studies
- Provides an evidence-based foundation for:
  - Strategic decision-making
  - Policy recommendations
- Explores how digital technologies:
  - Facilitate resource exchange
  - Optimise waste management
  - Promote sustainability
- Identifies key barriers to implementation.
- Showcases successful examples of:
  - Waste-to-value transformation
  - Innovative collaboration through digital tools

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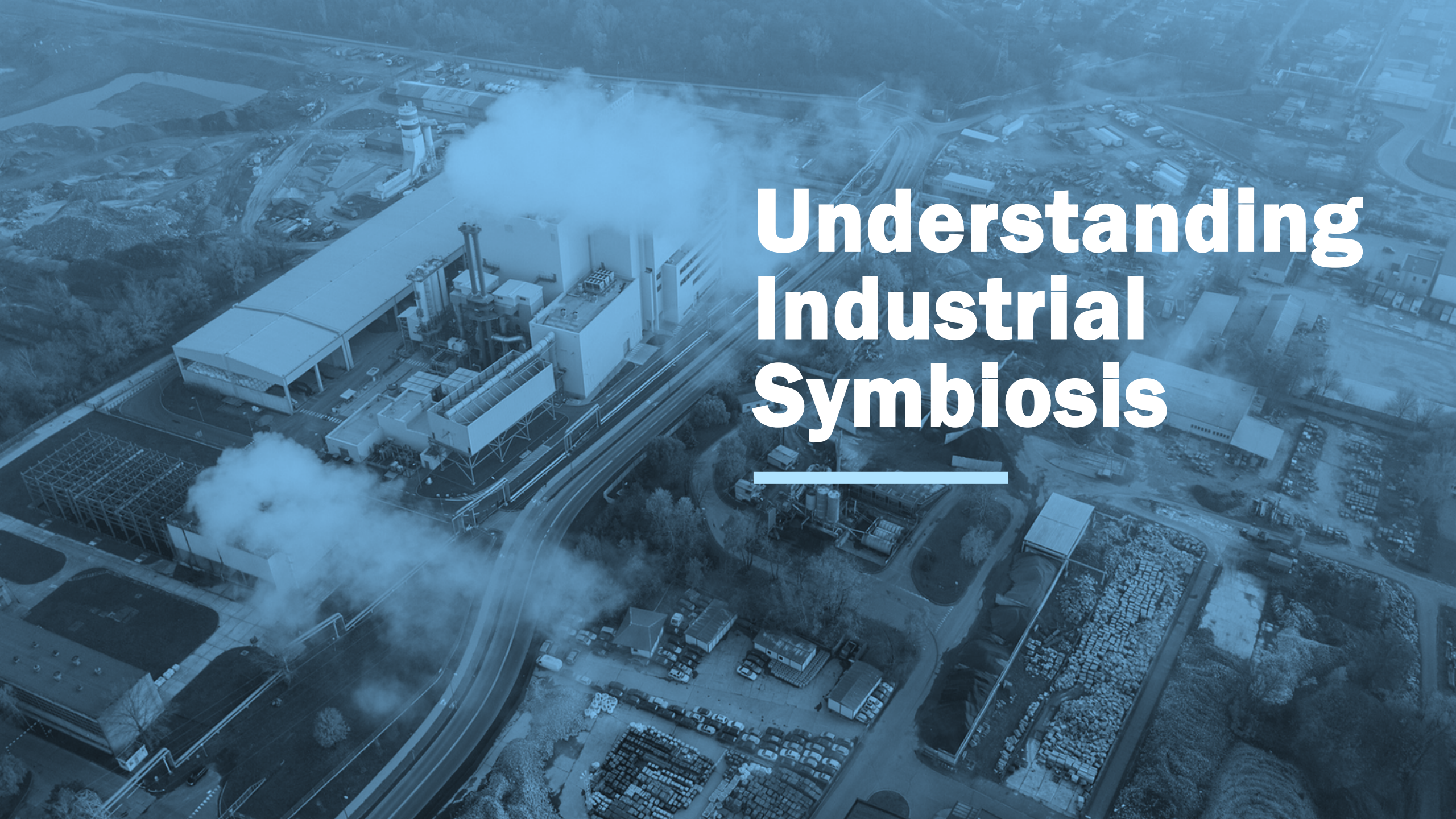
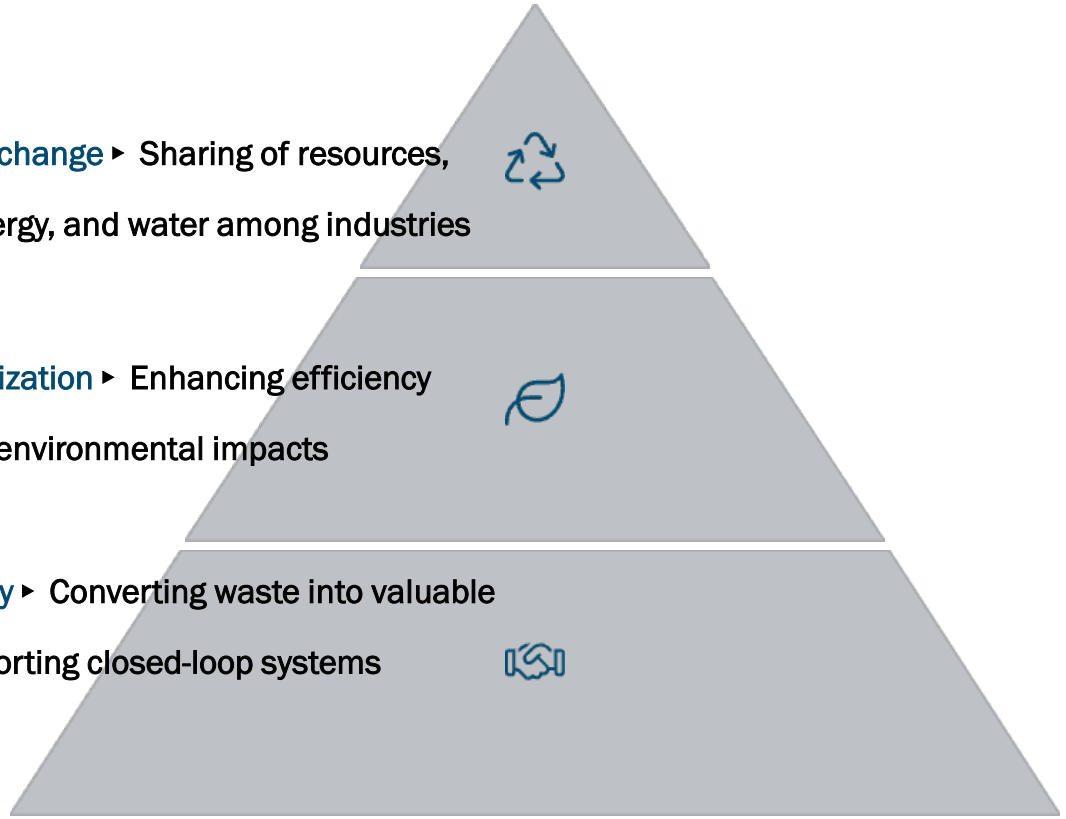


Understanding Industrial Symbiosis

Key Concepts of Industrial Symbiosis

- Industrial Symbiosis (IS) is a collaborative approach where industries exchange:
  - Materials, energy, water, and by-products
  - To improve efficiency and reduce environmental impact
- Key principles of IS:
  - Emphasizes reuse and recycling within industrial networks
  - Creates economic value from waste
  - Reduces greenhouse gas emissions and reliance on virgin materials



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Real-World Examples of Industrial Symbiosis

Kalundborg, Denmark

- Most well-documented IS example in the world
- Multiple industries participate in systematic resource exchanges
- Excess heat from a power plant is used by a fish farm
- Gypsum from power production is repurposed by a wallboard manufacturer
- Creates a closed-loop industrial ecosystem

Spanish Ceramics Industry

- Produces 95% of Spain's ceramics using recycled inputs
- Incorporates waste glass, ceramic sludge, and construction waste
- Reduces dependence on virgin raw materials
- A successful model of IS in the manufacturing sector

Śmiłowo Eco-Industrial Park, Poland

- Specialises in meat production waste recycling
- Converts waste into meat-bone meal biofuel and fertilizers
- Significantly reduces CO_2 emissions
- Generates bioenergy from waste streams

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Understanding Digital Industrial Symbiosis

- Combines Industrial Symbiosis with digital technologies to enable smarter resource sharing between industries
- Uses tools like AI, IoT, digital platforms, and blockchain to support circular practices
- Helps companies identify, track, and optimize exchanges of materials, energy, and by-products
- Promotes real-time data use and automated decision-making
- Reduces waste, improves efficiency, and creates economic and environmental benefits
- Makes IS more accessible and scalable, especially for SMEs
- A key enabler of the circular economy and sustainable industry transitions

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Survey Insights

Survey Overview and Methodology

- Conducted between December 2024 and March 2025
- **78 organizations** from Slovenia, Italy, Latvia, Poland, and Norway participated
- Data collected via **online questionnaire** (1KA tool)
- Focused on SMEs – 72% were micro or small enterprises
- Covered diverse sectors: **manufacturing, agri-food, technology, consulting, education, and more**
- Survey topics included:
  - Awareness of Industrial Symbiosis and Digital IS (DIS)
  - Sustainability practices and perceived importance
  - Willingness to participate in DIS initiatives
  - Barriers to participation and training needs
  - Use and perception of digital tools

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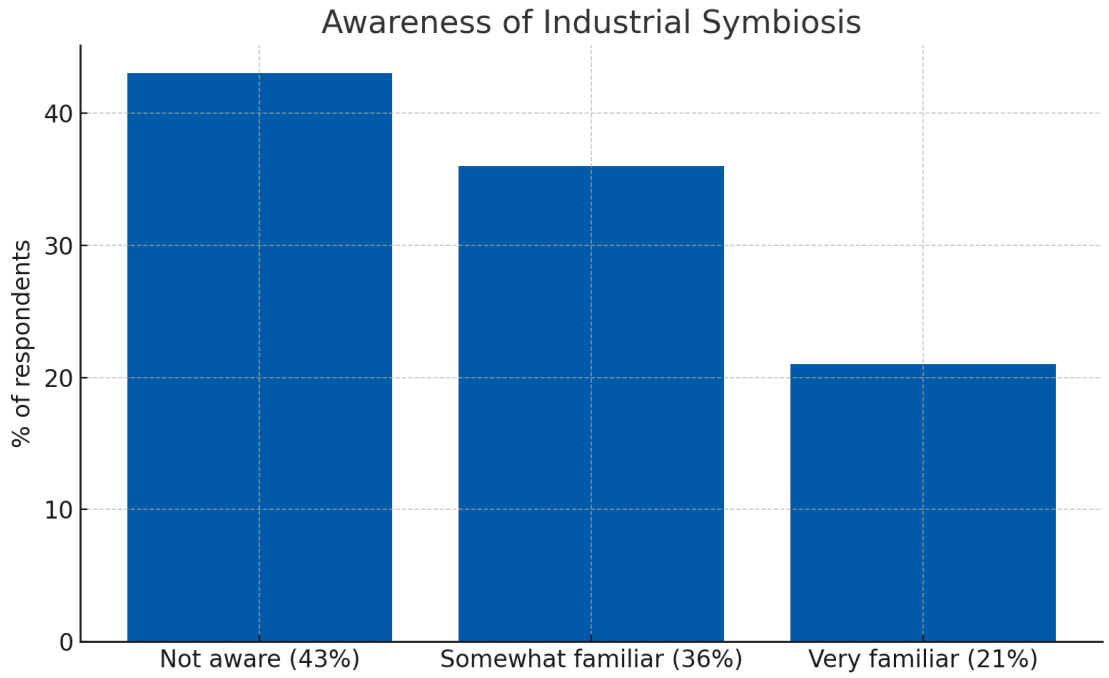
Awareness of Industrial Symbiosis

- 43% of respondents were not aware of IS
- Only 21% reported being very familiar
- Highlights the need for awareness-raising and basic education



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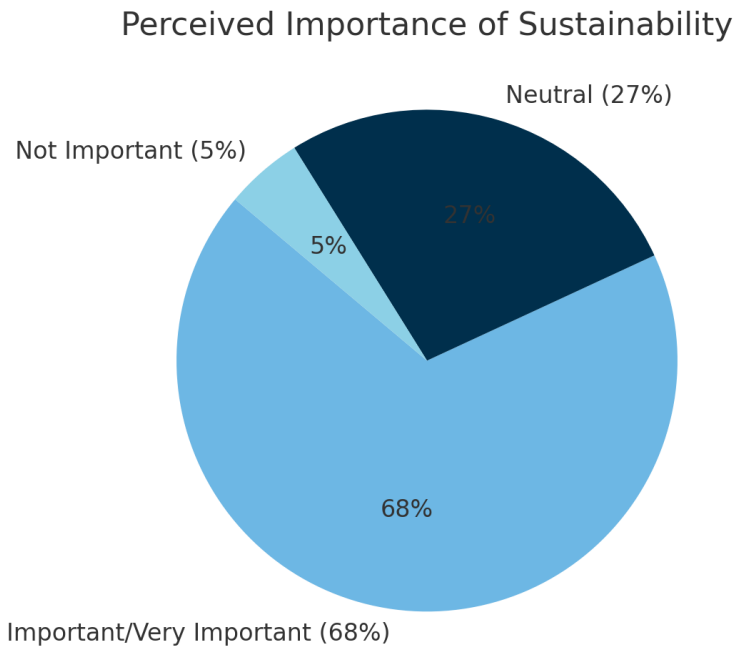
Importance of Sustainability

- 68% rated sustainability as important or very important
- 27% were neutral, and 5% saw it as not important
- Indicates a need to strengthen the business case for sustainability



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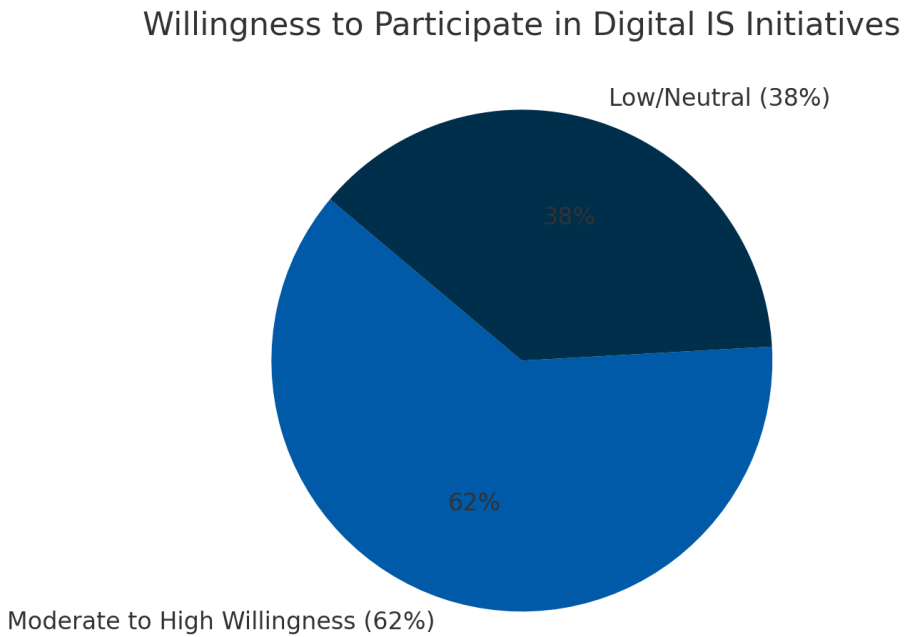
Willingness to Participate in Digital IS

- 62% expressed moderate to high willingness to engage in DIS
- 53% would consider resource-sharing if it reduced costs
- Shows clear interest if value is demonstrated



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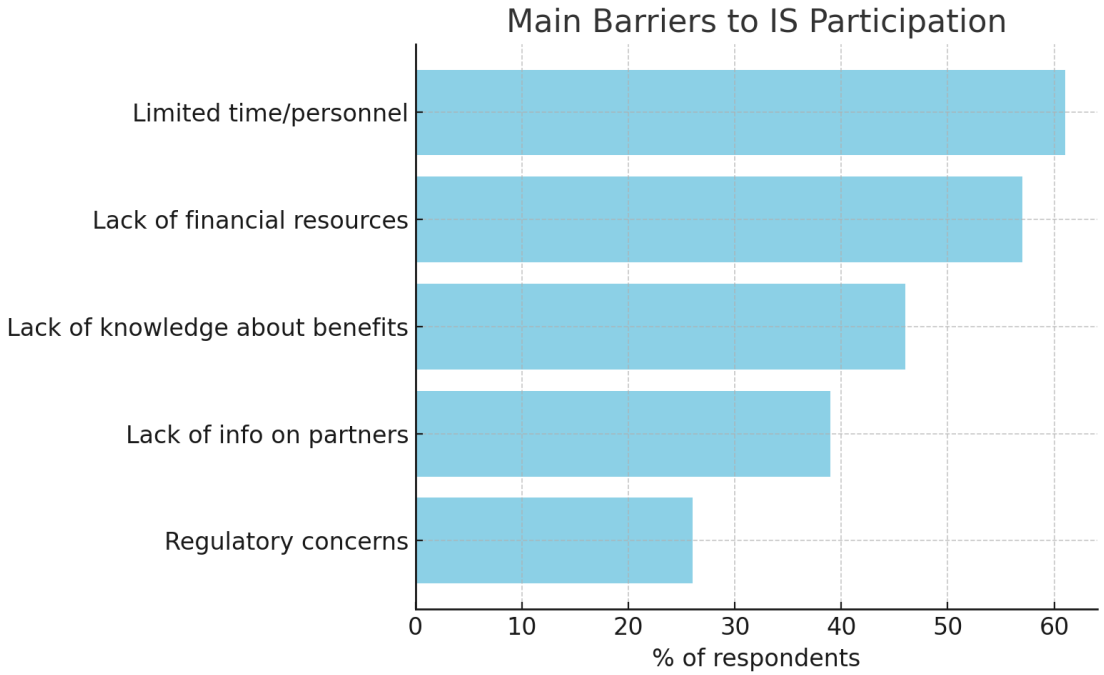
Barriers to Participation

- 61% cited limited time/personnel
- 57% lacked financial resources
- 46% lacked knowledge about benefits
- **Indicates need for training, funding, and partner matchmaking support**



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Survey Summary – Key Takeaways

- **Awareness is limited** – Nearly half of the respondents had never heard of Industrial Symbiosis
- **Sustainability matters** - 68% see it as important, but 1 in 3 remain neutral or unconvinced
- **Willingness exists** – Most are open to participating in Digital IS if the benefits are clear
- **Barriers are practical** - Time, money, and lack of knowledge are the biggest obstacles
- **Support is needed** - Companies want training, clear guidelines, and easier access to digital tools

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Interview
Insights

Interview Methodology

- Semi-structured interviews conducted across 5 partner countries: Slovenia, Italy, Latvia, Poland, and Norway
- Targeted small and medium-sized enterprises (SMEs), local facilitators, and relevant stakeholders
- Interviews explored real-life experiences with:
  - Industrial and Digital Symbiosis (IS & DIS)
  - Barriers and drivers for engagement
  - Perceptions of digital tools
  - Training and platform needs
- Aimed to complement survey results with deeper, qualitative insights

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Barriers and Challenges

- **Time and staffing limitations** are major obstacles for small businesses
- **Financial concerns** make it hard to prioritize IS/DIS adoption
- **Regulatory uncertainty** creates hesitation to act
- **Fear of data sharing and intellectual property loss** limits openness
- SMEs often feel **overwhelmed by complex platforms**

"We don't have extra time or people to explore something new, even if it sounds useful." — SME, Poland

"We would try, but we don't know what's allowed or if it's even legal." — Company representative, Italy"

"We'd like to reuse waste heat with nearby companies, but we don't know where to start or who to ask." — SME, Italy

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Motivation and Local Context

- Many SMEs are motivated to act, but **prefer local collaborations**
- **Personal relationships and informal exchanges** drive most current IS activities
- Interest increases when **examples** are region-specific or sector-relevant
- IS is often seen as positive, but **not yet a strategic business priority**
- **Disconnect between practice and terminology**—some already do IS without knowing the term

"If there's someone in our region doing this, we'd join. But we need a local connection first." — Micro enterprise, Latvia

"We usually collaborate through personal contacts, not platforms." — SME, Slovenia

"We do share waste with another business, but I didn't know that was called industrial symbiosis." — SME, Italy

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Digital Tools and Capacity Needs

- Interest in DIS exists, but **training and facilitation are critical**
- Platforms need to be **simple, intuitive, and localized**
- Current IS platforms are often **incompatible with existing systems**
- SMEs need **step-by-step guidance**, not just access
- Many are open to DIS but feel **left behind technologically**

"The platforms we looked at don't talk to our systems—we'd have to manage everything separately." — SME, Latvia

"Digital tools are interesting—but we'd need training and someone local to guide us." — SME manager, Poland

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Common Insights Across Survey and Interviews

- **Awareness is low** — Many companies are unfamiliar with IS and DIS terms
- **Barriers are shared and practical** — Lack of time, funding, and technical knowledge were dominant themes
- **Local context matters** — Proximity, trust, and personal networks are more influential than digital platforms alone
- **Willingness exists** — Many are ready to engage if clear benefits and support are provided
- **Need for support is strong** — Companies want training, real-life examples, and facilitation
- **Digital tools must improve** — Platforms must be simple, compatible with company systems, and clearly demonstrate value

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Conclusions and Recommendations

For SMEs

- Embed DIS in strategic planning
- Start by mapping internal resource flows
- Collaborate with public partners to reduce learning costs

For Platform Developers

- Prioritize usability and interoperability
- Offer tailored onboarding support
- Integrate AI and tracking functionalities

For Policymakers

- Create regulatory incentives for reuse
- Invest in public-interest platforms
- Promote awareness via regional agencies

For Training Providers

- Develop modular training on IS/CE
- Use real-world examples in materials
- Target both technical staff and decision-makers

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