Green and Digital Transformation in SMEs: Insights and Recommendations from Austria

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Abstract. The green and digital transformation of small and medium-sized enterprises (SMEs) is crucial for achieving sustainability and digitalization goals set by the European Union. The European Green Deal, the Green Industrial Plan, or the Net Zero Industry Act, exert increasing pressure on SMEs, which face unique challenges and opportunities in this transition. Based on the findings of a study within the INTERREG Central Europe project GREENE 4.0, this paper analyzes barriers, potentials, and support measures related to the twin transition. Key obstacles, such as unclear benefits and a lack of knowledge, were identified, while opportunities included cost reduction and improved sustainability through digital technologies. The results highlight the importance of internal capabilities, strategic communication, and targeted policy measures to enable SMEs to successfully engage in green and digital transformation.

Keywords: digital transformation, green transformation, SMEs, sustainability, technology acceptance

Introduction

Small and medium-sized enterprises (SMEs) are a particularly significant component of the European economy, accounting for more than 90 % of all enterprises (Burinskiené & Nalivaiké, 2024). In Austria, SMEs constitute 99.7 % of all businesses, underlining their dominant role within the national economy (KMU Forschung Austria, 2024). Numerous initiatives by the European Union (EU), such as the European Green Deal, the Green Deal Industrial Plan, and the Net Zero Industry Act, showcase that the role

of the industrial sector in combating challenges within the green and digital transformation is significant (Gallina et al., 2024). Within these frameworks, companies face a multifaceted transformation encompassing the production of technologies that enable the green transition, the generation and distribution of renewable energy, and the adaptation of industrial processes toward carbon-neutral production. This regulatory and policy context forms the foundation of the present research, which explores how such measures influence corporate transformation pathways (Deloitte, 2023).

Increasing market demands and international climate goals are putting pressure on companies to implement processes that are both environmentally friendly and efficient (Zimmermann, 2022). The transformation toward green and digital business processes is essential for the competitiveness and sustainability of Austrian SMEs. Within the European Green Deal framework, SMEs play a key role in achieving climate targets and strengthening innovation (European Commission, 2019). A better understanding of the barriers and success factors for implementing green and digital transformation in SMEs is crucial for developing targeted support measures (Scherf et al., 2021).

The INTERREG Central Europe project GREENE 4.0 is an EU-funded project with partners from seven Central European countries (Austria, Czech Republic, Germany, Hungary, Italy, Poland, Slovenia) and various sectors, including universities, technology and innovation parks/centers, and development agencies. The project's overarching objective, across its different work packages, is to support manufacturing companies in piloting new value chains, fostering open innovation approaches, and ultimately advancing the transformation of business models in both the green and digital dimensions. Within the first work package, a comprehensive survey was conducted among Austrian SMEs operating in the manufacturing and processing industries.

The study aims to analyze the level of acceptance, barriers, and prerequisites for adopting environmentally friendly production processes and digital technologies in SMEs. Drawing on insights from both the empirical study and existing literature, this paper explores the following research questions:

1. What barriers influence the green and digital transformation of SMEs in Austria?
2. How do SMEs benefit from green and digital transformation?
3. What measures can be developed to specifically support SMEs in their green and digital transformation?

By addressing these questions, the paper aims to contribute to a more nuanced understanding of the conditions under which SMEs can successfully navigate the transition toward more sustainable and technologically advanced business models.

Literature Review

Digital transformation is a broad concept that encompasses both the customer-oriented transformation of business models and the implementation of digital technologies, along with associated organizational changes (Larsson, 2020). In contrast, there is no universally accepted definition of the term green transformation (Cheba et al., 2023). It is often described as a structural change aimed at protecting and preserving the natural environment while simultaneously promoting social justice and equitable distribution (Scoones et al., 2015).

Digital transformation exerts a positive effect on collaborative green innovation. This positive impact is amplified when companies have more financial flexibility. Policies to promote digital transformation and digital-related subsidies drive SMEs into digital transition. This enhances initiatives for collaborative green innovation (Chen et al., 2024). Hence, embedding digital initiatives within a company also leads to an increasing resource investment in green innovation (Fan et al., 2024).

If a company is embracing both green and digital initiatives, intending to transform its business model, this process is referred to as 'twin transition'. In this paper, the terms green and digital transformation and twin transition are used interchangeably to describe the simultaneous pursuit of ecological sustainability and digital innovation in SMEs.

Most of the literature emphasizes the role of digital technologies in enhancing ecological sustainability on a societal level. However, there is also evidence to suggest that digital transformation can encourage sustainable behavior on an intra-organizational level (Veit et al., 2024). SMEs in Austria – similar to those across the EU – face significant challenges in fully integrating digital technologies into their business operations (Burinskiene & Nalivaike, 2024).

Although the classification of barriers is not uniformly defined across the literature, researchers continue to propose frameworks to facilitate analysis and understanding. One such approach groups barriers into seven categories, comprising internal and external factors: (1) Organizational, Managerial and Attitudinal; (2) Training and Skills Development; (3) Technological; (4) Financial; (5) Informational; (6) Market and Business Context; (7) Governmental. Among these, the first three categories – (1) Organizational, Managerial and Attitudinal; (2) Training and Skills Development; and (3) Technological – primarily involve internal factors, whereas the remaining categories are largely shaped by external influences (Alayón et al., 2022). Financial, technological, and organizational barriers frequently represent the most significant factors hindering the comprehensive adoption of green and digital technologies (Situm et al., 2024).

The ability of SMEs to respond to these barriers depends on whether the challenges originate internally or externally. Several of the barriers can be addressed by engaging in knowledge-sharing and social networks, offering educational initiatives through public institutions or key customers, and fostering external partnerships with relevant stakeholders. Category (1) Organizational, Managerial and Attitudinal emerged as the most influential in terms of enabling solutions to these barriers, followed by enablers related to (6) Market and Business Context, as well as those linked to (7) Governmental involvement (Alayón et al., 2022).

Other enablers of the twin transition in manufacturing SMEs include the adoption of lean strategies, which contribute to more sustainable practices by improving efficiency and reducing waste. The integration of digital tools can further support environmental goals by applying lean principles to optimize the use of resources and minimize environmental impact. Confronted with growing environmental pressures, SMEs must strategically enhance their capabilities to identify and pursue emerging opportunities within a competitive landscape increasingly shaped by digitization and sustainability imperatives. Innovative and service-oriented initiatives can further strengthen efforts to transition toward greener business models (Abilakimova et al., 2024).

The resource-based view emphasizes the impact of internal capabilities on achieving a competitive advantage. However, this does not automatically correlate with digital transformation in SMEs. Digital initiatives have to be implemented effectively to contribute to a company's success (Civelek et al., 2023). This is also applicable to green transformation, as internal capabilities enable green initiatives, but their impact depends on environmental proactivity, strategic commitment and resource strength (Zhang et al., 2018).

Methodology

To address the research questions a quantitative research design was employed using a structured questionnaire. This approach allows for systematic data collection from larger samples and supports statistical analysis (Curran & Blackburn, 2001, p. 74; Strübing, 2013, p. 4). Quantitative research design enables the identification of patterns, correlations, and generalizable insights regarding digital and green transformation in SMEs. The questionnaire was developed based on an extensive literature review to ensure content validity and theoretical grounding (DePoy & Gitlin, 2011, p. 204; Greenstein & Davis, 2013, p. 67). It drew on key concepts from digital and green transformation, technology acceptance, and the resource-based view, providing a framework for operationalizing constructs and designing relevant variables. The study adheres to fundamental quality criteria of quantitative research – objec-

tivity, reliability, and validity. These criteria guided both the research design and the interpretation of results, thereby enhancing the credibility and replicability of the findings. Technical terms (e. g., green value chain and related concepts) were defined within the respective survey questions to ensure clarity and consistency in participants' understanding.

The survey included demographic variables (e. g., company size, industry, and federal state) as well as core items addressing perceived barriers, required resources, and organizational measures for transformation. Building on the categories proposed by Alayón et al. (2022), the survey design was informed by the main categories identified in the literature review. From these overarching categories, a selection of specific subcategories relevant to transformation barriers were derived, including lack of knowledge/skills, high costs, unclear benefits, lack of time, not relevant for our business activities. Responses were collected using 7-point Likert scales. To complement the structured questions, the survey included several open-ended questions allowing participants to elaborate on their individual experiences, perceived challenges, and success factors. A pre-test with 30 experts from academia and industry ensured clarity and completeness, leading to refinement in wording and structure (Hulland et al., 2018). Data collection took place in 2023 across Austria, focusing on SMEs in the manufacturing sector (ÖNACE code C). In 2023, the number of companies operating in the industrial sector (ÖNACE code B–E) in Austria was 40 301. The most substantial industrial sector, comprising 32 369 companies, was ÖNACE code sector C – manufacturing of goods (Statistik Austria, 2023). According to the Chamber of Commerce, the vast majority of those companies, constituting 87 %, are SMEs with up to 250 employees (Wirtschaftskammer Österreich, 2025). The total population of companies, therefore, amounts to 28 161. Participants were reached through a comprehensive database containing contact information of manufacturing companies within Austria. A follow-up reminder was sent several days after the initial invitation. The database served as the primary source for survey distribution. Of 185 responses, 155 valid questionnaires remained after excluding incomplete entries (Afifi et al., 2020, p. 25; Jamshidian, 2009, p. 116). The data were analyzed using descriptive statistics and statistical tests to explore group differences (e. g., by company size) and correlations related to transformation readiness and implementation.

Given the defined sampling strategy and methodological rigor, population validity can be assumed (Kromrey, 1994, p. 197; Bortz & Döring, 2006, p. 397). The sample offers a representative and robust empirical foundation for interpreting the results within the Austrian manufacturing SME context. Alternatively, the sample can be said to represent a reduced section of the population (Kromrey, 1994, p. 197; Bortz & Döring, 2006, p. 397) and the survey units had the same chance of being included in the sample (Riesenhuber, 2009, p. 11; Benesch, 2013, p. 145).

Results

Barriers to Green and Digital Transformation

The analysis of the five most frequently mentioned barriers to green and digital transformation among Austrian SMEs reveals important insights into the challenges companies face. While all barriers received medium to high levels of agreement, the relatively high ratings for "unclear benefits" and "not relevant to our business activities" suggest a more fundamental issue: for many companies, the strategic value and relevance of sustainability and digitalization efforts are still not evident. This perception may significantly hinder transformation, especially if firms do not view such efforts as necessary or beneficial within their operational context. In contrast, traditional obstacles such as "high costs" and "lack of knowledge or time" appear to be somewhat less dominant but still relevant, particularly in smaller businesses where resource constraints are more acute. Notably, the correlations indicate that barriers tend to cluster: for instance, companies struggling with knowledge gaps are also more likely to experience time constraints or perceive higher costs. This highlights the interdependent nature of transformation challenges and underscores the need for integrated support strategies. The data show no statistically significant differences between company sizes, suggesting that the core barriers are not specific to micro, small, or medium-sized enterprises, but are structurally embedded across the SME sector.

Overall, the findings point to a need not only for financial or technical assistance but for strategic communication, awareness building, and clearer demonstration of value to ensure that green and digital transformation is perceived not as a burden, but as a meaningful and achievable opportunity.

Table 1: Descriptive statistics and correlations – Barriers to green and digital transformation

	Descriptive Statistics			Correlations				
Barriers	**μ**	**Median**	**σ**	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**
(A) Lack of knowledge/ skills	3.979	4.000	1.707	--				
(B) High costs	4.771	5.000	1.519	.299*	--			
(C) Unclear benefits	5.333	6.000	1.449	-.020	.317*	--		
(D) Lack of time	4.917	5.000	1.674	.379**	.022	-.135	--	
(E) Not relevant to our business activities	5.563	6.000	1.443	-.075	.040	.322*	-.420**	--

Notes: n=49 responses; μ=mean; σ=standard deviation; significances: *) 5 percent, **) 1 percent
Data source: Authors' own study.

In addition to the quantitative data, respondents provided 75 textual responses describing barriers to the green and digital transformation of SMEs in Austria. These responses were subsequently categorized into six main themes:

- financial barriers: high initial investment costs and limited access to external funding, uncertainty regarding the return on investment;
- organizational and resource-related barriers: time constraints, lack of personnel, limited internal capacities;
- technical constraints: outdated infrastructure, limited availability of suitable technologies;
- regulatory and bureaucratic hurdles: complex administrative procedures, legal uncertainties;
- market and customer-related factors: insufficient demand for sustainable products, high price sensitivity;
- socio-cultural barriers: low internal acceptance, resistance to change, lack of awareness or skills among staff.

Opportunities and Potential of Green and Digital Transformation

The analysis of perceived opportunities and potentials of green and digital transformation among Austrian SMEs reveals a generally positive outlook, with all items receiving moderate to high agreement. The strongest support was expressed for cost reduction through energy-efficient technologies, indicating that economic considerations remain a central motivator for transformation efforts. However, the close clustering of mean values across all items suggests that respondents view green and digital transformation as offering multiple, interrelated benefits. Correlation analyses reinforce this impression: numerous significant associations between the individual items point to a strong conceptual coherence in how SMEs perceive transformation benefits. For instance, efficiency gains through eco-friendly production methods are closely linked with improved product quality and the sustainability of products and processes.

Interestingly, significant differences between company sizes were found for two specific items. The opportunities "Enhancement of sustainability with digital technologies" (B) and "Cost reduction via energy-efficient machines" (D) were rated significantly higher by larger SMEs. This suggests that company size influences the perceived relevance of certain transformation potentials, likely due to differences in resource availability, technical infrastructure, or strategic planning capacity. Larger enterprises may have already experienced or anticipate more clearly the concrete benefits of these measures.

In addition, the strong correlation between green production investment and risk reduction (e. g., against supply volatility) underlines that firms are aware of the long-

term strategic relevance of sustainable practices. Overall, the findings demonstrate that SMEs perceive green and digital transformation not only as a moral or regulatory duty, but increasingly as an opportunity to improve processes, reduce costs, innovate, and manage future risks—with digital tools acting as central facilitators. The observed size-related differences further underscore the need for tailored support strategies that account for heterogeneity within the SME sector.

Table 2: Descriptive statistics and correlations – Opportunities and potentials of green and digital transformation

	Descriptive Statistics			Correlations							
Opportunities/Potentials	**Mean**	**Median**	**Std.-Dev**	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**
(A) Efficiency gains through eco-friendly production methods	3.795	4.000	1.885	--							
(B) Enhancement of sustainability with digital technologies	3.929	4.000	1.659	.241*	--						
(C) Improved product quality through green production	3.545	4.000	1.692	.573**	.333**	--					
(D) Cost reduction via energy-efficient machines	4.411	5.000	1.717	.229*	.329**	.328**	--				
(E) Greener processes through production digitalization	3.723	4.000	1.767	.384**	.566**	.435**	.192*	--			
(F) Greening supply chains via digital systems	3.830	4.000	1.616	.371**	.547**	.421**	.111	.744**	--		
(G) More sustainable products through digitalization	3.446	4.000	1.681	.414**	.476**	.470**	.106	.715**	.820**	--	
(H) Risk reduction through green production investment	3.375	4.000	1.634	.406**	.410**	.561**	.286**	.552**	.545**	.509**	--

Notes: n=112 responses; μ=mean; σ=standard deviation; significances: *) 5 percent, **) 1 percent
Data source: Authors' own study.

In addition to the quantitative results, 78 qualitative responses provided insights into how SMEs perceive the potentials of green and digital transformation. The analysis shows that companies do not view transformation solely as a challenge, but increasingly recognize concrete opportunities across multiple dimensions. Many firms identified ecological and ethical potentials, emphasizing contributions to climate protection, resource conservation, and intergenerational responsibility. These aspects were often linked to intrinsic motivations and corporate values. At the same time,

respondents strongly emphasized economic potentials of transformation. Companies identified opportunities for cost reduction, increased efficiency, and improved competitiveness—often enabled through digital tools and process optimization. Moreover, market-related potentials were highlighted, including meeting rising customer expectations, strengthening brand image, and leveraging sustainability as a sales argument.

External drivers such as political targets, standards, and regulatory frameworks were seen as additional structuring forces that can support transformation. Importantly, many companies framed transformation as part of their innovation and modernization strategy, with the potential to position themselves as forward-looking and responsible market actors. In some sectors, such as agriculture or energy systems, respondents described how digital and green transformation already create synergies in everyday practice. Overall, the findings suggest that SMEs identify a broad range of positive potentials – from internal value alignment to competitive advantages – that can motivate and guide transformation processes.

Measures to Support SMEs in Green and Digital Transformation

The analysis of supportive conditions for the green and digital transformation of Austrian SMEs highlights a clear prioritization of internal over external enablers. Many companies perceive their own technical infrastructure and internal know-how as key foundations for transformation, suggesting that investments in employee competencies and digital capabilities may be particularly effective in driving progress. In contrast, external conditions – such as regulatory incentives, legal obligations, and access to external expertise – are viewed with more skepticism. The responses point to a perceived lack of coordinated policy support and limited availability of practical guidance. The frequent mention of insufficient information from public institutions further underlines the need for clearer communication and better-aligned support structures.

Correlation patterns reinforce this interpretation: strong internal capabilities often go hand in hand, while perceived external deficits such as missing expertise, unclear legal frameworks, and limited state information tend to overlap and reinforce each other. This suggests that fragmented external conditions may form cumulative barriers, particularly for companies already less embedded in support networks. No statistically significant differences were found between different company sizes. This indicates that the perceived importance of supportive conditions is broadly shared across the SME sector—regardless of whether a company is micro, small, or medium-sized. As a result, policy measures should address common structural needs while remaining adaptable to sector-specific challenges.

Taken together, the findings point to a dual approach: while many SMEs already have the internal prerequisites in place, external support systems – especially in the form of advisory services, accessible information, and clear regulatory frameworks – must be improved to fully unlock transformation potential.

Table 3: Descriptive statistics and correlations – Measures to support green and digital transformation

	Descriptive Statistics			Correlations						
Measures	**μ**	**Median**	**σ**	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**
(A) Internal knowledge and resources for green production	4.129	4.000	1.454	--						
(B) Technical infrastructure for digitalization	4.604	5.000	1.429	.393**	--					
(C) Legal barriers hinder green production	3.129	4.000	1.494	.033	-.012	--				
(D) Legal pressure for green production	3.554	4.000	1.493	-.096	-.061	.125	--			
(E) Regulatory incentives for green transition	3.317	3.000	1.462	-.003	.126	-.058	.390**	--		
(F) Lack of state information on green production	3.911	4.000	1.517	-.096	-.025	.199*	.002	-.084	--	
(G) Lack of external expertise for green production	3.733	4.000	1.441	-.244*	-.009	.257**	.062	.041	.358**	--

Notes: n=101 responses; μ=mean; σ=standard deviation; significances: *) 5 percent, **) 1 percent
Data source: Authors' own study.

In addition to the quantitative data, a total of 69 textual responses were analyzed and categorized into six thematic areas, reflecting key measures to support SMEs in their green and digital transformation. Financial support emerged as a central theme, with respondents emphasizing the need for subsidies, fair investment conditions, and affordable green technologies especially for smaller firms with limited capital. Beyond funding, the importance of training and knowledge transfer was frequently noted, including employee education, access to external expertise, and the integration of environmental topics into early education. Regulatory conditions also play a critical role: participants highlighted the need for simplified administrative procedures, faster approvals, and clearly defined legal frameworks to reduce uncertainty and accelerate implementation.

Furthermore, the availability of suitable technologies ranging from renewable energy systems to digital infrastructure was considered essential. Respondents also underlined the need for better advisory services and easier access to information on funding and practical implementation. Lastly, broader societal awareness and a shift in

consumer behavior were seen as necessary to create market conditions that reward sustainable business practices. Overall, the results suggest that an effective transformation requires coordinated measures across financial, technical, legal, informational, and societal domains.

Discussion

The results of this study indicate that although Austrian SMEs recognize the opportunities associated with green and digital transformation, significant barriers – particularly those related to knowledge gaps, unclear benefits, and resource limitations – persist. Importantly, the findings show that these barriers are interrelated, underscoring the need for integrated support strategies. Companies perceive internal capabilities as critical enablers, yet external conditions, such as regulatory clarity and access to information, require substantial improvement. The results suggest that there persists a lack of clarity regarding the strategic value and relevance of efforts to promote digital and green initiatives. To foster a successful twin transformation, it is essential to invest in employee training, enhance advisory services, streamline administrative procedures, and develop clearer policy frameworks. Overall, SMEs are progressively perceiving transformation as a strategic opportunity, not merely a compliance requirement. The analysis revealed no statistically significant differences between company sizes, indicating that the main barriers are not specific to micro, small or medium-sized enterprises but are structurally embedded across the SME sector. This pattern suggests that the challenges associated with the green and digital transitions are systemic rather than size-dependent. In line with OECD (2021) and the European Commission (2019, 2023), this finding implies that policy measures and support systems should be broad in scope yet flexible in application, addressing shared transition challenges while allowing for sector- or industry-specific adoption. A holistic approach, advocated by the corporate leadership, is imperative in order to integrate digitalization and sustainability into overall organizational structures. Key measures to support SMEs in their transition process include not only funding opportunities, but also the necessity for the exchange of information with external and advisory experts, as well as sector leaders who can serve as exemplars of best practices.

It should be noted that the sample size included in this study is limited. However, the results are consistent with existing literature, supporting the assumption of their validity and relevance for practical application. Based on these findings, specific recommendations for business practice can be derived. At the same time, the results also point to several unexplored areas that warrant further research.

Future research should build on the findings of this survey by conducting longitudinal studies and cross-sector comparisons to better understand transformation dynamics

over time. In particular, there is a significant research potential in identifying and analyzing instruments that could enhance the acceptance of green and digital technologies.

References

Abilakimova, A., Bauters, M., & Ogunyemi, A. A. (2025). Systematic literature review of digital and green transformation of manufacturing SMEs in Europe. *Production & Manufacturing Research, 13*(1), 1–28.

Afifi, A., May, S., Donatello, R. A., & Clark, V. A. (2020). *Practical multivariate analysis.* Boca Raton, FL: CRC Press.

Alayón, C., Säfsten, K., & Johansson, G. (2022). Barriers and enablers for the adoption of sustainable manufacturing by manufacturing SMEs. *Sustainability, 14*(4), 2364.

Benesch, T. (2013). *Schlüsselkonzepte zur Statistik. Die wichtigsten Methoden, Verteilungen, Tests anschaulich erklärt.* Berlin, Heidelberg: Springer Spektrum.

Bortz, J., & Döring, N. (2006). *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler.* Berlin, Heidelberg: Springer.

Bundesnetzagentur (2023). *Digitalisierung und ökologische Nachhaltigkeit in Unternehmen. Eine vergleichende Betrachtung von KMU und Großunternehmen.* https://data.bundesnetzagentur.de/Bundesnetzagentur/DE/Fachthemen/Digitalisierung/Mittelstand/Downloads/studie_langfassung.pdf (abgerufen am 19.12.2024)

Burinskiene, A., & Nalivaike, J. (2024). Digital and sustainable (twin) transformations: A case of SMEs in the European Union. *Sustainability, 16*(4), 1533.

Busch, A. M., Ortiz, D., & Löffler, C. (2022). Nachhaltigkeitsmanagement in österreichischen KMU. In T. Müller, & A. Schneider (Hrsg.), *Zukunft verantwortungsvoll gestalten. Forschungsforum der österreichischen Fachhochschulen 2021* (p. 77–89). Wiesbaden: Springer Gabler.

Cheba, K., Bak, I., & Pietrzak, M. (2023). Conditions of the green transformation. The case of the European Union. *Technological and Economic Development of Economy, 29*(2), 438–467.

Chen, R., Zhang, B., & Chen, Y. (2024). How does digital transformation influence collaborative green innovation? *Journal of Global Information Management, 32*(1), 1–21.

Civelek, M., Krajcik, V., & Kljucnikov, A. (2023). The impacts of dynamic capabilities on SMEs' digital transformation process: The resource-based view perspective. *Oeconomia Copernicana, 14*(4), 1367–1392. https://doi.org/10.24136/oc.2023.019

Curran, J., & Blackburn, R. A. (2001). *Researching the small enterprise.* London: Sage Publications.

Deloitte. (2023). *Sustainability & climate: Transformation and resilience – A strategy for the EU's green industrial policy.* Deloitte. https://www.deloitte.com/content/dam/assets-zone2/de/de/docs/about/2024/Transformation%20and%20Resilience%20Report_Deloitte_KlimaWirtschaft.pdf (retrieval date October 13, 2025)

DePoy, E., & Gitlin L. N. (2011). *Introduction to research: Understanding and applying multiple strategies* (4th ed.). St. Louis, MO: Elsevier.

European Commission (2019). The European Green Deal: Striving to be the first climate-neutral continent. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en (retrieval date December 19, 2024)

European Commission (2023). A green deal industrial plan for the net-zero age. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023DC0062 (retrieval date October 13, 2025)

Fan, L., Guo, Y., Wang, Y., & Wang, W. (2024). Navigating green innovation in high-tech manufacturing: The roles of customer concentration and digital transformation. *Sustainability, 16*(15), 6358.

Greenstein, T. N., & Davis, S. N. (2013). *Methods of family research.* Thousand Oaks, CA: Sage Publications.

Hulland, J., Baumgartner, H., & Smith, K. M. (2018). Marketing survey research best practices: Evidence and recommendations from a review of JAMS articles. *Journal of the Academy of Marketing Science, 46*(6), 92–108.

Jamshidian, M. (2009). Strategies for analysis of incomplete data. In. M. Hardy, & A. Bryman (eds.), *The hand-*

book of data analysis (pp. 113–145). London: Sage Publications.

KMU Forschung Austria (2024). *KMU im Fokus 2023. Bericht über die Situation und Entwicklung kleiner und mittlerer Unternehmen der österreichischen Wirtschaft.* Bundesministerium für Arbeit und Wirtschaft. https://www.kmuimfokus.at/assets/kmu_im_fokus_2023.pdf (retrieval date December 19, 2024)

Kromrey, H. (1994). *Empirische Sozialforschung. Modelle und Methoden der standardisierten Datenerhebung und Datenauswertung.* Konstanz: UVK/utb.

Krüger, H. (2022). Risikomanagement in einem volatilen Wirtschaftsklima. *Der Aufsichtsrat, 19*(6), 87–88.

Larsson, A. (2020). A journey of a thousand miles: An introduction to the digitalization of labor. In A. Larsson, & R. Teigland (eds.), *The digital transformation of labor: Automation, the gig economy and welfare* (pp. 1–12). London: Routledge.

OECD (2021). *Green industrial policies for the net-zero transition.* Paris: OECD Publishing. https://www.oecd.org/en/publications/green-industrial-policies-for-the-net-zero-transition_ccc326d3-en.html (retrieval date October 13, 2025)

Riesenhuber, F. (2009). Großzahlige empirische Forschung. In S. Albers, D. Klapper, U. Konradt, A. Walter, & J. Wolf (eds.), *Methodik der empirischen Forschung* (pp. 1–16). Wiesbaden: Gabler. https://doi.org/10.1007/978-3-322-96406-9_1

Scherf, C.-S., Brunn, C., Gensch, C.-O., Köhler, A. R., von Hofe, A., Hilger, A., Magnus-Melgar, M., & Schultheis, L. (2021). *Anreizsysteme für eine ökologisch nachhaltige Digitalisierung in kleinen und mittleren Unternehmen (KMU).* https://www.oeko.de/fileadmin/oekodoc/Nachhaltige-Digitalisierung-KMU.pdf (retrieval date December 19, 2024)

Scoones, I., Newell, P., & Leach, M. (2015). *The politics of green transformations.* London: Routledge.

Situm, M., Carnuth, L., & Schiller, S.-M. (2024). Digitalisierung, Nachhaltigkeit und KMU. Strategische Überlegungen für die moderne Unternehmensführung – Erkenntnisse über Barrieren und Treiber grüner Technologien und Ableitung von Gestaltungsempfehlungen zur Implementierung. *Krisen-, Sanierungs- und Insolvenzberatung, 20*(2), 60–68.

Statistik Austria (2023). Allgemeine Unternehmensdemografie. https://www.statistik.at/statistiken/industrie-bau-handel-und-dienstleistungen/unternehmensdemografie/allgemeine-unternehmensdemografie (retrieval date October 13, 2025)

Strübing, J. (2013). *Qualitative Sozialforschung. Eine komprimierte Einführung für Studierende.* München: Oldenbourg.

Veit, J., Ehlen, R., Fasbender, U., Otto, S., & Ruiner, C. (2024). Twin transition in practice. Gruppe. Interaktion. Organisation. *Zeitschrift für Angewandte Organisationspsychologie, 55*(2), 157–165.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425–478.

Wirtschaftskammer Österreich (2025). Industriestatistik. Wichtige Kennzahlen auf einen Blick. https://www.wko.at/oe/industrie/statistik (retrieval date October 13, 2025)

Zhang, Y., Sun, J., Yang, Z., & Li, S. (2018). Organizational learning and green innovation: Does environmental proactivity matter? *Sustainability, 10*(10), 3737.

Zimmermann, F. (2022). ESG als Herausforderung für die Aufsichts- und Beiratsarbeit. Warum und wie der Aufsichts- bzw. Beirat ESG jetzt in seine Arbeit integrieren muss. *Der Aufsichtsrat, 19*(5), 71–73.