Harnessing AI Capacities for Sustainable Business Models: Empowering Firms across Economic, Social, and Environmental Dimensions

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Abstract

The rapid advance of artificial intelligence (AI) is transforming industries by enabling cost reduction, personalised solutions, and improved customer service. AI also supports sustainability by facilitating data-driven decisions, operational efficiency, and better management of environmental and social externalities. However, a gap persists between technological potential and the effective adoption of sustainable and responsible business practices. This study explores how AI capacities contribute to sustainable business model (SBM) innovation, focusing on the Italian cosmetics sector. Based on a qualitative analysis of interviews with chief executive officers (CEOs) and senior managers from 11 companies, the research highlights how dynamic capabilities (DCs) powered by AI capacities enable organisations to sustainably enhance value creation, delivery, and capture. The findings identify best practices that leverage AI for sustainability, including product personalisation, process automation, and predictive analytics. The study provides actionable insights into how AI-based systems can drive both innovation and sustainability. Building on these insights, the paper proposes a theoretical framework that conceptualises the link between lower-order AI capacities, high-order DCs, and SBM innovation. Within this framework, best practices emerge as the operational outcome of AI-enabled DCs: they not only innovate processes and practices but also act as catalysts that transform and reconfigure the business model itself towards sustainability. By contextualising these insights within a sector-specific framework, the paper contributes to the growing body of knowledge on AI's role in supporting sustainable business transformation.

Keywords: *Artificial Intelligence – AI capacities – Business Model – Sustainable Value – Sustainable Engineering*

Paper type: Research Paper

Managerial relevance statement: This study provides engineering managers, innovation consultants, and technical professionals with actionable insights into how AI can support SBM innovation. By analysing practices in the cosmetics sector, the research shows how AI capacities—perceptive, predictive, and prescriptive—enhance firms' DCs (sensing, seizing, transforming), enabling them to adapt, innovate, and respond to sustainability challenges. The findings highlight how AI contributes to the emergence of best practices—such as product personalisation, packaging optimisation, and process automation—which act as both outcomes of strategic adaptation and enablers of further innovation. These practices are not static solutions but dynamic routines that reflect the organisation's ability to integrate AI into its broader transformation journey. The conceptual framework proposed in this study illustrates how AI, when embedded in organisational capabilities, supports the reconfiguration of value creation, delivery, and capture. The development framework offers engineering professionals a structured lens to guide the integration of AI into sustainable innovation strategies, helping them navigate complexity and lead change across technical and organisational domains and achieve the Sustainable Development Goals – SDG.

This paper also contributes to the following SDGs: SDG 9, SDG 12, SDG 13.

1. Introduction

The recent surge in technological innovation, particularly in artificial intelligence (AI), has attracted significant attention in the business landscape [1][2]. AI's disruptive impact on businesses is evident across various sectors, facilitating personalised offerings, cost reduction through automation, and scalability of customer service activities [3]. McKinsey's research reports that over 60% of companies are now using generative AI systems, and 40% are increasing related investments [4]. Such diffusion shows that digitalisation is reshaping the foundations of value creation, delivery, and capture, which requires the continuous renewal of business models [5][6].

At the same time, companies are facing increasing pressure to improve their sustainability performance [7]. This pressure stems not only from regulatory and societal expectations but also from the strategic need for a firm to survive, improve its value reputation, attract and maintain consumers, and ultimately boost economic performance. Many organisations are experimenting with digital and green technologies to reconcile profitability with responsibility. Among these, AI plays a crucial role by enabling resource efficiency, informed decision-making, and sustainable operations [8].

Despite the growing potential of AI, a gap persists between its current technological possibilities and its effective use in developing sustainable business models (SBMs). While technologies such as machine learning and the Internet of Things hold promise, their contribution to sustainable business model innovation (BMI) remains fragmented, and both their benefits and their downsides are poorly understood [9][10] [11].

Previous studies have mainly focused on sustainability in general [9][2]. Few examine how AI contributes to the three dimensions of sustainability—economic, social, and environmental—and how AI technologies can transform the mechanisms of value creation, delivery, and capture [13]. Prior research often emphasises the potential of AI to enable sustainable BMI but pays limited attention to the organisational and managerial barriers that firms face when implementing these technologies in real-world industrial settings [6]. Issues such as technological infrastructure, organisational culture, and change management processes continue to hinder the large-scale and effective integration of AI into sustainable practices. Moreover, while the literature increasingly recognises the strategic relevance of AI, highlighting what AI can do in terms of its capacities, little is known about the processes whereby firms translate technological potential into SBM transformation, that is, how companies actually reconfigure their resources, structures, and routines to achieve this innovation [10]. Hence, there is an important theoretical gap: existing research often takes for granted the role of organisational capabilities and lacks a robust mechanism to explain how AI fosters BMI in practice. To address these limitations, this study aims to investigate how AI capacities foster BMI oriented toward sustainability, providing both theoretical and empirical insights into this relationship. Accordingly, it seeks to answer the following research question:

How do AI capacities foster BMI in terms of economic, social, and environmental sustainability, transforming value creation, value delivery, and value capture?

To answer this question, we draw on the dynamic capabilities (DC) framework, which provides a suitable foundation to explain how firms convert technological potential into organisational innovation. Specifically, we conceptualise AI capacities [6]—*perceptive*, *predictive*, and *prescriptive*—as lower-order technological capabilities that enable the higher-order DCs of *sensing*, *seizing*, and *reconfiguring*. Through this perspective, AI becomes a technological enabler that reinforces firms' adaptive and innovative potential, supporting SBM transformation. Building on this framework, we empirically identify and analyse the best practices that emerge from these AI-enabled DCs, showing how they serve as the operational mechanisms linking technology adoption to sustainability-oriented BMI.

A qualitative research methodology was deemed most appropriate to meet the study aim. The paper focuses on the Italian cosmetic sector, which is an industry characterised by high digital maturity and a strong sustainability orientation. We conducted interviews with chief executive officers (CEOs) and other key managerial figures from 11 companies recognised for their strong commitment to sustainability and the adoption of AI technologies. To complement the interview data, secondary company data were analysed to identify how the firms leverage AI to implement sustainability-oriented BMI. The analysis allowed the identification of replicable best practices, defined as routinised actions that demonstrably generate positive business and sustainability outcomes [11] across the three value dimensions of creation, delivery, and capture.

The findings show that AI's perceptive, predictive, and prescriptive capacities enhance firms' DCs, enabling sustainable BMI through improved value creation, delivery, and capture [12;][13]. The paper concludes by presenting a conceptual framework that illustrates the interplay between AI capacities and DCs, followed by implications for theory and practice.

The paper is structured as follows. The next section outlines the literature review on BMI, DCs, AI and its capacities, and the link with sustainability. The methodology section follows, after which the findings and discussions are presented. The study concludes with reflections on its limitations, suggestions for future research, and overall conclusions.

2. Literature review

2.1. BMI towards sustainability

A business model can be understood as the architecture through which a firm creates, delivers, and captures value [14]. *Value creation* concerns how resources and capabilities are mobilised, often in collaboration with partners, to generate offerings that are meaningful for customers and stakeholders [15]. *Value delivery* refers to the mechanisms and channels through which these offerings are transferred to customers and stakeholders, ensuring that value propositions are effectively realised. *Value capture* involves how the firm secures and distributes the economic and non-economic benefits derived from this value, ensuring financial viability and long-term performance [15][16]. As markets and technologies evolve, however, business models cannot remain static. They must evolve, leading to the need for BMI. BMI has been defined as the process whereby firms redesign how they create, deliver, and capture value to adapt to changing environments and technologies [17][16]. It represents a critical mechanism for sustaining competitiveness, as firms continuously align their resource configurations and value propositions with market and societal dynamics [18]. BMI may involve incremental adjustments or more radical transformations that reshape a firm's value proposition, resource configuration, or network relationships. Considering that the environment changes constantly and very quickly, BMI has proven pivotal for the competitive and economic success of both incumbent firms and new ventures [19].

In recent years, sustainability has become one of the most important drivers of BMI. Today, firms face growing pressure to enhance their sustainability performance [7]. This pressure stems from multiple fronts—regulatory demands, stakeholder expectations, and shifting consumer preferences—all of which push companies to integrate environmental and social considerations into their strategic and operational decisions. As a result, sustainability is no longer a peripheral concern but a central element in shaping competitive advantage and long-term value creation. This development has led to the emergence of sustainability-oriented BMI, through which firms embed environmental and social goals alongside economic ones [20][21]. According to [22], p. 44], an SBM involves ‘innovation to create significant positive impacts, or reduce negative impacts, for the environment and society, through changes in the way the organization and its value-network create, deliver and capture value or change their value propositions’. An SBM extends the traditional concept of value by incorporating the triple bottom line—economic, environmental, and social value—into the firm’s activities [22]. Such models aim to create shared value and require firms to rethink their value propositions, governance mechanisms, and stakeholder relationships to align competitiveness with responsibility[23][24]. Empirical evidence suggests that sustainability-oriented BMI is positively associated with firms’ financial and market performance, including return on equity, revenue growth, and stock market value [25]. A manifestation of sustainability-oriented BMI can be observed not only when companies engage in partnerships with other organisations, but also when they leverage digital technologies to reconfigure their value creation and delivery processes. Digitalisation enables firms to develop new distribution channels, optimise resource allocation, and reach previously unserved or underserved market segments, thereby amplifying both economic and societal impact [19]. Hence, digital innovations reshape how organisations coordinate resources, interact with stakeholders, and generate value [6]. Among these technologies, AI is emerging as a particularly transformative force [10]. The following section explores how AI contributes to the evolution of sustainability-oriented BMI, examining its potential as a catalyst for innovation and systemic change.

2.2. AI as an enabler of sustainability-oriented BMI

AI stands out as one of the most promising technologies for enabling the transition towards sustainability. Its capacity to process data, identify patterns, and generate insights allows firms to address complex environmental and social challenges while improving operational performance [26]. At the environmental level, for instance, AI can help design solutions aimed at reducing emissions, optimising product life cycles [27], improving energy saving and water management by optimising their consumption with data cleaning, feature selection, classification methods, and stand-alone or hybrid data-driven models. Additionally, AI may positively impact biodiversity monitoring, transportation, and overall sustainability [28]. AI's potential extends to enhanced decision-making support, strategic management through servitisation, and improvements at the supply chain level [29]. From a social point of view, AI presents various potentials, including benefits for human resources and social welfare, consumer behaviour [30], and smart cities and urban development. For example, [31]demonstrated how human-friendly, robot–human coordination systems improve health and safety conditions for employees. However, AI also poses challenges related to well-being, bias, misinformation, context insensitivity, ethical dilemmas, and data security, whether of employees [20], consumers [30][32]or society at large. Additionally, through data-driven learning and automation, AI influences all three dimensions of the business model. It enables value creation by supporting mass customisation and the development of sustainable products and services tailored to customer needs. It improves value delivery through predictive logistics, process optimisation, and real-time monitoring of supply chains, fostering transparency and circularity. Finally, it enhances value capture by reducing costs, improving productivity, and identifying new revenue opportunities associated with sustainable offerings [15][26].

Recent studies conceptualise these mechanisms through the notion of *AI capacities*, which represent the firm's ability to apply AI technologies in specific functional and strategic processes [6]. Three main capacities are typically identified:

- Perceptive capacity, which allows firms to understand what is actually happening when products are being used in industrial customer operations, providing real-time knowledge of resource use, customer behaviour, problems, requirements, and sustainability performance.
- Predictive capacity, which allows learning from past and current data to forecast future events, anticipate sustainability risks, and identify emerging opportunities.

- Prescriptive capacity, which provides recommendations or suggestions to implement specific actions aimed at improving efficiency, managing risks, and achieving sustainability goals.

These capacities affect the business model's dimensions differently. They foster mass customisation in value creation, develop new routines for value delivery, and improve profitability and impact measurement in value capture. However, while AI's potential to drive sustainable innovation is widely acknowledged, many firms struggle to translate technological advances into tangible business model change. As [6], p. 2] note, 'the primary challenge is no longer technology development but putting AI technology capacities to use in concrete business model applications'.

Empirical research confirms that the integration of AI into sustainability strategies remains limited and is often constrained by technological, cultural, and managerial barriers[9][11]. Although isolated examples exist of AI-driven sustainability improvements, the broader mechanisms through which AI supports BMI are still underexplored [33]. In particular, few studies have analysed how AI capacities contribute simultaneously to the three dimensions of sustainability and how they interact with firms' existing capabilities to enable systemic transformation. The lack of studies suggests that AI alone is not sufficient to achieve sustainable BMI. The integration of AI into sustainability-oriented BMI demands not only technological adoption but also organisational change, as firms learn to align digital transformation with their strategic and operational configurations.

2.3. A DC perspective on AI-enabled sustainability-oriented BMI

As discussed above, for AI to translate into lasting sustainability-oriented BMI, firms must develop the ability to adapt, integrate, and reconfigure their resources and processes over time. This organisational mechanism aligns with the concept of DCs, defined as a company's ability to adapt to changing market conditions by reconfiguring its resources and processes [34]. According to [14]p.43], DCs include 'the sensing, seizing, and reconfiguring needed to design and implement a business model'. *Sensing* refers to the firm's ability to identify, interpret, and anticipate emerging opportunities and threats. Doing so involves scanning the external environment, analysing market trends, and leveraging strategic foresight to detect shifts in customer needs, technological advancements, or regulatory changes. *Seizing* involves mobilising resources and making strategic decisions to capture the opportunities identified through sensing [14], [35], [36]. These activities may include investing in new technologies, redesigning products or services, or rethinking the business model to align with sustainability goals. *Reconfiguring* is the continuous process of renewing and reconfiguring organisational structures, assets, and capabilities to maintain long-term adaptability. It ensures that the firm remains resilient and responsive to change, enabling sustained innovation and alignment with evolving market and societal expectations [37], [38], [39]. All three DCs are essential for BMI, particularly when sustainability is a strategic priority. The three DCs enable firms not only to respond to external pressures but also to proactively shape their value creation, delivery, and capture mechanisms.

A hierarchical view of DCs [34] sees these processes as higher-order organisational capabilities that orchestrate and integrate second-order capabilities, such as AI capacities. In this view, AI acts as a technological enabler that enhances firms' ability to adapt and innovate their business models under sustainability pressures. Specifically, AI capacities can be considered *lower-order technological capabilities* that strengthen these *higher-order DCs*. Perceptive capacity supports *sensing* by generating awareness of environmental and market changes; predictive capacity informs *seizing* by providing forward-looking insights to guide sustainable innovation; and prescriptive capacity enables *transforming* by recommending actions that reconfigure operations and governance processes in line with sustainability objectives [40]. In this sense, DCs represent the organisational foundation through which AI can be translated into enduring, sustainability-oriented BMI, ensuring that digital transformation contributes to long-term competitiveness and responsible value creation.

Nevertheless, existing research has largely analysed AI and DCs separately. Some studies have emphasised the technological potential of AI, while others have focused on the strategic role of DCs in organisational change[6]. This separation leaves unclear how AI capacities contribute to the development and strengthening of the DCs required for sustainability-oriented BMI. Moreover, empirical evidence disentangling the mechanisms through which AI supports sensing, seizing, and transforming in real organisational contexts remains scarce [36]. This lack of empirical grounding reinforces the need for an integrated framework that clarifies how AI capacities and DCs interact to drive sustainability-oriented BMI.

Accordingly, this study proposes a conceptual framework (Figure 1) that links AI capacities (perceptive, predictive, and prescriptive) to the DCs of sensing, seizing, and reconfiguring, illustrating how these interactions foster sustainability-oriented BMI. Through this framework, AI capacities are conceptualised as technological micro foundations that reinforce the firm's DCs, enabling the continuous reconfiguration of business models to align economic, environmental, and social value creation.

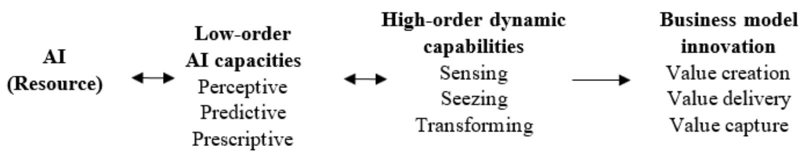

Figure 1. Conceptual Framework

Authors' Elaboration

3. Methodology

3.1 The qualitative method and the research context

Our study adopts a qualitative research design, utilising semi-structured interviews as the primary data collection method to demonstrate how a specific firm integrates AI into sustainability-oriented BMI. This approach is well-suited for exploring complex phenomena [41][42] such as the integration of AI and sustainability into business models [41][6]. Qualitative methods enable an in-depth understanding of experiences and perspectives, allowing for the identification and analysis of patterns of meaning within the data. The interview data were analysed through a thematic analysis process aimed at identifying recurrent patterns across cases and deriving an empirical framework that aligns with the extant literature [41][43][44]. Qualitative methods also provide a means of identifying commonalities in the way a topic is discussed or described, helping to make sense of shared elements [45][46]. This process of identification supports analytic generalisation and is particularly valuable for generating new insights and developing novel theoretical perspectives on emerging phenomena [42] Interviews with employees from various disciplines enabled us to gather multiple perspectives, which helped minimise potential informant bias.

To analyse the role of AI in driving SBMs, we chose the cosmetics industry due to its prominence in the global economy and its strong emphasis on technological innovation and sustainability. According to [47], the cosmetics sector continues to grow, with production increasing by 12.4%, reaching €13.3 billion in 2022, and exports exceeding €5.8 billion (44% of production). In terms of sustainability, the cosmetics sector stands out for the need to introduce sustainability as a priority. Companies within this sector exhibit a high level of attentiveness to their sustainable and ethical footprint, as evidenced by various standards and certifications, such as ISO, cruelty-free, or vegan products. Nevertheless, challenges remain in achieving net-zero targets. Moreover, smart manufacturing technologies have been widely adopted throughout the cosmetic sector value chain. The so-called 'beauty tech' is increasing, driving changes and innovation in business models [48]. Therefore, the cosmetics industry exemplifies a 'double transition', namely, towards both sustainability and AI adoption.

The sample of respondents was purposefully selected [45] following carefully defined theoretical sampling criteria to ensure the collection of rich and relevant data [41]. The selection process focused exclusively on the Italian cosmetics market, which is the fourth largest in Europe and a global leader in makeup manufacturing, with Italian companies accounting for 67% of European makeup production and 55% of global output[35][49]. For the sample selection, reference was made to the definition in Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 30 November 2009 [48], which defines a cosmetic product as: Any substance or mixture intended to be placed in contact with the external parts of the human body or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odours. To select different key informants, we used the Cosmetica Italia database, which provides a comprehensive list of active companies in the sector. Two theoretical sampling criteria were identified [45]: sustainability commitment and AI application in business models. For the first, we selected employees in companies with a demonstrable commitment to sustainability across environmental, social, and economic dimensions. The sample was then refined to include firms with certifications or credentials attesting to their sustainability practices. The second involved assessing the AI adoption in the business models of the selected participants' companies, with a focus on firms demonstrating high levels of innovation. Additionally, to enhance the generalisability of the findings, the sample included respondents from companies of varying sizes and types, ranging from large international firms to innovative startups [45]. This diversity allows for a transition from isolated case studies to established best practices. To ensure that the theoretical sampling criteria were met, comprehensive and up-to-date data were gathered from company documents and compiled into a dataset. Between December 2023 and February 2024, 11 key informants were interviewed. The cases are briefly presented in the table below.

Interview – I Number	Interviewee's role	Market served by the interviewee's company	AI usage in the interviewee's company
I1	CEO	Skincare	AI focused on automating the process of creating the formula for personalised cream.
I2	CEO	Body care startup	AI focused on logistics to reduce environmental impact: attention to the automation and predictive analysis of the seasonality of cosmetic products.

I3	CEO	Body care	Gradual innovation with a specific focus on the digital consumer experience. Targeted investments in AI, personalisation, and connectivity enable the brand to automate product recommendations on the website, based on budget and needs.
I4	Project manager	Skincare	Production of zero-impact sustainable cosmetics through a micronisation process. Implementation of AI to streamline organisational processes and marketing activities.
I5	Cosmetic business development manager	Makeup	Design of machine vision systems by implementing AI in lipstick production. Focus on automation, enhancement, and efficiency of production processes.
I6	Project manager	Skincare sector startup	Brand focused on sustainable and vegan cosmetics with a special emphasis on generative AI to make internal processes, communication, and marketing more efficient.
I7	Digital trading coordinator	Body and skincare	Development of sustainable cosmetics and 'nude cosmetics', where AI enables the identification of products without packaging. Special attention is paid to digital sustainability.
I8	CEO	Haircare startup	Creation of personalised hair care products through AI, generating a positive impact on the environment.
I9	Past CEO	Body and skincare and makeup	Production of body care cosmetics, with investments and a growing focus on sustainability and innovation.

I10	CEO	Skincare	Sustainable and innovative skincare brand with a focus on promoting essential cosmetics. Certified by AIAB and vegan quality. AI increasingly applied to internal processes.
I11	Corporate Communications' Director	Body and skincare and makeup	AI applied to various business activities, such as skin analysis, sustainable production processes, product recommendations to consumers, and research and development.

Table 1. Interviewee Sample Characteristics

Author's own elaboration

3.3. Data collection and analysis

The interviews were conducted online from February to April 2024. Two researchers participated to prevent potential cognitive, experiential, and reflexivity biases [50]. Each interview lasted approximately 45 minutes. To ensure data robustness, the study triangulated the interview results with additional material from company websites, corporate documents (e.g., annual social reports, booklets, investor relations), and initiatives available on digital channels, aligning with the methodologies proposed by [51]. This approach allowed for a comprehensive framing, comparison, and exploration of the key themes across diverse data sources. Each interview was audio-recorded and transcribed verbatim for later thematic analysis [52]. Given the exploratory nature of the research, an abductive approach was adopted, building upon the existing literature discussed in previous sections [18].

The interview protocol is outlined in Appendix A. Following each interview, the two researchers familiarised themselves with the data, and this process continued until all the interviews were completed. Thereafter, the two authors manually codified the raw data, including interview transcripts and supplementary documents related to the study topic. The coding focused on AI capabilities and sustainability, structured around the three business model dimensions: value creation, delivery, and capture. An abductive logic guided the analysis, which involved moving iteratively between empirical evidence and the DCs framework. The researchers conducted open coding through repeated readings of the data to identify thematic elements and relevant phrases [41], [50]. As patterns emerged, DC theory informed the refinement of axial codes and the consolidation of sub-themes [41].

To maintain impartiality and trustworthiness, the researchers worked independently throughout the coding process. The initial codes were reviewed and discussed with the broader research team to ensure inter-coder reliability and to integrate an external, supervisory perspective. This process helped prevent bias and resolve any coding discrepancies [46].

The identified sub-themes were subsequently aligned with specific main themes grounded in the DC perspective, leading to further discussions within the research team to achieve consensus [53]. The final themes aimed to illustrate how AI contributes to enhancing the three business model dimensions—value creation, delivery, and capture—through an environmental, social, and economic sustainability lens. Appendix B presents an example of the data coding structure and analysis.

4. Findings

4.1 AI and sustainable value creation

Data analysis reveals how the use of AI for sustainable value creation begins with fostering economic sustainability through more responsible business operations. To this end, a balance must be struck between innovation and maintaining the current business model to achieve a competitive advantage by adopting AI. All three AI capacities (perceptive, predictive, and prescriptive) emerged as crucial in this process. Specifically, some interviewees explained how their AI system is designed to analyse data and continuously refine their performance. As the system gathers more data, it becomes better at recognising patterns and making accurate predictions, allowing the company to optimise its operations for sustainability: "Our AI system feeds itself; it is something that works better and better as it has more and more data. We try to feed it and optimise it so that it pays attention to sustainability. In this way, I can also better manage some risks and increase the competitive advantage" (I3).

Regarding competitive advantage, knowing in advance how to focus on sustainability better enables companies to implement the strategies and investments that will most likely allow them to stay ahead of competitors. As [7] pointed out, excessive investments can be perceived as disproportionate, unless the company also offers non-green products, which balance the consumer's perception. Thus, firms could leverage AI to manage sustainability and its connected criticalities. Similarly, AI capacities help the company better manage risks by anticipating potential issues before they arise, such as supply chain disruptions or shifts in consumer demand. Thus, all three AI capacities foster the seizing capability. These insights suggest that the company can adjust its strategies and leverage a more performative seizing capability, whether through altering production processes, investing in specific areas, or adopting new business models, to remain agile and more proactive than its competitors.

In addition to economic sustainability, AI's perceptive and predictive capabilities contribute to social sustainability for both customers and employees. In the first case, social sustainability matches product customisation, which benefits customers by providing tailored solutions as a consulting service (I8). For instance, a company explains how their AI-powered skin analyser allows customers to upload a photo from which the system recommends solutions for specific skin issues and how integration with virtual reality (VR) technologies could allow more in-depth analyses. In another case, AI tools have been developed to analyse customer interactions with customer service by associating emotional tags, identifying the urgency of requests based on the customer's tone of voice. This precise, personalised approach to customer care was described as sustainable because it allows the company to deliver targeted and stress-free services, and it serves as a good example of the reconfiguring capability that AI capacities facilitate. As "*Vivatech booth demonstrate its expertise at harnessing the power of data, tech and AI to help consumers become better-informed and gain access to beauty products and services personalized for their specific needs By putting our resources behind emerging technologies that democratize access to smarter and more sustainable beauty, we enable everyone to enjoy beauty more equitably and on their terms. This level of innovation would not be possible* *without the growing complementary expertise of Beauty Tech teams, as well as, our open innovation program via partnerships with some of the world's most exciting startups and tech leaders" [54]*

Moreover, as well as providing customised content, AI systems can ensure the company's ethical values are respected: "*Our sustainability approach has prompted us to reflect not only on data management, but also on how we develop the user interface, which must be unequivocally at the service of the value model we represent"* (I3). Additionally, these AI-powered systems: "*not only improve customer care but have the potential to reduce the risk of employee burnout and harassment by over-complaining and demanding customers"* (I3).

At the same time, if the system detects stress or frustration in a customer's tone of voice, it can foster sensing capabilities, alerting employees and enabling them to approach the situation with more empathy or escalate it for faster resolution. Used in this way, AI can truly help employees first, to focus on the most pressing issues, thus improving their workflow efficiency; and second, to communicate with the customer more effectively and reduce the emotional stress often generated by handling difficult customers. However, as most interviewees pointed out, many misunderstandings remain regarding AI's potential to generate benefits for employees. Respondents from various companies identify significant concerns and potential malpractices tied to fears, unethical use, and misuse of AI capabilities. Environmentally, the high energy consumption for training and operating AI models, the carbon footprint of data centres, and the disposal of technological hardware are key issues. Societally, there are risks of job displacement and misrepresentation, where companies claim to use AI but rely on simplistic algorithms, leading to misleading recommendations that fail to address complex individual needs. Overreliance on automation may erode professional expertise, compromise human-centred quality, and risk algorithmic discrimination. Data management challenges include the need for reversibility, preventing misuse, and avoiding regulatory violations, and there are also concerns about fragmentation and loss of control over personal, employee, and corporate data. Economically, smaller companies face a lack of employee expertise and struggle against larger firms with superior resources, data access, and AI capabilities, creating a growing competitive gap. These issues highlight the need for ethical AI practices, transparency, and equitable resource distribution to support sustainable and fair innovation. Finally, the study findings also demonstrate AI's potential for environmental value creation, despite concerns about the term being overused. AI's perceptive capacity allows companies to develop better reconfiguring capabilities. One example of producing innovative solutions that are more sustainable is using eco-friendly materials that contribute to reducing waste and the company's overall environmental footprint. As underlined in the report of enterprise-interviewer I10: "*Thanks to new technologies, by 2030, we will introduce innovations that will enable our consumers to reduce by 25 percent the water consumption associated with the use of products, compared to 2016, calculated on average and per finished product"*. I4 explained how AI, along with new technologies such as micro-ionisation, enabled their company to produce skincare products, such as masks and serums, in powder form that customers dilute at home. Thus, the company has leveraged its seizing capability.. Innovation allowed for more sustainable packaging, using recycled and biodegradable cardboard. Other interviewees emphasised the importance of AI's perceptive and predictive capabilities in supporting environmental sustainability and enabling more sensing and reconfiguring capabilities. For instance, I11 explained how they use AI to track and monitor ingredients that may be at risk of extinction, using data from organisations such as the International Union for Conservation of Nature (IUCN). By analysing these ingredients and ecosystems in real-time, through perceptive capacity and sensing, AI provides companies with valuable insights into environmental risks, enabling them to anticipate challenges such as biodiversity loss or resource scarcity and to employ quality monitoring and optimise best practices. However, some participants revealed concerns about the rising trend of 'AI washing', whereby companies claim to use AI to appear innovative or environmentally responsible without fully understanding or leveraging the technology's capabilities. Acting in this way can lead to misleading practices: if the AI is not applied in a meaningful way, customers may be deceived. For example, AI models used for product recommendations or skincare analysis may be based on simplistic algorithms that do not fully address individual needs or concerns. This usage can result in recommendations that are not personalised or fail to account for complex factors affecting skin health. The same may happen if the company decides to use a limited or biased dataset, relying, for example, on a narrow range of skin types. Doing so can create challenges not only for businesses but also for the consumers who rely on AI-driven recommendations, as issues such as limited database coverage and reliance on algorithmic models can lead to misleading outcomes.

4.2 AI and sustainable value delivery

The study findings reveal that AI capacities and related capabilities also play key roles in reaching sustainability values in the context of value delivery. Specifically, these advanced technologies may generate economic sustainability in several ways, in particular, through process optimisation, waste reduction, and increased efficiency: "*The use of automated systems, such as photo cameras, results in process improvement from a multi-level perspective, so* [perceptive and prescriptive AI capacities] *allow a more responsible use of resources, so more efficient profit goals"* (I5). The use of the photo camera and related systems to control lipsticks thus allows an improvement of the multilevel process, as they are more objective and effective than the human eye. As a perceptive capacity, the camera connects with the control system and catches drips and waste (e.g., excessive product), allowing the operator to dose the correct number of products. As regards prescriptive capacities, this system speeds up the sampling control process by reducing human error. Consequently, AI capacities improve the firm's sensing capability. As mentioned above, the human eye cannot go at the speed of the machine, so quality control has been based on samples and specific time intervals. Under the AI system, quality control and quality assurance become an almost continuous process, reducing waste by only controlling certain batches. When these systems are properly trained, based on the firm's requirements and the machine's learning capabilities, they adapt more easily to the complexities of controlling and processing different products. Consequently, they enable new best practices in terms of optimisation, business customisation, and adaptability. For example, as the interviewees pointed out, a matte, pearl, pink, and ruby-red lipstick differ significantly from each other, as do their applicator tips. There are oils, formulations, and textures to consider. By adjusting the machine's settings and using a camera for monitoring, the process is consistently controlled, minimising resource waste and ensuring the product meets the requirements of partners and other companies involved. Additionally, AI's predictive capacities allow companies to better forecast product demand, optimising production and reducing excess inventory. As I9 explained, AI can help identify more sustainable ingredients and optimise cosmetics production, significantly contributing to sustainability in areas such as supply chain management. This reduces costs related to storage and inventory, preventing unnecessary waste and ensuring a more efficient use of resources throughout the supply chain, supporting firms' seizing capability. AI also enhances environmental benefits in value delivery, notably through improvements in packaging, logistics, stock management, and resource utilisation. I10 provided an example of AI's perceptive and prescriptive capacities when selecting suppliers and materials. This capacity ensures that businesses can quickly and accurately source sustainable materials, helping to reduce the environmental impact of their packaging and production processes. In terms of logistics, AI improves the speed and sustainability of product deliveries across multiple countries by optimising delivery routes and minimising unnecessary transportation. As I2 explained—and as underlined in various online magazines that cover the project—they use AI to determine the fastest and most sustainable route for deliveries. Thus, AI initiates processes that optimise both in-stock and warehouse supplies, allowing companies to reduce fuel consumption and emissions: Thus, AI initiates processes that optimise both in-stock and warehouse supplies, allowing companies to reduce fuel consumption and emissions. These predictive and prescriptive capacities streamline supply chain operations, ensuring that goods are delivered efficiently while minimising the environmental burden of transportation across multiple countries. Thus, firms leveraging these AI capacities can reconfigure and perform best practices in terms of risk reduction and more transparent value chains [55]. Moreover, AI facilitates waste reduction by enhancing product quality control: *AI allows for waste reduction by discarding only what is truly unusable, based on adjustable tolerances for different types of production, orders, and customers. This helps avoid 'false rejections' by* *preventing unnecessary material wastage* (I5). By fine-tuning these processes, AI minimises inefficiencies in production and reduces the amount of waste generated, thereby decreasing the environmental impact of value delivery.

On the social front, AI's impacts are less pronounced but still strategic in enabling sustainable value delivery. For example, the AI capacity that supports decision-making enables the promotion of new sustainable consumption processes; thus, it also exploits new channels, especially digital ones. In this regard, I9 mentioned the use of AI in search engine optimisation (SEO), where it helps refine product descriptions with technical accuracy while remaining sensitive to local cultural nuances: *"It reviews and offers alternatives, helping develop content that respects diverse local peculiarities"* (I9). This quote illustrates the perceptive and predictive capacities of AI in marketing and communication strategies.

Furthermore, AI connects companies with global digital creators, highlighting how its perceptive and prescriptive capacities enhance collaboration across global teams. For employees, considered as the relevant stakeholders and actors in key activities to deliver value, AI reduces workloads and the stress associated with manual tasks. AI's perceptive and prescriptive capacities streamline processes, making work more efficient and thus allowing firms to better seize and transform their business model sustainably. Nevertheless, concerns remain regarding AI's impact on jobs: "*While AI creates efficiency and reduces workload, it could lead to job reductions and a potential decline in the quality of work*" (I4). This remark acknowledges the trade-offs between AI-driven efficiency and human labour. In quality control, AI helps address the limitations of human perception in fast-paced environments. AI's perceptive and predictive capacities thus enhance accuracy and reliability in industrial processes, aligning with all three DCs.

4.3 AI and sustainable value capture

The findings show how AI facilitates the capture of sustainable value across multiple dimensions—economic, environmental, and social—enabling businesses to integrate advanced technologies into their operations and decision-making processes. The interviewees highlighted how AI supports economic sustainability in the long term, promoting financial stability. All three AI capacities help companies understand market dynamics and optimise operational efficiency. For instance, I11 emphasised AI's perceptive capacity to "*ensure more accurate and regular monitoring of progress and impacts"* while also leveraging its prescriptive and sensing capabilities to provide a clearer understanding of market needs and global trends. These capabilities allow businesses to remain competitive and responsive to emerging opportunities in international markets.

Furthermore, most of the companies represented in this study think that AI can help redesign cost structures by enhancing sustainability throughout the production process. The abilities to forecast market demand, optimise resource allocation, and reduce unnecessary expenditure all contribute to the reconfiguring capability to sustain long-term financial sustainability.

The findings also present important environmental benefits of AI in the value capture dimension. I9 and I1 both underlined the role played by all three AI capacities in obtaining resource optimisation, waste reduction, improved energy efficiency, and predictive analytics for more sustainable and conscious decisions on the entire value chain. Opportunities for value capture refer not only to personalisation and loyalty, but to the perceptive and predictive capacities of AI, which facilitate sensing and seizing capabilities, allowing a firm to minimise its environmental impact: "*We are thinking of offering different solutions customised to the client's needs. In general, we have noticed that since we have been using this system, we have reduced the return of products"* (I7). The same capabilities can also help firms capture new targets: "*With our bot, even more difficult customer segments, such as men, are able to choose the best gift with peace of mind, reducing waste*" (I11).

In general, these capabilities optimise whole business management overall by performing monitoring and optimisation best practices. Additionally, I10 highlights the perceptive potential of AI thus: "*The concept of beauty on demand, probably through AI, is one of the next evolutionary steps. Of course, this is not something everyone can do. New algorithms, and those willing to pay for this information, will allow you to arrive at a production that is exclusive to you, without having to go and try to* *identify or push large market trends. Another example, with the virtual try-on, we could reduce the use of traditional product sampling. Even if we are not in large beauty shops, we manage to capture clients from other channels and let them test the product immediately and conclude the sale journey"* (I10). At the social level, AI's perceptive and predictive capacities are useful means to transform the business, helping reduce tests on persons and animals, reducing costs, enhancing quality, and promoting sustainability: "*We are using an AI database that allows us to reduce testing on people and animals, reducing our costs and our negative impact on the environment"* (I9).

AI's role in sustainable value capture is more nuanced and controversial. Thinking about companies' cost structure block, I1 observes that these advanced technologies "*can do the work of many people together*", automating tasks, improving efficiency, and ultimately reducing labour costs. However, these possibilities raises concerns about job displacement, as echoed by several interviewees, which is among the primary social sustainability issues related to implementing AI and other technologies. These concerns highlight potential challenges to social sustainability, particularly as regards maintaining employment and ensuring that the workforce adapts to the rise of AI-driven automation. However, AI also presents opportunities to enhance social sustainability by improving consumer education, promoting ethical behaviour, and enabling firms to manage intermediations more effectively and perform best practices in terms of transparency, customisation, and business adaptability: "*We have a proprietary platform that helps us manage online transactions and preferences more efficiently. It allows us to track which products are most popular and during which time periods, enabling us to drive sales through loyalty programmes. More importantly, it helps us communicate our values. We were founded with sustainability in mind, and in our product descriptions, we provide not only the ingredients but also sustainability certifications, such as whether a product is vegan or nickel-free. Customers can also read full, transparent reviews from other buyers and search for products based on these criteria"* (I2). In the case cited by I2, above, the perceptual and predictive capabilities of AI algorithms analyse user behaviour on e-commerce platforms in real time, improving seizing capabilities as shopping experiences, customer sentiment, and transaction management. At the same time, the prescriptive capabilities of the algorithms suggest when it is best to send discounts or which sustainability criteria to focus on, for example, protection of animals, emission reductions, or community respect. Additionally, AI's predictive capacities can be used to support communities and mitigate potential political risks. I2 noted how historical-political data can be integrated into AI algorithms to "*better and promptly understand any political criticalities that could impact our business...or decide how to support these communities*". This observation suggests that AI can play a positive role in addressing broader social and political concerns, thus contributing to a more responsible and socially aware business model.

5. Discussion: Best practices for sustainable BMI

The findings confirmed that AI capacities play a crucial role in enabling sustainability-oriented BMI by strengthening firms' DCs, sensing, seizing, and reconfiguring. While the theoretical framework developed in Section 2.3 explains how AI capacities enhance firms' DCs, the empirical evidence extends this framework by showing how these capabilities materialise in practice and influence outcomes. Specifically, the analysis identifies a set of best practices—routinised and replicable actions—through which firms leverage AI to embed sustainability principles into their value creation, delivery, and capture processes. These practices emerged from the data as concrete expressions of AI-enabled DCs, illustrating how organisations translate technological capacities into sustainability-oriented transformation.

AI's three core capacities, namely, perceptive, predictive, and prescriptive, operate synergistically to enable these DCs [6][40]. For example, the perceptive and predictive capacities facilitate seizing and reconfiguring, allowing firms to provide customised, environmentally friendly, and cruelty-free solutions to customers. The prescriptive capacities complement the first two by guiding adaptive decision-making aligned with sustainability goals. AI also supports certification management and quality control, which are critical in a sector that must comply with strict sustainability standards. Additionally, the research findings showed that the AI solutions most frequently adopted by the investigated firms to enable sustainable BMIs are machine learning and predictive analytics, including through the training of specific neural networks. In particular, cosmetic firms use natural language processing, semantic analysis, and automatic tagging for customer relationship management; natural language generation for creating and optimising content for local markets; and predictive algorithms for sending targeted discounts, optimising loyalty campaigns, formulating and choosing packaging, and optimising the use of resources. These examples show how AI-enabled DCs materialise through best practices in monitoring, optimisation, and transparency, thus helping firms to transform their business models toward sustainability.

As suggested by [36], DCs are associated with performance change and are enacted through repeatable and structured routines. Consistent with [35], such routines often display commonalities across effective firms, reflecting patterns of organisational learning and adaptation. Our findings empirically capture these patterns in the form of best practices, that is, recurring actions through which firms operationalise AI-enabled DCs to support sustainability-oriented business model transformation (see Table 2).

Sustainable dimension	Best practices		
	Value Capture	Value Delivery	Value Creation
Economic	Accurate monitoring Cost structure Activity Optimisation	Process improvement Resource efficiency Supply chain management Analysis of compliance and sustainable certifications	Customisation Use of large datasets to limit bias
Environmental	Resource optimisation	Logistic optimisation	Sustainable packaging

	Waste management Energy efficiency	Stock management Reduced waste through precise rejects	Green formulations At-risk ingredient monitoring Transparency in environmental progress and emission reductions
Social	Personalised consumer education Better understanding of political impacts Manage intermediations more effectively	Sustainable consumption processes Connects digital creators Reduces employee workload	More responsive and customised customer service Client satisfaction Product adaptation to new needs due to climate change Reduces employee stress

Table 2. Best practices in SBMs enabled by AI capacities

Author's own elaboration

Table 2 highlights how AI capacities help generate economic, environmental, and social impacts through the development of specific best practices in the three dimensions of cosmetic firms' business models. From an economic perspective, AI capacities significantly enhance DCs, fostering firms' efficiency and competitive strength [28], [56][28]. These advanced solutions have the potential to innovate all three dimensions of the business model. In value capture, AI fosters best practices related to better quality control systems and cost optimisation. In value delivery, it supports process and supply chain management as well as efficient resource allocation. In value creation, customisation, better response, and content creation are the leading best practices. By optimising costs, improving resource management, and enhancing personalisation, AI capacities operationalise dynamic capabilities through best practices that increase firms' competitive advantage and sustainability.

From an environmental standpoint, AI capacities promote DCs that support pro-environmental behaviours. In terms of value capture, AI facilitates energy and resource consumption optimisation while driving waste reduction through customisation. Its ability to do so is connected to the value delivery dimension, where AI optimises logistics, stock management, and waste reduction [9], [28]. In value creation, AI-powered best practices support cosmetic firms in the development of sustainable packaging, enhance green formulations, and monitor at-risk ingredients to preserve customer health and safety while reducing testing times on humans and animals.

From a social perspective, AI capacities foster sensing and seizing capabilities that enhance firms' understandings of customers, employees, and communities [25][33]. In value capture, AI enables personalised consumer education, raises awareness of political impacts, promotes ethical behaviour, and helps cosmetic firms manage intermediaries through improved data management and service translation. In value delivery, AI promotes sustainable consumption and collaboration with digital creators. In value creation, AI enhances customer service, satisfaction, and employee well-being by reducing workload and technostress through prescriptive and perceptive capacities (e.g., through the use of sentiment systems). Models that keep track of possible conflicts allow companies to get to know and better mediate with different stakeholders, thus preserving and facilitating the sensing and seizing capabilities. Hence, similar best practices ensure benefit in terms of awareness and customisation. These practices can be interpreted as concrete expressions of BMI, enabled by higher-order DCs, which are, in turn, supported and amplified by AI-specific capacities. For instance, the use of natural language processing to analyse customer feedback and detect emerging preferences reflects *sensing*; predictive algorithms that optimise loyalty campaigns and product personalisation exemplify *seizing*; and the integration of AI tools to redesign packaging and reduce environmental impact illustrates *reconfiguring*. These examples highlight how AI-enabled routines—such as trend detection, resource optimisation, and stakeholder engagement—become codified best practices that sustain competitive advantage and long-term transformation. Hence, the DC framework provides a robust lens to interpret how AI capacities and sustainability objectives converge through best practices, showing that firms capable of routinising such AI-enabled behaviours are more likely to innovate their business towards sustainability in the cosmetic sector.

6. Theoretical and managerial implications

The present study aims important insights for both academics and practitioners.

Theoretically, it contributes to the growing literature on sustainable BMI, AI, and DCs by providing an integrative theoretical framework that clarifies the mechanisms through which AI fosters sustainability-oriented BMI. First, the study clarifies the processes through which firms operationalise AI to develop sustainability-oriented BMI. While previous studies have emphasised the potential of AI for sustainable value creation [6], [40], limited research has examined how firms integrate AI capacities into their strategic and operational routines [9], [11], [36]. By analysing companies that have embedded AI in their sustainability strategies, this study provides empirical evidence of how AI capacities are converted into DCs that support business model transformation for sustainability. Second, the study offers theoretical insights into the hierarchical relationship between AI capacities and DCs. Specifically, AI capacities are conceptualised as lower-order technological capabilities that constitute the micro-foundations of higher-order DCs—sensing, seizing, and reconfiguring [34]. This hierarchical mechanism explains how technological resources are translated into organisational adaptability and long-term competitiveness [57]. Through this perspective, AI is not merely a technological tool but a resource that enables firms to develop and strengthen their sensing, seizing, and transforming capabilities. In doing so, the study shows how AI capacities reinforce DCs that drive sustainable value creation, delivery, and capture. By conceptualising AI capacities in this way, the study extends prior work that has typically focused on AI's automation and augmentation functions [6], offering instead a perspective on AI as a dynamic enabler that continuously supports organisational learning and transformation [10]. Third, the findings extend the DC perspective by demonstrating that AI-enabled DCs foster business model transformation through the identification and codification of best practices [1][11]. As depicted in Figure 2, these best practices act as operational bridges between DCs and business model outcomes, showing that technology-driven transformation requires the institutionalisation of learning processes. This insight refines current theoretical models by emphasising that AI-enabled DCs, while necessary, are not sufficient; firms must actively develop and scale AI-based routines to embed sustainable value creation, delivery, and capture into their business models [57]. Fourth, this study helps reconcile a central theoretical tension within the DC literature. While [35] describe DCs as relatively standardised and transferable across firms, [34] emphasise their firm-specific and path-dependent nature. Our model suggests that AI capacities constitute *lower-order technological capabilities* that serve as the foundation upon which *higher-order DCs* are developed. These DCs determine how such capacities are selectively configured into sustainable BMI outcomes and support firms in achieving and creating best practices. Sustainable business model transformation thus emerges as the mechanism through which AI-enabled best practices are embedded into economic, social, and environmental value processes [13]. Finally, the study contributes to the broader sustainability and innovation literature by demonstrating that AI capacities directly support the triple bottom line—economic, social, and environmental—integrating efficiency, responsibility, and environmental stewardship within the same capability framework [22][19][27][29].

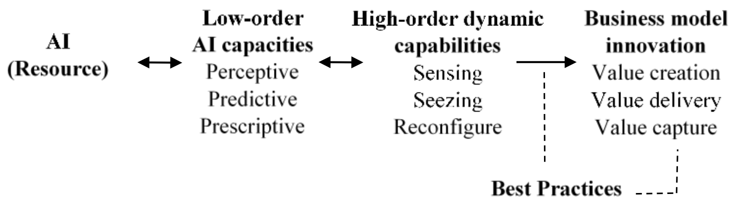

Figure 2 AI capacities' influence on business models to enable economic, social, and environmental best practices

Author's own elaboration

The study findings also have some important managerial and social implications. First, the paper outlines AI capacities, shedding light on their ability to optimise processes, resources, and partner relationships as well as to improve the personalisation of products, services, and innovation [52]. Managers play a pivotal role in harnessing AI to scale business models and emphasise sustainability-focused solutions. The findings highlight the importance of addressing challenges such as technical limitations, maintenance concerns, and transparent AI management. Business managers must carefully select AI models that align with specific business and sustainability goals, incorporating tools to monitor economic, social, and environmental dimensions. Additionally, fostering collaboration with AI, adapting models as necessary, and promoting cross-functional teamwork at both board and management levels are essential for effective integration. Engaging stakeholders is essential for fostering a supportive ecosystem that enhances both sustainability and competitive advantage. To remain competitive, organisations should combine in-house AI models with open-access tools. The integration of AI into SBMs requires a systemic approach, where technology, organisational processes, and regulatory frameworks are aligned to maximise impact. AI should not be viewed merely as a technological tool but as a strategic enabler for reshaping industries towards economic, social, and environmental sustainability. Use cases play a pivotal role in identifying best practices and guiding organisations through the complexities of AI-driven transformations. By analysing real-world applications, firms can assess AI's potential to innovate SBMs. Additionally, adopting AI-driven solutions aligned with sustainability standards is crucial [20], [52]. Policymakers should, therefore, establish clear oversight and evaluation mechanisms to ensure compliance, aiding companies in aligning their practices towards sustainability. Doing so requires not only developing new regulations but also continuously updating existing ones to keep pace with AI's evolving capabilities. Hence, specific sustainability indicators must be included in AI models, for example, that not only the most customised of two solutions, but also the most sustainable or least impactful, is proposed. It will be critical to monitor and promote the responsible use of AI tools by anchoring them to established standards, such as the Sustainable Development Goals [13], [24]. Given AI's energy consumption and potential social implications, it is essential to prevent misuse and encourage a concerted, shared approach to its deployment. To achieve this, technical working groups with stakeholders and associations should be established not only to explore how AI can be leveraged for optimisation and efficiency but also to integrate these dimensions into broader sustainability best practices. Such practices include avoiding the reinforcement of stereotypes—whether related to beauty or other societal constructs. Investment in AI systems must align with organisational culture and purpose. In essence, organisations should adopt a dual approach: building AI capacity to address future demands while developing specific AI capabilities that deliver both strategic and operational value. Finally, investment in AI systems must align with an organisation's culture and purpose. Organisations should adopt a dual approach: building AI capacity to meet future demands while developing specific AI capabilities that deliver both strategic and operational value.

7. Conclusion

The paper has shed light on the potential of AI capacities in facilitating the construction of sustainable BMIs by enabling new best practices that can deliver results in terms of economic, social, and environmental sustainability. By focusing on the cosmetics sector and analysing interviews with key informants, who are experts in AI-driven sustainability, this study has provided findings into how AI can facilitate the transition towards more sustainable business practices. Our research provides enriching best practices on the useful intersection of AI and sustainability, addressing a critical gap in the literature. Unlike prior studies that analyse AI's role in business efficiency or sustainability in isolation, our findings demonstrate how AI directly contributes to economic, social, and environmental sustainability best practices. These findings reinforce AI's transformative potential in shaping SBMs and allow managers and policymakers to integrate AI into broader sustainability best practices while preventing biases and balancing trade-offs.

The study is not without limitations. Although qualitative methodology is valuable for developing models and practices that can be generalised and applied across different companies, the present investigation focuses on a single sector—the cosmetics industry—and a single country, Italy. This scope helps mitigate some common limitations of qualitative research, such as subjectivity in data interpretation, coding biases, and difficulties in generalising results. Moreover, the sample was selected according to specific criteria to ensure a representative understanding of the phenomenon under study. Future studies should adopt broader sampling strategies, minimise self-selection bias, and expand the sample size to include companies with diverse attitudes towards AI and sustainability, including less sustainability-conscious or AI-adopting firms. This strategy would offer a more comprehensive and balanced perspective. Further research should also employ quantitative tools to rigorously test the proposed framework, assess the relative influence of AI capacities and capabilities in promoting sustainable behaviours, and explore the classification of best practices alongside potential malpractices. Undoubtedly, advancements in AI will continue to reshape the sustainability landscape, raising new research questions. Future studies could investigate how AI's capacities can generate powerful synergies to address sustainability challenges more effectively. AI's role in driving circular and regenerative business models should be further explored, particularly regarding resource optimisation beyond waste reduction, enabling large-scale recycling and reuse across all dimensions of business models. As the present research suggests, the road to sustainable use for sustainable business models is in its early stages, as some pillars require more focus.

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