Finding the Industry 5.0 balance: Supporting companies embedding Industry 5.0

Deliverable D7.1

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December 2025

Co-funded By the European Commission

Key points

- **Industry 5.0 as a strategic vision and implementation pathway**: Industry 5.0 aims to create a human-centric, sustainable, and resilient industrial ecosystem. It complements Industry 4.0 by embedding values and policy-driven objectives into technological transformation, while also emphasising practical implementation.
- **Learning from company perspectives**: We explored through eight case studies how companies understand Industry 5.0 and its three pillars (human-centricity, sustainability and resilience), and how they are already implementing Industry 5.0. Based on their respective contexts, these cases show that companies interpret and engage with Industry 5.0 in different ways, . Company engagement with the three pillars of Industry 5.0 can be partial, focused on a specific pillar. Sustainability is often linked to decarbonisation and compliance with EU climate goals; human-centricity focuses on inclusion and skills development; resilience is seen as supply chain security and risk management but remains the least understood and most challenging pillar.
- **Current uptake and challenges**: Although the three pillars of Industry 5.0 have long been embedded in legislation and corporate practices (with resilience somewhat less established), they are often treated as separate topics and rarely explicitly connected to the Industry 5.0 framework. As a result, progress on Industry 5.0 may appear limited, even though empirical evidence from Work Package 3 of the BRIDGES 5.0 project highlights that many companies are already actively embedding Industry 5.0 components in their practices. The reality seems to be that we are at the limits of current progress in sustainability, human-centricity, and resilience. There has been significant progress in the past decade, culminating in the Industry 5.0 policy. The challenge is that progress seems to stall and that we need a clearer vision for the way forward, as well as more tools and instruments to make progress. This is where **Bridges 5.0** has a role. The eight company cases show that companies perceive a tension between the long-term Industry 5.0 ambitions and short-term competitiveness pressures. Investments in sustainability and resilience are currently being redefined as cost-increasing, creating an imbalance with global market dynamics. These tensions help explain why Industry 5.0-related practices may be pursued as separate initiatives rather than an integrated Industry 5.0 framework, and point to the importance of driving and pulling factors, positive examples and clear messaging to realise Industry 5.0.
- **Rebalancing and integrating the Industry 5.0 pillars**: The central challenge does not appear to be implementation but understanding that companies are already far in Industry 5.0. They need support in rebalancing and connecting initiatives into a coherent Industry 5.0 framework.
- **Skills and workforce development**: Up- and reskilling are critical for Industry 5.0. We are all aware of the need for lifelong learning, adaptive skills, and integrated approaches to digital, green, and resilience-related competencies. But stating these needs does not clarify what needs to be done to bridge current skill gaps. Innovative approaches such as Teaching and Learning Factories, further developed within the BRIDGES 5.0 project, show very promising results. The core idea is that skills need to be developed closer to the company's problems and to the technological frontier. Forthcoming findings will offer policymakers and companies evidence from these new tools for workforce transformation. They underscore the importance of supporting learning environments and organisational practice alongside individual upskilling efforts.
- **Policy alignment and recommendations**: Existing EU legislation supports sustainability and human-centricity but rarely makes explicit links to Industry 5.0. Resilience is largely

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absent from regulatory frameworks, requiring stronger integration into future policies. Policymakers should frame the three pillars as mutually reinforcing elements of competitiveness, emphasising their role in innovation, operational continuity, and long-term market advantage. The action should be directed at developing a support structure for workplace learning, next to the existing education system.

- **Role of BRIDGES 5.0**: The project accelerates **Industry 5.0** adoption by providing conceptual frameworks, skilling approaches, and innovative learning pathways such as Teaching and Learning Factories. It also fosters stakeholder engagement and policy dialogue, helping to connect strategic vision with the needed practical implementation.

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Context and Importance of the Issue

Background to BRIDGES 5.0 and this policy brief

The BRIDGES 5.0 project centres on workforce skills for **Industry 5.0** (Oeij et al., 2023). **Industry 5.0** (I5.0) represents a transformative vision for European manufacturing, aiming to foster a more human-centric, sustainable, and resilient industrial landscape. The ultimate goal is to achieve a sustainable state that combines environmental responsibility, worker well-being and innovativeness, organisational competitiveness and resilience.

While the policy discourse has increasingly embraced this paradigm, its translation into company practice remains uneven and is still evolving. Companies are operating in a context where they face multiple, overlapping transitions including digitalisation, decarbonisation, demographic change and geopolitical uncertainty. Over the past decade, many companies have taken important steps to respond to these transitions through investments in skills, workplace organisation, sustainability measures and risk management. Research shows that Industry 5.0 concepts, especially human-centricity, are increasingly reflected in job vacancies and corporate practices, signalling that elements of the vision are already being operationalised (Grybauskas & Cárdenas-Rubio, 2024). However, these practices are not consistently recognised or framed as contributing to Industry 5.0, and companies can experience uncertainty about how the concept relates to their existing strategies, regulatory obligations or competitive position.

This policy brief explores how companies understand and operationalise the three pillars of **Industry 5.0** in practice. It draws on previous policy briefs, insights derived from eight company cases, and stakeholder validation. Additionally, a workshop was held in Patras where information was gathered through discussion and a guided session on the responses from the company cases to gain deeper insight into the interpretations and issues experienced in advancing towards this vision.

This policy brief explores how companies conceptualise Industry 5.0, how they prioritise its three pillars and which key challenges they encounter. In particular, it highlights the role of the company context in shaping how the pillars are interpreted and implemented. **The policy brief seeks to provide policymakers and other key stakeholders with a picture of how companies engage with Industry 5.0 in practice, in order to inform approaches that support companies in aligning their existing and emerging practices with the objectives of Industry 5.0.**

Input from companies and other stakeholders

To inform this policy brief, a questionnaire exploring company interpretations of Industry 5.0 pillars and the challenges they face was disseminated via the Fresh Thinking Labs[1] platform and the BRIDGES 5.0 Company Board, yielding eight company cases of which four companies are part of the BRIDGES 5.0 project, and four companies are not part of the project. The cases were further validated through discussions with other stakeholders and enriched by insights from the Patras workshop with the consortium.

The main goal of the questionnaire was to gather insights on company practices linked to the different pillars and how these can tackle the challenges companies face. Additionally, questions were included on companies' understanding of the **Industry 5.0** concepts and its

[1] Fresh Thinking Labs is the international open-source movement for workplace innovation. BRIDGES 5.0 has created some open-source labs where information about Industry 5.0 is shared, including webinars and conferences.

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pillars, questions ranking the three pillars based on different criteria, and open questions on identified challenges. A full overview of company responses can be found in Annex 1 and 2 of this policy brief.

Conceptualising Industry 5.0

To interpret the answers given by companies, it is important to understand how the three pillars of Industry 5.0 are conceptualised. In Work Package 1 of the BRIDGES 5.0 project (Oeij et al., 2023), an extensive conceptualisation of the three pillars was carried out. From this, **human-centricity** can be seen as the ability of an organisation to design and manage work systems that prioritise human values and well-being by fostering autonomy, voice, participation, and self-fulfilment; empowering workers in decision-making for change and daily operations; optimising workloads inclusively; applying a human-in-command principle in human-technology interaction; and leveraging human-centred design methods alongside assistive and augmenting technologies to enhance capabilities rather than replace them.
Sustainability can be seen as the ability of an organisation to minimise its environmental impact and promote responsible resource use by empowering workers with knowledge, conducting lifecycle and environmental assessments, adopting green technologies, designing circular processes, and fostering a culture of making and promoting green choices throughout operations and value chains.
Resilience can be seen as the ability of an organisation to anticipate, adapt, and respond effectively to challenges and disruptions by integrating risk management, fostering creativity and flexibility, building strong networks, and continuously learning to maintain stability and performance across systems and processes.
The examples collected show that the slightly different understanding companies have of the pillars is context-dependant (See Annex 1).
The conceptualisation of human-centricity offered by Oeij et al. (2023) emphasises human-in-command principles and design methods whereas the companies also highlight cultural and emotional aspects such as workers being the “soul of the company” and diversity/inclusion. This could be seen as the result of investing in and organising their structures to embrace human-centric approaches. Workers who feel autonomous and in-command are more likely to foster a positive company culture, while conversely, hierarchical structures could arguably lead to a culture of low trust.
Where the Bridges 5.0 conceptualisation of sustainability focuses on empowering workers, green technologies, and circular processes, the companies add strategic dimensions like net-zero goals, financial sustainability, and product-level contributions.
The Bridges 5.0’s formulisation of resilience is broad and conceptual while companies focus more on practical measures like supply chain transparency, harmonised processes, and security to manage disruptions.
The definitions put forward show that the context of a company influences the way the different pillars are defined by them. Definitions of resilience vary the most across companies, often emphasising different aspects (supply chain transparency, long-term thinking, risk management). These findings were confirmed in the workshop in Patras where an important point mentioned was that resilience is very context-dependent, potentially more so than the other pillars. For some companies, resilience is focused on the geopolitical situation while for others it is closely linked to tariffs or supply chain disruptions.

Importance and Challenges of Industry 5.0 pillars

Human-centricity is perceived as the most important pillar to the respondents, followed by sustainability. Whilst companies did find resilience to be an important pillar, none of the companies indicated resilience as the most important Industry 5.0 pillar for their organisation.

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When it comes to how challenging the pillars are to companies, resilience is ranked as the most challenging pillar. However, all pillars are challenging, which one is the most challenging depends on the company. While the companies' conceptualisations of resilience were the most context-specific and it was overall ranked lowest in terms of importance, it is indicated as the most challenging topic to address (See Annex 2).
Industry 5.0 is designed as a long-term strategy to strengthen EU competitiveness by promoting sustainability, human-centricity, and resilience. Yet, company challenges show that they often perceive tensions between these ambitions and short-term market realities (See Annex 2). From their perspective, investments in sustainability and resilience can seem costly, while EU regulations and high-skilled labour requirements appear to add pressure compared to global competitors. SMEs may struggle even more due to limited resources, reinforcing their view that strong policy support and coordinated implementation are essential. These perceived tensions highlight that while **Industry 5.0** aims to secure long-term resilience and competitiveness, addressing the short-term implementation concerns companies experience is critical.

Lastly, if we look at the perceived progress companies have made on each pillar, the results align with previous results. Both human-centricity and sustainability are ranked highly on progress made by companies while resilience is ranked as the lowest pillar (See Annex 2).
A possible reason for resilience being ranked as making the least progress on by companies is because they do not identify company practices as linked to resilience even when they are. This was also put forward as an explanation by those participating during the Patras workshop. Resilience is oftentimes embedded in standard company procedures, such as supplier contracts and cybersecurity, but since the concept of resilience is less well understood, companies struggle to link company practices to this pillar.
When it comes to company practices, the examples linked to sustainability are straightforward and often linked to decarbonisation or product passports. It is important to emphasise that sustainability agendas and policies predate Industry 5.0. Initiatives such as the European Green Deal and EU climate targets are embedded in existing regulations and are well-known to companies.
Similarly, company practices related to human-centricity address familiar themes. Many firms already focus on involving employees in transitions and providing training. Human-centricity reflects long-standing cultural norms in Europe, which may make this pillar feel relatively easier to address.
Resilience, however, shows much greater variation in company practices, with diverse focus areas depending on context. This aligns with discussions in Patras, where resilience was described as more context-dependent than the other pillars. A full overview of the company practices collected can be found in Annex 2.
Overall, these concepts are not new for companies. They have been working on them for years. What is challenging, however, is explicitly linking existing practices to the three Industry 5.0 pillars and, even more so, viewing them as an integrated framework rather than separate initiatives.

What this tells us about company pathways towards Industry 5.0?

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The findings, taken together with evidence gathered in the context of the BRIDGES 5.0 project, suggest that company engagement with Industry 5.0 should be understood as a set of differentiated pathways rather than a binary distinction between those implementing Industry 5.0 or not. Companies interpret and engage with the pillars of Industry 5.0 in ways that are shaped by their context which can include their sector, size, the regulations they are subject to as well as their experience with economic or other shocks. As a result, companies may find themselves in very different positions when approaching Industry 5.0 implementation:

- **Unfamiliarity/Denial**: some companies have never heard of Industry 5.0, or do not consider Industry 5.0 important and therefore see no need to act.
- **Uncertainty**: others acknowledge the need to act but lack clarity on how to proceed.
- **Lack of incentives**: some know how to implement Industry 5.0 but face insufficient motivation or market drivers to invest.
- **Failed attempts**: some companies have tried to implement Industry 5.0 but experienced setbacks or failure.
- **Early movers**: finally, there are companies already doing a great deal, actively embedding industry 5.0 principles into their strategies and practices.

Recognising these five positions is crucial for tailoring policy recommendations and support measures, ensuring that companies receive differentiated guidance depending on their level of readiness and experience. Evidence from Grybauskas et al. (2024) (as well as the company cases examined in this policy brief) finds that companies are already implementing practices that align with one or more of the Industry 5.0 pillars, especially in the areas of sustainability and human-centricity.

Resilience emerges as a particularly important consideration of these pathways towards Industry 5.0. Compared to sustainability and human-centricity, resilience is less clearly defined, more context-specific and more difficult for companies to operationalise. It can be experienced indirectly through skills shortages or supply-chain disruptions which may be why resilience is typically ranked as less important by companies, even though it becomes critical during a time of crisis.

Companies are navigating the Industry 5.0 vision under conditions of uncertainty, balancing short-term pressures with longer-term objectives. Recognising these differentiated pathways is essential for developing policy approaches that acknowledge where companies currently stand. Equally important is supporting companies in connecting their existing practices into an integrated framework rather than pursuing separate initiatives and support their progression towards Industry 5.0 that are aligned with companies' realities.

What does this mean for policymakers?

It is clear from the company definitions, challenges, and practices that rather than a lack of action, policymakers are confronted with a landscape where those actions can be fragmented, uneven and context specific. These efforts align with Industry 5.0 pillars, yet they are not fully connected within an integrated framework. While sustainability and human-centricity have gained traction in corporate strategies, resilience is frequently overlooked or treated as a reactive rather than proactive concern. Yet all three pillars influence and are influenced by one another. Resilience can, for example, not be treated in isolation: it underpins sustainable operations and human-centric workplaces by ensuring continuity and stability during crises.

A key challenge is not the absence of relevant EU legislation or policy instruments, but the **limited visibility of Industry 5.0** as an actionable framework from a company perspective.

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Industry 5.0 is a new framework, and it takes time to find a strong foothold. For sustainability, the link between company practices and the wider EU strategy is relatively strong, even though **Industry 5.0** is not made explicit in current EU-wide sustainability legislation. For the other two pillars, companies do not seem to link the **Industry 5.0** pillars to existing EU legislation. This gap between policy ambition and company-level understanding could pose a significant barrier to the broader uptake of **Industry 5.0**. Making clearer links between existing legislative frameworks, funding instruments and the three Industry 5.0 pillars could help companies recognise how their current practices already contribute to this vision and where further alignment is possible.

Disconnect between Industry 5.0 and existing EU legislation

Industry 5.0 emphasises human-centricity, sustainability, and resilience. While current EU frameworks focus on one or multiple of these pillars, (such as the Corporate Sustainability Due Diligence Directive (CSDDD), and Corporate Sustainability Reporting Directive (CSRD)) these were developed independently of (and prior to) Industry 5.0 and therefore do not explicitly reference it. Nevertheless, they can serve as important vehicles to operationalise its pillars. Furthermore, EU proposals such as the Quality Jobs Roadmap and Act (expected Q4 2025), Adequate Minimum Wages Directive, Platform Work Directive, and telework/right-to-disconnect initiatives offer strong opportunities to explicitly support human-centricity.

By contrast, legislation that clearly aligns with resilience remains limited. The European Commission work programme 2026 and the EU's Strategic Agenda 2024-2029 rarely use the term 'resilience'. Oftentimes what is considered as resilience within **Industry 5.0** is described as dealing with future challenges or being better equipped to deal with global change. The Joint Research Centre has highlighted resilience as a critical capability for managing systemic risks and ensuring industrial continuity, yet this perspective is not consistently embedded in legislative instruments.

To operationalise resilience, legislators could strengthen its visibility by clarifying how existing requirements, such as risk assessments, stress tests, supply-chain redundancy, and crisis preparedness, relate to resilience within key directives like CSDDD, Industrial Emissions, or Public Procurement. Rather than introducing new obligations, this approach would help translate resilience from an abstract pillar into an actionable concept, making it easier for firms to understand and apply confidently.

Future policy discussions could explore how to connect existing and upcoming EU frameworks with **Industry 5.0** principles in a way that strengthens all three pillars without adding unnecessary complexity. For example:

- Sustainability reporting could incorporate forward-looking indicators that link environmental goals with resilience strategies (e.g., supply chain diversification for climate risk).
- Workforce initiatives could integrate adaptive skills, such as systems thinking and risk management, alongside digital and green skills, reinforcing human-centricity, sustainability, and resilience.
- Voluntary guidelines could help companies operationalise resilience in ways that complement sustainability and human-centricity rather than compete with them.

This would help companies conceptualising the three different pillars[2] while also offering them actionable future steps related to the three pillars of **Industry 5.0**. It would not only benefit

[2] The SEISMIS project developed guidelines that could support this conceptualisation (de Vries et al., 2025)

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companies already actively focusing on **Industry 5.0** but also increase the visibility and dissemination of **Industry 5.0** and its three pillars.

Tension with competitiveness

The **Industry 5.0** pillars are often perceived by companies as clashing with traditional competitiveness metrics focused on cost efficiency and short-term returns. High labour costs in many Member States can amplify this perception, as firms under global pressure may feel compelled to prioritise cost-cutting over investments in workforce well-being or green technologies. While these pillars are intended to deliver long-term productivity and stability, businesses often view the required upfront spending on reskilling, digitalisation, and decarbonisation as eroding short-term margins. This creates what companies see as a structural dilemma: absorb higher costs now for future resilience, or maintain lean operations to stay competitive today? In practice, human-centricity, sustainability and resilience are increasingly associated with greater productivity, adaptability and risk management. Therefore, there is a role for many different stakeholders, including policymakers, to reduce the uncertainty companies may have about the business case for Industry 5.0.

The EU's emerging Competitiveness Compass aims to redefine competitiveness beyond price, integrating sustainability, innovation, and social fairness into performance metrics. This shift signals a move toward "competitive sustainability", where long-term benefits, such as energy security, skilled labour, and adaptive supply chains, are valued alongside cost control. However, success depends on strong policy incentives, financing tools, and regulatory clarity to help firms bridge the gap between immediate cost pressures and strategic investments. If implemented effectively, these measures could transform perceived tensions into synergies, positioning Europe as a leader in resilient, human-centric industrial growth.

Positioning the three pillars as drivers of competitiveness**,** rather than compliance burdens, will be critical to shifting these perceptions. They enable firms to innovate under uncertainty, maintain global market stability, and deliver sustainable growth.

Supporting differentiated pathways towards Industry 5.0

This policy brief found that amongst companies engaged in activities that align with the pillars of Industry 5.0, they still differ in the contexts they operate in and the challenges they face. Policymakers must recognise that companies may be positioned very differently in their readiness and willingness to adopt Industry 5.0. These positions shape what needs to be tackled:

- **Unfamiliarity/Denial:** Companies in this position need awareness-raising, clear messaging, and positive examples that demonstrate the relevance and benefits of Industry 5.0.
- **Uncertainty (know they must act but don't know how):** These companies require guidance, frameworks, and capacity-building instruments to translate ambition into practical steps.
- **Lack of incentives (knowledge without motivation):** Here, driving and pulling factors such as financial incentives, regulatory alignment, and market signals are essential to make implementation worthwhile.
- **Failed attempts (tried but unsuccessful):** These companies benefit from supportive policies, peer learning, and success stories that help them overcome setbacks and rebuild confidence.

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- **Early movers (already doing a lot):** These companies are actively embedding Industry 5.0 principles into their strategies and practices. They need recognition, visibility, and opportunities to showcase their successes so that their experiences can serve as positive examples and inspire others.

In short, tackling uneven implementation of Industry 5.0 initiatives **requires a mix of driving factors**, pulling factors, positive examples, and effective messaging tailored to the specific situations companies find themselves in. Only by addressing these differentiated needs, and by leveraging the momentum of early movers, can policymakers ensure that Industry 5.0 moves from vision to widespread practice.

Policy recommendations

Rather than fixed recommendations, the following considerations could guide future policy development.

For EU Policymakers and Regulators

- **Integrate the three pillars:** Encourage approaches that link sustainability, human-centricity, and resilience in corporate strategies and reporting. Policy frameworks should incentivise integrated reporting and cross-pillar strategies rather than siloed practices.
- **Legislative alignment**: Ensure that existing and upcoming EU legislation explicitly reflects Industry 5.0 concepts., not through the creation of a stand-alone compliance framework, but by ensuring that policies and instruments are designed as complementary elements within a broader policy mix. While sustainability is already strongly embedded in regulatory frameworks, human-centricity and resilience would benefit from clearer references to strengthen alignment and improve transferability across sectors. The emphasis is on rebalancing and connecting the three pillars, so that companies can better understand how they fit together, rather than introducing new compliance obligations.
- **Skills and workforce policy**: Support lifelong learning and adaptive skills development that integrate digital, green, and resilience-related competencies. Promote innovative approaches such as Teaching and Learning Factories. Research from the BRIDGES 5.0 project shows very promising results here which will be made available to a wide audience through open publication, masterclasses and a dedicated platform (Fresh Thinking Labs).
- **Competitiveness narrative**: Frame Industry 5.0 pillars as mutually reinforcing elements of competitiveness. Emphasise their role in innovation, operational continuity, and long-term market advantage to counter perceptions of trade-offs between short-term costs and long-term benefits. More positive examples need to be shown where short-term costs also relate to short-term benefits to enable companies to be confident in the business case.
- **Visibility of early movers**: Highlight successful company examples to inspire adoption and reduce uncertainty, ensuring frontrunners are recognised and leveraged as role models.

For National and Regional policymakers

- **Translate Industry 5.0 locally**: Member States and regions to adapt the Industry 5.0 vision to their national and local contexts. This includes integrating Industry 5.0 objectives into existing industrial, skills and innovation strategies. Priority could be given to supporting measures that help companies connect the pillars of human-centricity, sustainability and resilience initiatives into coherent approaches. Advisory services and regional innovation ecosystems play a key role in helping companies move towards integrated practices.

For social partners, business associations and intermediary stakeholders

- **Collective action to promote integrated approaches**: Social partners, business associations and other intermediary stakeholders can play a role in showcasing concrete

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examples and supporting collective initiatives such as sectoral roadmaps, joint learning and training initiatives and the space to experiment in shared environments. Collective approaches can be particularly beneficial for SMEs, which can lack the resources to act by themselves.

For Companies and Business Leaders

- **Adopt integrated strategies**: Move beyond siloed approaches by embedding sustainability, human-centricity, and resilience together in corporate strategies, operations, and reporting.
- **Invest in workforce skills**: Prioritise up- and reskilling initiatives that combine digital, green, and resilience-related competencies. Engage with innovative training models such as Teaching and Learning Factories once results and frameworks are available. Companies need to recognise that Industry 5.0 involves experimentation and adjustment over time.
- **Reframe competitiveness internally**: Recognise that Industry 5.0 pillars are not a cost burden but drivers of innovation, continuity, and long-term market strength. Position them as strategic assets rather than compliance obligations.
- **Learn from peers**: Draw on positive examples and early movers to benchmark progress, reduce uncertainty, and accelerate adoption.

For Academics and Researchers

- **Highlight positive examples**: Document and disseminate successful cases of Industry 5.0 implementation to help other companies learn from early movers and reduce hesitation.
- **Bridge research and practice**: Provide evidence-based insights into how integrated approaches to sustainability, human-centricity, and resilience can be operationalised.
- **Support workforce innovation**: Continue developing and testing new learning models (e.g., Teaching and Learning Factories) and share findings widely once published to ensure companies and policymakers can apply them effectively.

Through empirical analysis, company case studies, learning factory interventions and structured stakeholder dialogue, BRIDGES 5.0 provides empirical evidence on how companies engage with the Industry 5.0 pillars and their associated outcomes. By focusing on organisational practices, skills development and learning ecosystems the project contributes evidence and methodologies that can help policymakers deliver context sensitive approaches to supporting progress towards Industry 5.0.

Conclusion

Industry 5.0 represents a long-term strategy to strengthen Europe's competitiveness by embedding sustainability, human-centricity, and resilience into industrial transformation. However, the transition is far from straightforward. Companies are already implementing practices aligned with Industry 5.0 pillars, but this can be uneven. Companies face definitional ambiguities, resource constraints, and perceived tensions between strategic goals and short-term market realities. While sustainability and human-centricity have gained traction, resilience remains underdeveloped and poorly linked to policy frameworks.

Bridging these gaps requires coordinated action. They key task is to help companies to align, integrate and strengthen their practices within a coherent Industry 5.0 framework: clearer conceptualisation of the pillars, explicit integration of Industry 5.0 principles into EU and national legislation, and strong support for skills development. By fostering collaboration between policymakers, companies, and stakeholders, and by promoting integrated approaches across the three pillars, Europe can turn Industry 5.0 from an aspirational concept into a practical roadmap for inclusive, sustainable, and resilient growth.

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Annexes

Annex 1 – Company understanding of Industry 5.0

In the questionnaire, companies were asked to define the pillars for the context of their company. Table 1 shows some examples of definitions per pillar that were given by the companies themselves.

Table 1: Examples of definitions per Industry 5.0 pillar

Sustainability	Human-Centricity	Resilience
Sustainability includes a variety of topics from ecodesign to process optimisation, shift to new renewable energy sources, reporting demands etc.	Our technology is designed with people in mind, our claims are 'Humanufacturing', and 'Our tech speaks human'.	Resilience is about increasing the transparency in supply chains, interacting differently with suppliers (away from single sourcing), security aspects etc.
Sustainability is the driving force of transformation - net zero - but also sustainability in financial terms. It's critical to get the balance right.	Human centricity recognises that our workers are the soul of the company and the community that machines can never be.	Resilience recognises that there will be bumps in the road and we must think long term, get up and get back on track.
Sustainability applies to both our products (our products are fundamental for the green transition in every sector) and processes. It is a solid and constant value strongly present in the company culture.	To empower each employee with the necessary knowledge, skills and tools for performing their job in the best way. To ensure that all the characteristics of the person are taken into account in the workplace (e.g. physical impairments, gender/minority/religion elements.). In such human-centric workplace, innovation is facilitated, supported and fostered at any level.	Harmonised methods, processes and tools to simplify decision-making processes and reduce the risk of errors, complexity and dependencies across the entire supply chain. Reacting only is not the proper way to deal with supply chain disruptions that are affecting us more often and heavier. Such resilience enables the company to better manage operations and productivity.

Annex 2 – Company challenges, progress, and practices

Once the three pillars were conceptualised by the companies, respondents were asked to rank the three pillars based on different criteria. Per respondent, the pillar ranked the highest is awarded three points, the second pillar two points, and the last pillar one point. The results are then accumulated per pillar to give an overall ranking of the pillars based on all eight responses. Figure 1 shows the results of the rankings related to the importance of each pillar.

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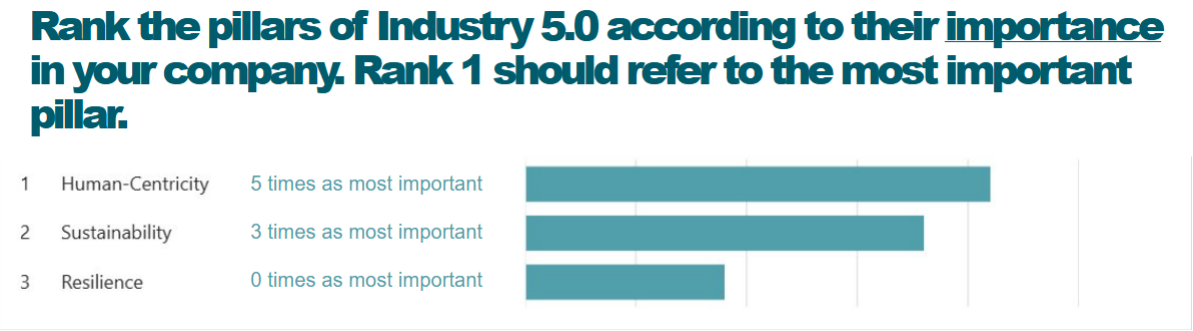

Figure 1: Importance of Industry 5.0 pillars according to the eight company cases

The next question looked at how challenging companies find each of the pillars.

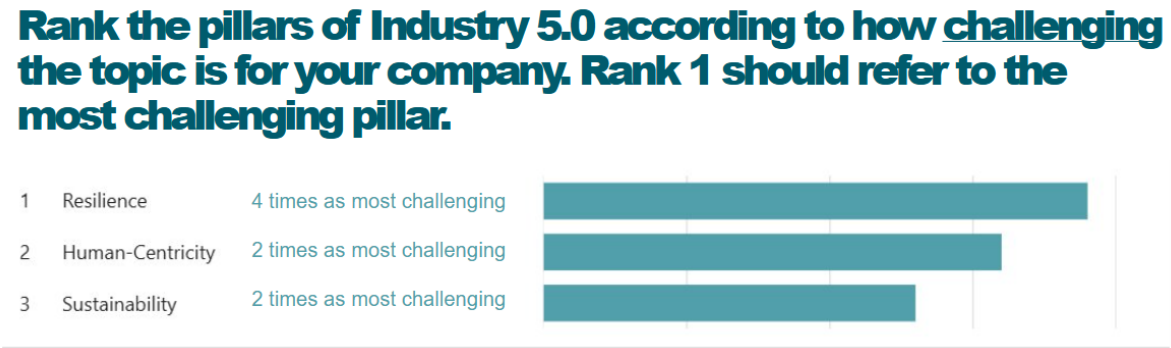

Figure 2: Challenges encountered with Industry 5.0 pillars according to the eight company cases

Additionally, Table 2, which shows some of the challenges identified by companies related to each pillar, underlines the variety of challenges linked to resilience.

Table 2: Main challenges per Industry 5.0 pillar

Sustainability	Human-Centricity	Resilience
Due to European legislation, reduction of CO2 in production has no alternative in Europe.	A high skilled workforce can be a European asset compared to others in the world, although workforces in Asia make up leeway in this area.	The traditional business model will be bankrupt in the coming years. We are and will be in a very shaky position. Resilience is as well very important to survive. Compared to the global market we in Europe have disadvantages by high energy prices and high personnel costs.
Even though efforts have been made, standardisation in sustainability is still a challenge, especially when considering the global nature of our economy. Also, the "competitive" pressure from other countries of the world on a more effective energy transition might	Ensuring a proper balance between the incredible fast pace of the digitalisation process and empowering the employees with the right skills and tools in the best way possible (not "imposing" the technological shift but "accompanying" it).	In general, it is about the difficulty of properly alternating sources. In the last years there has been a pandemic, the Suez channel crisis, floods, earthquakes, export bans These are hard/impossible to foresee, hence the challenge of clear and fast information for the decision-making process rises.

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undermine the European policies and initiatives.	Also, skills shortages and talent mobility impact the recruitment and retention strategies.	Only reacting is not the right way, proactivity is key.
Sustainability is hard while the energy demand of the world is increasing day by day.	Human-centricity is not easy due to harsh working conditions of the heavy industries.	Resilient parts are mostly expensive.

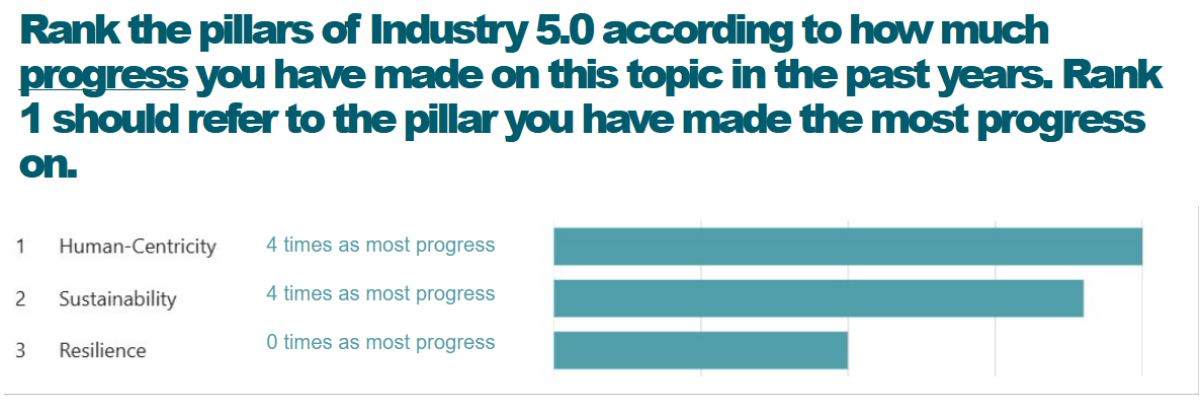

Figure 3: Progress made on Industry 5.0 pillars according to the eight company cases

Table 3 gives an overview of some company practices that are linked to each of the pillars.

Table 3: Company practices per Industry 5.0 pillar

Sustainability	Human-Centricity	Resilience
The first steps in producing and selling CO2 reduced steel are being made. We started to build a large direct reduction plant.	We have a tradition to integrate employees voice in many activities.	Strengthening process-orientation in several departments. Internal and external audits to check abilities.
One practical example for us is the digital product passport.	We have started various training initiatives on digitalisation and e-mobility.	Plant layout redesign to be more flexible for new product and solution production to adapt to changing market dynamics
Approval of Science Based Targets, including not only direct and indirect emission but also those of the suppliers. As an early mover in the industry, we provide our customers with a Product Carbon Footprint (PCF) for main product categories. This initiative is not just about meeting expectations — it's	Human Centricity includes a variety of technologies and approaches in production. Among these are digital assistance systems, human-machine interface (and how to set it up so that humans can interact with a machine) trustworthy AI, future skills (including inner development goals), a necessary	24/7 tool for monitoring events worldwide divided by risk type, according to the event the proper contact person is informed accordingly.

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about setting new standards. Offering the partners detailed PCF data so they can make informed decisions that contribute to achieving their sustainability targets and, ultimately, to a reduced carbon footprint.	transformation process (we call it "triple transformation"), inclusion on the shopfloor, new work, re-organisation of work due to the implementation of new technologies, etc. One concrete example is what information in what granularity is needed so that a human can make a qualified decision based on data.	
Significant investment in decarbonisation technology resulting gain the need for carefully thought through just transition.	Experiential training for decision-making process in production. The training was co-designed with the employees from different areas and levels. Combination of technical and soft-skills. Practical workshops for acceptance of new technology. Well received and potential for replicability and scalability.	Multi-sourcing and design for sourcing in order to have standard product and reduce complexity (as long as possible); Risk identification + Risk mitigation + Crisis management.”

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