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Digital transformation in the B2B context: A review, theorisation and future perspectives☆

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ABSTRACT

Digital transformation reshapes business models and enhances value delivery, significantly impacting business-to-business (B2B) ecosystems. This study examines this transformation through a network perspective, using the Actor-Resource-Activity (A-R-A) model to explore its implications for B2B environments. Through a Bibliometric-Systematic Literature Review, it synthesizes existing knowledge, identifies key research themes, analyzes their theoretical foundations, and highlights significant findings. The study also introduces a revised A-R-A model to reflect the role of digitalisation in B2B networks. It concludes with future research directions and discusses the theoretical and practical implications.

1. Introduction

Digital transformation is defined as the strategic implementation of digital technologies resulting in business models innovations and generating new ways of delivering value (Caputo et al., 2021; Fernandez-Vidal et al., 2022; Kraus et al., 2022; Verhoef et al., 2021). It is commonly delineated across three phases initiated by the conversion of analogue information into a digital format, a process referred to as digitisation. The next phase, digitalisation, leverages digital technologies to optimize existing operations, for instance, use social media platforms to enhance customers engagement (Drummond et al., 2020). As the final stage, digital transformation goes beyond and redefines business strategies, resulting in the creation of entirely new business models (Pagani & Pardo, 2017). The potential benefits for a firm are manifold, including enhanced and expanded capabilities (Rapaccini et al., 2020; Zhai et al., 2022), improved customer experiences (Fready et al., 2022; Matarazzo et al., 2021), and a broader international reach (Arenius et al., 2005; Guercini & Runfola, 2015).

Examples of digital transformations coming from global giants like General Electric (GE), Siemens, and Adobe illustrate how firms can successfully weave digital into their business practices. GE has embraced the digital shift by establishing a subsidiary, GE Digital, to provide industrial internet solutions such as asset performance tools and a cloud-based platform for industrial data analytics. Furthermore, GE pioneered a cloud-based platform-as-a-service (PaaS) specifically intended to empower industrial firms to capture and analyse vast quantities of data from industrial equipment. Consequently, this has enabled the facilitation of proactive maintenance and the optimisation of operational efficiency. Siemens, another global conglomerate with expertise in industrial manufacturing, energy, healthcare, and infrastructure, has launched MindSphere, an Internet of Things (IoT) operating system that analyses vast data sets to provide actionable insights and facilitate process optimisation. Furthermore, Siemens has adopted the Digital Twin Technology, which involves creating a digital replica of a physical product, process, or system. This innovative approach permits real-time monitoring and simulation, paving the way for pre-implementation optimisation, reduced time-to-market, and minimised operational costs. While GE and Siemens concentrated on enhancing industrial operations, Adobe transitioned to a subscription-based model which facilitates online access to the company's tools for users, thus, ensuring access to the latest features and updates. Consequently, this strategic shift has precipitated a transformation in Adobe's product delivery and revenue model.

Digital transformation in industrial contexts is shaped by the nature of B2B relationships, rooted in the embeddedness of firms within business networks (Anderson et al., 1994; Håkansson & Ford, 2002;

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Landqvist & Lind, 2019). These relationships are characterised by a greater degree of complexity due to the involvement of multi-level actors (Håkansson & Ford, 2002) engaged in transactions or relational exchanges (Quinton & Wilson, 2016). From a network perspective, business networks are constituted by actors who utilise and adapt resources for the purpose of conducting activities (Anderson et al., 1994; Håkansson & Ford, 2002; Lenney & Easton, 2009). This conceptualisation, known, as Actor-Resource-Activity (A-R-A) model, underscores the interconnectedness and interdependence of three elements in the creation of value and the maintenance of relationships within networks. The A-R-A model has been extensively applied in the analysis of B2B markets (Finch et al., 2012; Gadde et al., 2003; Lenney & Easton, 2009). However, in view of the increasing implementation of digital technologies and their transformative influence upon B2B relationships, market environments are undergoing significant changes (Pagani & Pardo, 2017; Storbacka, 2019), including the introduction of digital resources (Piccoli et al., 2020), the evolving roles of actors (Cantù et al., 2012) and the redefinition of value co-creation processes (Breidbach & Maglio, 2016).

Nevertheless, the existing literature suggests a paucity of comprehensive studies in this field, with the majority of studies focusing on the B2C field (Fraccastoro, Gabrielsson and Chetty, 2021a). Secondly, prior reviews have primarily concentrated on analysing the discrete digital technologies within the B2B context. For instance, Cartwright et al. (2021) explored the role of social media as a strategic tool, identifying three key strategic implications: sales facilitation, integrated communication, and employee engagement. Rad et al. (2022) conducted a review analysing the implications of Industry 4.0 technologies for supply chain performance. The study's findings yielded a framework delineating the benefits, challenges and critical success factors influencing supply chain performance in the context of Industry 4.0. Several researchers have examined how AI is being integrated into B2B marketing. Moradi and Dass (2022) examined AI in a broad marketing context, focusing on how B2B marketers perceive its benefits and challenges, while Saura et al. (2021) focus on AI's intersection with traditional marketing practices in the digital marketing realm.

Given the relatively sparse focus of previous research, this study aims to address the phenomenon of digital transformation by offering an comprehensive perspective on its impact within the B2B environment. In contrast to the numerous previous reviews that have focused predominantly on specific digital technologies, this study adopts a more extensive perspective that is rooted in the network approach. In particular, A-R-A model is employed to examine how digital transformation is reshaping B2B ecosystems by influencing actor interactions, business activities, and resources utilisation within networks. Therefore, this paper addresses the following research questions:

RQ1. How is digital transformation altering the B2B market from a network perspective?

RQ2. What potential future research directions emerge from analysis of digital transformation in the B2B context?

The research questions were answered through the implementation of a two-stage approach, comprising a bibliometric VOS (Visualisation of Similarities) analysis and a systematic literature review (SLRs) of 86 research papers. This approach synthesises scientific knowledge, thereby enhancing academic understanding and providing a more comprehensive perspective on the topic (Biemans et al., 2022; Pomirleanu et al., 2022). Bibliometric analysis provides valuable insights into the dynamics of the field by quantifying influential research and identifying key authors. It provides an unbiased perspective on the literature by capturing the collective views of the academic community, enhancing understanding of the current state of research within the field (Foroudi et al., 2020; Kumar et al., 2020; Lacka et al., 2020). In conjunction with SLRs, which synthesise existing research and identify gaps in the field (Chopra et al., 2023), this approach led to another contribution of the paper, suggesting future directions within the research domain (Chabowski et al., 2022).

The remainder of the paper is structured as follows: After the introduction, the next section (2) outlines the study's methodological approach. We then discuss the findings from the bibliometric VOS analysis and systematic review (3). The following section (4) develops an agenda for future research avenues. The final section (5) presents implications for theory and practice, along with mentioning the limitations of this paper.

2. Methods and data

The present study implements the Bibliometric-Systematic Literature Review Framework (B-SLR) from Marzi et al. (2025). We ensured the quality and reproducibility of the study by adhering to the PRISMA protocol (Moher et al., 2009) and the AMSTAR 2 checklist (Shea et al., 2017).

We initially reviewed the literature on "digital, digitalisation and digital transformation in the B2B context" in October 2021, to gather insights and key terms. Next, we applied the AMSTAR 2 protocol (Shea et al., 2017) to select inclusion and exclusion criteria before data collection, using guidance from established papers on the topic of the present study (Agnihotri et al., 2022; He & Zhang, 2022; Hu & Olivieri, 2022; Leone et al., 2021; Yeow et al., 2018).

Our research query was defined and keywords were refined to facilitate targeted data collection. Firstly, we created a large pool of keywords based on the ones appearing in the titles, abstracts and authors' keywords of the above-mentioned established papers. We then iteratively refined and reduces the number of keywords for the query until we reach a string able to broadly cover and collect all the documents related to our field of interest (Turzo et al., 2022). As such, the final set of keywords was: (digital*) AND (b2b OR "business-to-business" OR "business to business"). We then executed a comprehensive search on the Scopus Database and gathered 478 documents in January 2023. The Web of Science Core Collection database was used to confirm data validity by cross-checking the documents. There were no missing documents in the Scopus database, which was selected as our primary data source due to its extensive coverage (Mongeon & Paul-Hus, 2016). Next, applying an additional criterion to improve the quality of the documents to be included, we select documents published only with a CABS journals ranking of 2 or higher. As such, the entries were reduced to 218.

Next, all the authors independently read the full text of the 218 papers, comparing them with the inclusion/exclusion criteria set before the beginning of the data collection. Each author identified eligible documents and documents to be excluded for the next phase. All the authors discussed the documents that were subject to disagreement to reach a consensus on those that align with the research question and the defined inclusion/exclusion criteria. Such a process led to a sample of 171 pertinent articles.

Next, we conducted a bibliometric analysis on the selected sample of papers using VOSviewer software (van Eck & Waltman, 2010), yielding 165 interconnected items from the bibliographic coupling analysis. The cluster resolution was kept at 1.00, providing satisfactory topic homogeneity. As shown in Fig. 1, five distinct clusters were agreed upon. The papers were all independently re-read to identify the main topics discussed in each cluster. Again, a consensus was reached through team discussions about the topic and the sub-topics underlying the clusters that emerged from the bibliometric analysis.

Owing to space limitations, we chose the 50th percentile of normalised citations of papers from each cluster (Marzi et al., 2025), manually checking that the 86 papers selected were representative of each cluster's topic. This step allowed us to keep a representative number of papers for each cluster keeping a satisfactory contribution-to-length ratio.

We subsequently conducted a systematic literature review using Tranfield et al. (2003)'s approach. A total of 86 papers were selected for analysis and subsequently categorised into five clusters, which were

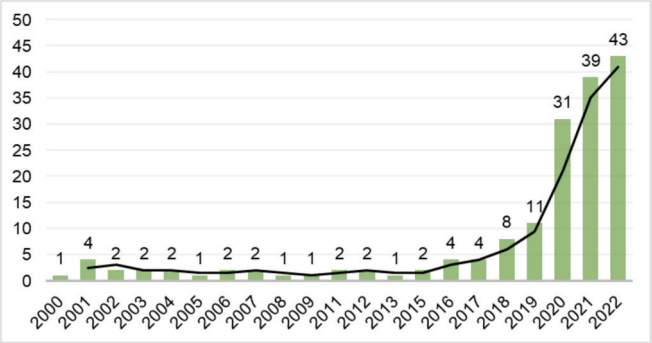

Fig. 1. Distribution of papers by year.

analysed through the lens of the A-R-A framework. Lastly, we identified and developed future research avenues for each cluster following the elaboration made during the systematic review process.

3. Results of bibliometric VOS analysis and literature review

The literature analysis begins with a bibliometric exploration of published papers on the topic. Fig. 1 illustrates the number of publications per year, revealing a significant increase, more than tripling in 2020 compared to the previous year. This surge in attention towards digital topics is primarily linked to the market disruptions triggered by the COVID-19 pandemic. As a result, both practitioners and scholars have shown heightened interest in digitalisation in recent years.

Next, we explored the main publication outlets of the given topic. Table 1 shows the main journals with at least three papers. Considering the inclusion criteria, the selected journals include but are not limited to ethics, accounting, auditing and governance fields within the B2B context. Table 1 shows that most articles appeared in *Industrial Marketing Management (48 over 120; 40%),* followed by *Journal of Business and Industrial Marketing (36 over 120; 30%)*. Thus, two specialised journals in the B2B field cover almost three-quarters of the sample with the selected articles.

Moving to the core of our literature review, Fig. 2 shows the graphical output of the VOS. The VOS analysis showed five polarised clusters introducing five distinct research themes. Each dot represents a publication, while the lines and distance between them reflect the strength of the citation links among papers.

The next phase involved a descriptive analysis of the formed clusters. The Red cluster encompassed 44 papers with 2,026 citations, the highest count in the sample. The Green and Blue clusters share second place in terms of publication volume, each with 35 papers. However, when considering citations, the Blue cluster surpasses the Green, with 1,120 citations compared to 752. Table 2 provides a more detailed breakdown, showing the number of reviewed papers (*in italics*) and total citations for each cluster.

Table 1
List of journals and the number of articles published between 2000 and 2022.

Journal	Number of papers	Total citations
Industrial Marketing Management	48	1597
Journal of Business and Industrial Marketing	36	443
Journal of Business Research	10	72
European Journal of Marketing	6	131
Information Systems Research	4	668
International Journal of Information Management	4	318
Electronic Markets	3	111
Information Systems Frontiers	3	44
Journal of Business-to-business Marketing	3	6
Journal of the Academy of Marketing Science	3	103

Next, in alignment with previous studies (Sassetti et al., 2018), we categorised articles based on the methodological approach within our dataset, first distinguishing between theoretical and empirical articles. A more detailed breakdown of the methodological approaches used within each cluster of the literature review is provided in Table 3. As indicated, the most common method used is qualitative, accounting for more than half the total sampled. Regarding the clusters, except for the Yellow cluster, all are qualitatively oriented. A qualitative approach is well-suited to the topics covered by most of the clusters, such as understanding the intricacies and complexities of digital transformation in B2B firms, exploring human behaviour and attitudes, and investigating how digital technologies affect business processes. However, the primary method used in the Yellow cluster is quantitative. This approach efficiently identifies the most effective digital technologies for B2B interactions and explores patterns in supplier-buyer relationships in the digital economy.

Before proceeding to the literature review, Table 4 presents the principal topics that have emerged from the literature, categorised by clusters, along with their central research questions.

4. Conceptualisation and review of the clusters

The bibliometric analysis identifies five clusters, each of which is examined through the lens of the A-R-A model which is pivotal to the B2B network approach perspective (Anderson et al., 1994; Ford & Mouzas, 2010; Håkansson & Ford, 2002; Lenney & Easton, 2009; Mosch et al., 2022). The model underscores the centrality of interactions in shaping business relationships (Anderson et al., 1994; Håkansson et al., 2009; Kaartemo et al., 2020). It conceptualises these interactions across three interdependent layers: actors bonds, resources ties, and activities links, which, in turn, forms three types of networks: web of actors, activity patters and resource constellations (Gadde et al., 2003; Håkansson, 2009; Håkansson et al., 2009).

In previous research, actors were considered to have bonds that are primarily social in nature (Finch et al., 2012; Hartmann & Herb, 2015). These bonds reflect the human-centred nature of the actor layer (Lenney & Easton, 2009), which encompasses the roles of individuals or collectives, such as groups, organisations or network of organisations, operating within and beyond the firm (Anderson et al., 1994; Ford et al., 2003). Several key characteristics define this layer. A critical feature is the possession of an identity, whether individual or organisational, that develops through continuous interaction within the network (Nyström, 2012; Pagani & Pardo, 2017). Actors are perceived as goal-orientated, enabling them to align their behavior with specific objectives, reflecting their capacity to form and act on intentions (Abrahamsen et al., 2012). They also have different levels of knowledge about the network's activities, resources and other actors. The involvement of actors in activities, whether independently or in interaction with other actors, implies the exchange and use of resources (Cantù et al., 2012; Finch et al., 2012), leading to sustaining and fostering relational ties (Nyström, 2012). The ability to leverage relationships within network, control resources and coordinate activities emphasise the agency of actors, positioning them as essential contributors to value creation and co-creation processes within the networks (Baraldi et al., 2012; Pagani & Pardo, 2017).

Resources can be entirely tangible as physical assets or intangible, such as intellectual property, corporate culture, and brand reputation (Anderson et al., 1994; Baraldi et al., 2012). Prior research highlights several key assumptions about the nature of resources, including their "double-face", existence in networked contexts, heterogeneity, openness and variability (Baraldi et al., 2012; Bocconcelli et al., 2017; Prenkert et al., 2022). The value of a resource depends on its ties formed through the interactions with other resources and the ways that they are adapted within a particular relationship (Håkansson, 1993; Penrose, 2009; Prenkert et al., 2022). Resources are distinctly related to actors and activities (Finch et al., 2012; Håkansson, 1993; Lenney & Easton, 2009) as in

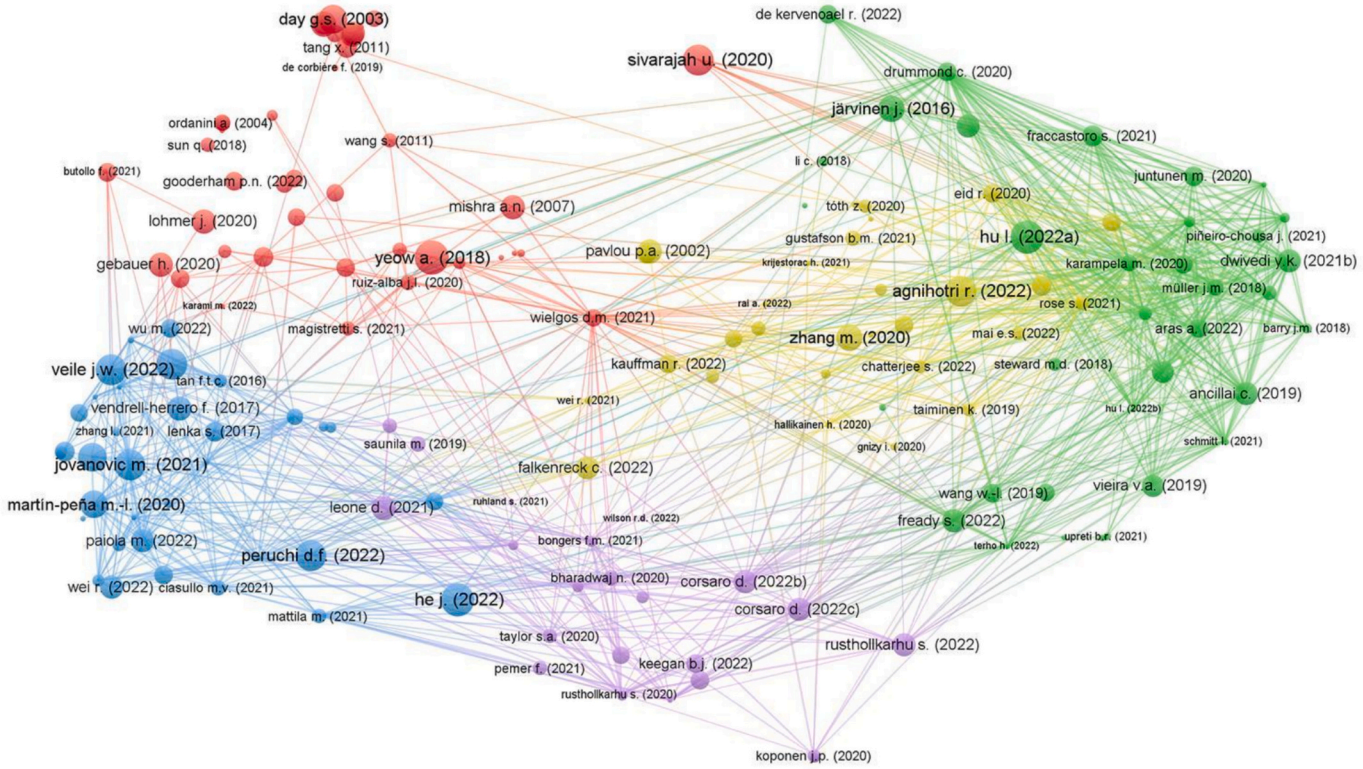

Fig. 2. Results of the VOS analysis.

Table 2
Descriptive statistics for the clusters.

Cluster	Number of papers	Total citations
Red	44 *(22)*	2026
Green	35 *(18)*	752
Blue	35 *(18)*	1120
Yellow	29 *(17)*	702
Purple	22 *(11)*	225

Table 3
Papers' research methods overview.

Methodological approach	Clusters					Total	Total in %
	Red	*Green*	*Blue*	*Yellow*	*Purple*		
Theorethical	1	2	3	1	2	9	**10**
Qualitative	15	9	11	2	8	45	**52**
Quantative	4	4	2	14	1	25	**29**
Mixed	1	3	1	0	0	5	**6**
Experts' opinion	1	0	1	0	0	2	**2**

order to achieve their goals, actors integrate resources into operational processes. In so doing, resources are transformed into value-creating inputs, with the emphasis on the co-creation of value through their utilisation of resources in activities.

The activity links are strongly economic as this layer involves the operational processes and functions performed within or between organisations (Anderson et al., 1994; Ford et al., 2003; Håkansson et al., 2009). Activities can be categorised into transformation activities, such as production, which are carried out by individual actors, and transaction activities, such as exchanges, undertaken between actors (Gadde et al., 2003; Håkansson, 1993; Håkansson & Ford, 2002). Activities are inextricably linked to both the actors performing and coordinating them (Dubois, 2006) and the resources sustaining and enabling them. This interdependence highlights the interactions between activities, actors, and resource levels (Gadde et al., 2003; Kaartemo et al., 2020), making the A-R-A model a framework for understanding how individual business relationships connect and influence the broader business network.

In the following section, the five identified clusters are explored through the lens of the A-R-A model.

Table 4
Summary of the clusters.

Cluster	Topic	Main research questions
Red	*Navigating digital transformation in B2B context: challenges and opportunities*	What are the main outcomes of digital transformation for B2B firms? What are the main obstacles of digital technology implementation within the B2B domain?
Green	*The impact of digital transformation on B2B marketing and selling activities*	How do digital technologies transform marketing practices? To what extent do firms leverage a digital approach for B2B selling?
Blue	*Digital servitisation and its implication within the B2B sector*	How does digital servitisation reshape business processes within the B2B context? How do digital platforms transform industries?
Yellow	*The role of digital technologies in the transformation of B2B supplier-buyer relationships*	Which digital technologies are the most efficient for B2B interactions? What factors contribute to building supplier-buyer relationships within the digital economy context?
Purple	*Digital transformation of value-added processes in B2B environments*	To what extent are value-related processes influenced by digitalisation? How do B2B firms benefit from digital transformation of value-related processes?

4.1. Red cluster— navigating digital transformation in B2B context: challenges and opportunities

4.1.1. Central theme

The first cluster includes articles that focus on the impact of digital transformation on B2B firms' performance and the challenges these firms face during the process. The B2B firms differ significantly from the B2C in their transformation journey (Straub & Watson, 2001; Subramani & Walden, 2001). Due to the lesser degree of customer dynamics, B2B manufacturing firms often adopt a hybrid approach that combines formalised stage-gate structures with agile methods (Rummel et al., 2022). Consequently, the integration of digital technologies by B2B companies transforms the supplier-customer relationship, especially by introducing digital value (Foster, 2005; Hakola, 2013). This change reshapes network structures (Chircu & Kauffman, 2000; Tang et al., 2011) and influences the buyer's purchasing decision (Langer et al., 2012), ultimately improving business performance (Mishra et al., 2021; Wielgos et al., 2021).

However, several challenges can limit the potential benefits of digital transformation. These include external barriers, such as market disruptions (Day, 2002; Zahoor et al., 2022), high volatility (Dehning et al., 2004), and legal and regulatory uncertainty (Lohmer & Lasch, 2020). Internally, the complexity is compounded by inter- and intra-organisational barriers, for instance, lack of awareness or trust, technological constraints (Lohmer & Lasch, 2020), managerial approach (Sivarajah et al., 2020) and security issues (Hidalgo et al., 2009). Furthermore, when firms are unable to translate their digitalisation investments into increased profitability, a digitalisation paradox often emerges (Gebauer et al., 2021). This paradox refers to a discrepancy between the expected benefits of digital transformation, such as increased efficiency and innovation, and the actual financial results.

4.1.2. Actors

Digital transformation within the ecosystem introduces an additional layer of complexity. At the organisational level, digital firms (Day et al., 2003; Tang et al., 2011) are introduced to the networks. Meanwhile, human-centered actors, including executives, shareholders, and customers, play a strategic role in facilitating collaboration, ensuring the effective deployment of resources, and aligning goals to harness the full potential of digital transformation.

4.1.3. Resources

The discussed digital technologies have been categorised based on their functionalities. The first category includes digital technologies adopted by firms intending to communicate with and involve market participants in business activities. Websites enable firms to offer value-added services to customers, while social media platforms encourage participation (Sivarajah et al., 2020), thereby improving the buyer-seller relationship (Foster, 2005). Both platforms can swiftly gather and deliver accurate data on target audiences, allowing firms to refine their strategies based on market demands, enhancing efficiency and decision-making.

The second category covers digital technologies for firms' sales and marketing, especially e-commerce platforms used for online buying and selling. Buyers' behaviour is primarily influenced by price and channel inertia (Langer et al., 2012), while shareholders are attracted by future positive returns (Dehning et al., 2004; Subramani & Walden, 2001). B2B firms are increasingly adopting mobile marketing for their campaigns (Salo et al., 2008). While the aim remains to boost brand awareness and revenue, the distinction lies in leveraging mobile technology for promotion.

The analysis of extant literature indicates how Industry 4.0 (Kazantsev et al., 2022) is effecting a paradigm shift in manufacturing through technologies such as the Internet of Things (Gebauer et al., 2021), sensors, and cloud computing (Abrell et al., 2016) for the optimisation of resource utilisation and the efficiency of production. Examples of such technologies include digital packaging printing technologies (Hakola, 2013) which are reshaping product manufacturing and customisation, blockchain (Lohmer & Lasch, 2020) and digital rights management (DRM) technologies (Hidalgo et al., 2009) which are introducing new approaches to data protection and distribution.

4.1.4. Activities

The implementation of digital technologies is seen as a facilitator that optimises firms' operational functions, rather than primarily as sources of radical innovation. Through their use, firms enable the sharing of valuable knowledge within networks (Sivarajah et al., 2020), resulting in a more dynamic and mutually beneficial exchange of information.

4.2. Green cluster— the impact of digital transformation on B2B marketing and selling activities

4.2.1. Central theme

The second cluster examines digital transformation within marketing and sales development in a B2B environment. The literature predominantly discusses the shift towards digital and social media as marketing channels, assessing their influence on supplier-buyer relationships and various stages of the B2B sales process. The study of Fraccastoro, Gabrielsson, and Pullins (2021a) highlighted the role of digital technologies as communication tools throughout the sales process, which include identifying new opportunities and managing relationships. In addition, Hu (2022)'s study highlighted their effectiveness in the maintenance of supply chain resilience and the improvement of interactions within extended networks.

4.2.2. Actors

At the organisational level, the primary players are firms that leverage digital technologies to enhance their marketing and sales activities. Organisations, from small businesses to large corporations, use digital tools to expand reach, tailor marketing, and simplify sales (Järvinen & Taiminen, 2016). At the individual level, managers plan and execute digital strategies, while salespeople use tools such as social media and CRM software (Fraccastoro, Gabrielsson, and Pullins, 2021b; Gabrielsson & Gabrielsson, 2011).

The central role, however, belongs to the customers, as their preferences and feedback influence firms' strategies. In today's digital era, customers actively participate in content creation and dissemination, and their online engagement significantly impacts a firm's market position (Hu, 2022). Consequently, understanding customers' digital behaviours is crucial to a firm's marketing and sales activities.

4.2.3. Resources

Digital technologies serve a dual role in this cluster. Firstly, they are defined as platforms facilitating communication and engagements among individuals, organisations, and businesses. Social media is identified as one of the most widely used digital platforms (Aras et al., 2022; Dwivedi et al., 2021). As pointed out by Fraccastoro, Gabrielsson and Chetty (2021a), in contrast to traditional media channels, social media enables users to actively share, co-create, and modify content. Consequently, social media encompasses various tools that allow users to generate and co-create content, such as social networking sites, online blogs, and content communities. Firms can use channels such as email, virtual reality, and video conferences for direct and clear communication with their stakeholders (Fready et al., 2022; Wang et al., 2019).

Secondly, digital technologies play an essential role in enhancing marketing and sales practices. Besides social media platforms, these technologies encompass marketing automation, defined as software platforms designed to automate marketing processes through specified criteria for content delivery (Järvinen & Taiminen, 2016), mobile marketing (Müller et al., 2018), and digital communication, which includes both firm-led and market-led communications (Vieira et al.,

2019).

4.2.4. Activities

In the majority of cases, digital technologies refine a firm's marketing and sales activities. Big data analytics offer valuable consumer market and technological insights (Wang & Wang, 2020). A firm's social media presence strengthens brand relationships (Karampela et al., 2020; Lipiäinen & Karjaluoto, 2015) by establishing new digital engagement strategies and tactics (Drummond et al., 2020; Juntunen et al., 2020), and promoting user-generated content (Aras et al., 2022). In some B2B industries, social media is used as a tool for self-governance (Lin et al., 2020). Mobile marketing efforts, such as mobile advertising (Dwivedi et al., 2021), can bring about changes in purchasing patterns (Müller et al., 2021).

As a result of digital transformation, a new selling strategy, namely social selling, was introduced (Ancillai et al., 2019). Social selling involves using social and digital channels to reach customers and other market participants at relevant touchpoints. It is characterised by the application of digital marketing principles, such as content or social media marketing, at the individual salesperson level. The primary benefit of social selling for firms is an increase in digital customer engagement (Wang et al., 2019), leading to higher buyer acquisition and increased sales (Järvinen & Taiminen, 2016).

4.3. Blue cluster— digital servitisation and its implication within the B2B sector

4.3.1. Central theme

The integration of digitalisation and servitisation has culminated in a concept known as digital servitisation. This process transforms the capabilities, offerings, and processes of industrial firms and their associated ecosystems using digital technologies (Galvani & Bocconcelli, 2022; Gebauer et al., 2021). Achieving successful digital servitisation necessitates both digitisation - the conversion of analogue information into digital format, and digitalisation - the strategic combination and recombination of digital technologies for new ways of value creation and capture (Ciasullo et al., 2021). Its implementation is based on creating industrial platforms that connect installed industrial assets and equipment (Jovanovic et al., 2021). Adopting a service-oriented approach allows B2B firms to develop innovative business models, fundamentally transforming processes related to value generation (Paiola et al., 2022; Veile et al., 2022; Vendrell-Herrero et al., 2017).

4.3.2. Actors

At the organisational level, the firm has traditionally functioned as the primary agent. However, the landscape is undergoing a transformation with the integration of digital platforms (Pauli et al., 2021; Veile et al., 2022), which are no longer merely supportive tools but have evolved into independent actors.

4.3.3. Resources

Digital servitisation focuses mainly on digital platforms of various types, reflecting different capabilities and underscoring their multidimensional functionality. Digital platforms are modular IT architectures embedded within business networks to enable stakeholder interactions and support diverse business activities (Veile et al., 2022; Wu et al., 2022). In the B2B context, industrial digital platforms have gained interest. The platforms' core consists of data collected and integrated from industrial assets, forming the basis for smart applications and services creation (Pauli et al., 2021; Veile et al., 2022). Technologies like IoT are used, facilitating the production of advanced services in the manufacturing industry (Hein et al., 2019; Paiola et al., 2022). Other types of platforms include digitalised interactive platforms and payment platforms, each differing in terms of technical architecture and organisational complexity (Pauli et al., 2021).

4.3.4. Activities

Digital servitisation transforms how firms create value-related processes (Paiola et al., 2022; Veile et al., 2022; Vendrell-Herrero et al., 2017). For instance, a study by Lenka et al. (2017) explored how digital capabilities enable value co-creation with customers. Digital technologies enhance provider-customer interactions, influencing their depth and breadth, resulting in co-created value processes. Hence, a digital platform's resource-connecting function can offer a competitive edge (He & Zhang, 2022). Unlike previous clusters where digital technologies mainly facilitated business operations, the service-dominant approach highlighted digital platform business models (Grabher & van Tuijl, 2020; Peruchi et al., 2022). These models impact supply and demand processes, integrate complementary assets and platform readiness, while enabling applications (Hein et al., 2019). However, their efficiency depends on the ecosystem's co-evolution, especially the modular approach (Wei et al., 2022). Algorithms, online communities, and platform access allow diversifying and unifying mechanisms to work concurrently, alleviating impacts of paradoxical tensions between performance, processing, and organisation.

4.4. Yellow cluster— the role of digital technologies in the transformation of B2B supplier-buyer relationships

4.4.1. Central theme

This section discusses the influence of digitalisation on supplier-buyer relationships within the B2B context. The primary research focus is on the outcomes of customer behaviours, such as customer trust and loyalty (Agnihotri, 2020; Falkenreck & Wagner, 2022; Zhang et al., 2020), and purchase intentions (Crisafulli et al., 2022; Yuan et al., 2021; Zhang & Li, 2019). Understanding and leveraging the impact of digital technologies enables B2B firms to navigate the changing market environment. This is accomplished by building trust with customers and partners (Pavlou, 2002; Rose et al., 2021), establishing robust brand legitimacy (Gustafson & Pomirleanu, 2021), and effectively managing coordination and collaboration across networks (Chatterjee et al., 2022).

4.4.2. Actors

The firm continues to function as the central actor at the organisational level. At the individual level, roles now extend beyond suppliers and buyers to include chatbots (Behera et al., 2022), which act as virtual conversational agents using natural language, thereby transforming interactions and enhancing efficiency in B2B processes.

4.4.3. Resources

The most frequently used digital resources in this context relate to communication and engagement technologies, notably social media (Agnihotri, 2020; Rose et al., 2021; Zhang & Li, 2019). The high use of these digital channels is due to their interactive nature and their ability to maintain increased participation in task-related communication (Murphy & Sashi, 2018). Eid et al. (2020) noted that social media is characterised by shifts from desktop-based to web-based interactions, from the firm to the consumer as the primary creator of value, and a shift in power.

Chatbots, software designed to converse with humans in natural language, were introduced by Behera et al. (2021). Cognitive chatbots enable personalisation and contextualisation in their interactions by using cognitive capabilities. To deliver a more genuine and informative customer experience, live video streaming (LVS) platforms have become essential to the digital marketing strategy of B2B firms (Zhang et al., 2020).

A second group of digital resources focuses on sales activities. These include B2B e-commerce (Yuan et al., 2021) and salesforce platforms (Gustafson & Pomirleanu, 2021), which aid in tracking and measuring specific campaigns. This group also includes B2B online marketplaces. These e-marketplaces can be characterised as virtual networked

organisations that provide infrastructure, technologies, and value-added services to support and enhance industrial buyer-seller relationships (Pavlou, 2002; Zahoor et al., 2022).

A final group of resources relates to automation technologies, such as Artificial Intelligence (AI). AI refers to integrating automated decision-making capabilities into a firm's systems and processes (Chatterjee et al., 2022). Implementing AI, when compared with manual processes, reduces the time required for routine activities.

4.4.4. Activities

Digital technologies are fundamentally altering the nature of interaction and collaboration within supplier-buyer relationships by acting as enablers, facilitators, and enhancers. Digital technologies, including social media, data analytics, and online research tools, enable suppliers and buyers to collect and analyse market knowledge regarding products, competitors (Agnihotri, 2020), and customer preferences (Eid et al., 2020). Consequently, suppliers can provide personalised and improved customer experiences based on the information acquired. Through customer relationship management (CRM) systems, artificial intelligence, and chatbots (Behera et al., 2021; Chatterjee et al., 2022), suppliers can provide tailored recommendations, quick assistance, and personalised services, leading to increased customer trust (Rose et al., 2021), loyalty (Zhang et al., 2020), and purchase intentions (Crisafulli et al., 2022; Yuan et al., 2021; Zhang & Li, 2019).

The rapid exchange of information accelerates the process of building connections between market participants. Enhanced commitment velocity allows suppliers and buyers to respond to market changes, seize opportunities, and adapt to evolving customer demands. Such decision-making and executive agility improve overall coordination and collaboration, resulting in better outcomes for both suppliers and buyers (Kauffman & Pointer, 2022; Mai & Liao, 2022).

The integration of e-commerce platforms, online marketplaces, and digital payment systems into the buyer-seller relationship significantly increases transactional efficiency (Pavlou, 2002). By building trusted relationships within networks, a firm's brand becomes more attractive to customers compared to its competitors. This subsequently assists in building strong brand legitimacy (Gustafson & Pomirleanu, 2021), including reputation, awareness, and credibility, and enhances overall performance (Carayannis & Turner, 2006).

4.5. Purple cluster— digital transformation of value-added processes in B2B environments

4.5.1. Central theme

The final emerging theme centres on the complexity of value creation and the associated processes within a digital B2B context. Recent crises have compelled B2B firms to expedite their digitalisation endeavours to alleviate potential long-term effects (Rangarajan et al., 2021). The transition towards digitalisation affects the dimensions of networks (Corsaro & Anzivino, 2021) and sales activities (Corsaro & Maggioni, 2022; Ramos et al., 2023), thus triggering changes in value creation processes.

4.5.2. Actors

At the organisational level, the primary actors in this section are firms that are adapting to digital technologies to enhance their value-adding processes. At the individual level, alongside traditional human roles such as salespeople and buyers, technology is increasingly assuming roles similar to human agents, for instance virtual assistants such as Siri (Taylor et al., 2020).

4.5.3. Resources

Artificial Intelligence (AI) technologies predominantly represent this cluster. AI comprises algorithms, systems, and machines capable of demonstrating intelligence (Rusthollkarhu et al., 2022). In essence, AI simulates the human mind and consciousness, allowing it to perform tasks that typically require human involvement, such as learning, responding, acquiring knowledge, and making decisions based on acquired information (Keegan et al., 2022). As noted by Leone et al. (2021), the complexity of potential tasks depends on the type of AI, with different types responsible for various tasks ranging from repetitive activities to understanding and responding to others' emotions. Machine learning, a subset of AI, utilises mathematical and statistical models, allowing computer programs to make judgments and conclusions (Bharadwaj and Shipley, 2020a). This digital tool enables the adjustment of variable weights as more data becomes available, resulting in a more holistic forecast that considers multiple factors.

4.5.4. Activities

In most instances, the adoption of digital technologies facilitates the activities of firms involved in value-related processes. The integration of digital elements affects not only value creation but also other associated aspects (Corsaro & Anzivino, 2021). For instance, AI technologies are enabling B2B firms to streamline the customer journey and enhance customer experience (Leone et al., 2021; Rusthollkarhu et al., 2022), thereby augmenting the process of value co-creation. As pointed out by Jayashankar et al. (2020) the implementation of big data technologies strengthens the connection between co-creation and epistemic value-in-use via indirect interactions, whereas value co-destruction weakens the co-creation process. In other words, the value derived from co-creation stems from the ability to utilise large data volumes, enabling more profound insight and understanding. Conversely, factors leading to value destruction or reduction hinder the effectiveness of the value co-creation process.

Furthermore, the escalating role of technology has digitalised the interaction between buyers and sellers, introducing a new form of sales interaction referred to as digital sales interaction (Bharadwaj and Shipley, 2020b). Digital transformation impacts sales strategies by introducing inside sales (Ramos et al., 2023), which rely on communication technologies without the traditional face-to-face interaction. Consequently, B2B firms enhance their value and competitive edge, which ultimately influences sales performance. Digital technologies impact network actors. Notably, alongside human actors, research by Taylor et al. (2020) included technology assuming human-like actor status, such as Siri. However, human factors, especially competence and behavioural attributes like knowledge, skills, and attitudes, remain vital for implementing digital formats and influencing value-related processes (Saunila et al., 2019).

5. Theoretical development and agenda for future research

In developing the theoretical contributions of our analysis, we adopted the miner-prospector approach (Alegre et al., 2023; Alvesson & Sandberg, 2020; Breslin & Gatrell, 2023). In this way, using bibliometric analysis and systematic literature reviews, we identified the current state of the art, highlighted research gaps and outlined future directions for each of the clusters (Chopra et al., 2023; Lacka et al., 2020). Furthermore, we have proposed a comprehensive perspective, exploring how digital transformation is redefining the A-R-A model in the B2B context.

In the traditional view, the actors layer was viewed as human-centric (Anderson et al., 1994; Håkansson et al., 2009; Håkansson & Ford, 2002). The advent of digital transformation has precipitated a shift within dynamic ecosystems by introducing new digital actors, such as digital platforms (Day et al., 2003;Pauli et al., 2021; Veile et al., 2022) and AI-driven technologies, including chatbots (Behera et al., 2021) and virtual assistants (Chatterjee et al., 2022; Taylor et al., 2020). New actors replicate the core features of their traditional counterparts (Keegan et al., 2022; Kot & Leszczyński, 2020), thereby enabling them to assume roles that were held by human actors. For instance, digital platforms are characterised by the pursuit of specific objectives, such as facilitating complementary solutions (Pauli et al., 2021), thus reflecting the goal-

driven nature of the involved actors. These platforms facilitate data collection and integration from industrial assets (Pauli et al., 2021; Veile et al., 2022), illustrating actors' capacity to manage and coordinate activities within the network. Therefore, by centralizing data and providing technological support (Jovanovic et al., 2021; Vendrell-Herrero et al., 2017; Wei et al., 2022), such platforms effectively function as agencies, thereby leveraging resources. The aggregation of data endows platforms with the capacity for self-knowledge, thus, fostering and facilitating interactions with platform owners, third parties, and customers (Tang et al., 2011), thus facilitating relational ties. It follows that the identity of platforms is linked to their specific functions, and this evolves as they interact with other actors on the network. These interactions also help the platforms fulfil their role in value creation (Ciasullo et al., 2021; Hein et al., 2019). In a similar manner, AI-driven technologies including chabots (Behera et al., 2021), personal virtual assistant (Taylor et al., 2020) embody these characteristics and are more than mere tools. Indeed, they function as interactive agents capable of managing and coordinating activities, engaging users through natural language, and adapting to individual needs (Leone et al., 2021; Rusthollkarhu et al., 2022).

Adding new actors is conducive to the development of new bonds and the expansion of the network as a whole. From this perspective, digital technologies facilitate network dynamics by enhancing interactivity among the actors (Murphy & Sashi, 2018). This virtual “two-way interactions” (Karampela et al., 2020), in turn, affect customer engagement transforming the traditional role of the customer from passive observer to active participant in value creation processes (Veile et al., 2022). This, in turn, has the effect of enhancing cocreated value, and thus augmenting firm value (Fready et al., 2022). Therefore, collaboration between digital and human actors has an impact on the nature of exchanges within the B2B environment, transforming conventional bilateral exchanges into more interconnected and multidirectional dynamics.

Digital transformation has resulted in an increase in the heterogeneity and variability of resources, which can be categorised according to their function and role in the B2B context. These include communication and engagement tools such as social media (Juntunen et al., 2020; Rose et al., 2021), sales and marketing resources, for instance, e-commerce platforms and marketing automation (Järvinen & Taiminen, 2016; Wu et al., 2022), transformative Industry 4.0 technologies (Lohmer & Lasch, 2020; Pauli et al., 2021) and AI-driven systems (Behera et al., 2021; Chatterjee et al., 2022). Similarly to the actor layer, introducing digital resources enables the creation of more ties and extends the network in its entirety. The interconnected nature of the A-R-A model (Dubois, 2006; Håkansson et al., 2009; Håkansson & Ford, 2002) renders new resource ties accessible to actors, thereby enabling them to enhance the coordination of activities.

Digital servitisation exemplifies the double-faced nature of resources emphasising both their inherent functionality and the value derived from network interactions (Galvani & Bocconcelli, 2022; Paschou et al., 2020). The integration of digital technologies has been demonstrated to enhance scalability and modularity (Chatterjee et al., 2022; Hein et al., 2019; Lohmer & Lasch, 2020; Pauli et al., 2021; Wei et al., 2022), thereby enabling firms to respond more effectively to rapidly evolving external environments. However, the most evident change made by digital transformation is the shift of resources from being static inputs to becoming dynamic, value-creating contributors within the networks (Foster, 2005; Hein et al., 2019) due to their adaptability, interactivity, and innovativeness (Abrell et al., 2016; Karampela et al., 2020; Wei et al., 2022).

Digital transformation has not resulted in the introduction of entirely new categories of activities; rather, it is primarily concerned with the augmentation and optimisation of existing ones (Langer et al., 2012; Mishra et al., 2021; Wielgos et al., 2021). Mostly, transformation activities are digitalised trough technologies like Industry 4.0 are increasingly subject to digitalisation through technologies including Industry 4.0. (Kazantsev et al., 2022; Lohmer & Lasch, 2020; Paiola et al., 2022). These technologies transform the structure of supply chains (Vendrell-Herrero et al., 2017), business models and value creation processes (Veile et al., 2022). Transaction activities are being reconfigured through e-commerce (Langer et al., 2012; Wu et al., 2022) and digital-first practices like social selling (Ancillai et al., 2019), which prioritise relational efficiency and customer-centric engagement.

Another shift brought about by digital transformation is the adoption of service-oriented models by companies (Langer et al., 2012), which use digital platforms to transform physical goods into service-based ones. This shift has two main effects: allowing companies to deliver continuous value through ongoing services instead of one-off transactions, and changing the buyer-supplier relationship to one of collaboration (Veile et al., 2022). Thereby, activities have shift from from a predominantly transactional nature to one that is relational and value-driven (Leone et al., 2021). A critical element of this transformation is the emergence of digital value, which is created through virtual interactions (Fready et al., 2022). This includes data-driven insights (Agnihotri et al., 2023; Sivarajah et al., 2020), enhanced customer experiences (Kauffman & Pointer, 2022; Rusthollkarhu et al., 2022) and the co-creation of innovative solutions (Vendrell-Herrero et al., 2017) that redefine and strengthen relationships across the network.

Based on this analysis, we summarised the key findings in Fig. 3, highlighting the impact of digital transformation on the established layers of the A-R-A model.

Furthermore, upon the analysis, we found out that several digital technologies simultaneously embody characteristics of both actors and resources. This "role convergence" is a distinctive feature that challenges the defined boundaries between actors and resources layers in the traditional A-R-A model. The distinguishing feature between conceptual categories is that actors are theorised as active participants driving interactions within the network, while resources are passive entities deployed by actors to conduct activities (Ford et al., 2003; Håkansson et al., 2009; Håkansson & Ford, 2002; Lenney & Easton, 2009; Prenkert et al., 2022).

However, the advent of digital platforms and AI-driven technologies has served to disrupt this distinction. On the one hand, these technologies function as human actors (Behera et al., 2021; Pauli et al., 2021; Veile et al., 2022), autonomously interacting within networks and influencing decision-making processes. Conversely, they function as resources, employed by actors to optimise activities, for instance enhancing communication (Fraccastoro, Gabrielsson, and Pullins, 2021a), facilating supplier-customer interactions (Kauffman & Pointer, 2022; Ramos et al., 2023). This dual role creates a hybrid category that transcends the actor-resource dichotomy introducing new dynamics to the A-R-A model, whereby digital tools (resources) are capable of making independent decisions and interacting autonomously (actor-like behavior), while still serving as enablers for other participants. Drawing upon the findings, we propose an adjustment to the A-R-A model to account for the alterations wrought by digital transformation.

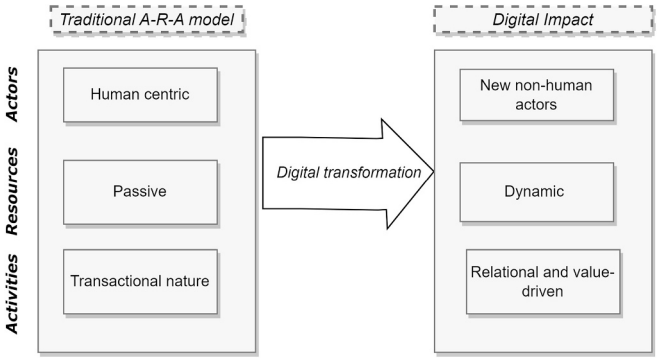

Fig. 3. Digital transformation within A-R-A framework.

Specifically, we introduce a new element labelled "Hybrid Role," which emerges from the blurring of boundaries between the categories of actors and resources. This addition reflects the dual functionality of digital technologies, which are able to act in an independent manner as well as serve to facilitate other resources. As illustrated in Fig. 4, the redefined A-R-A model demonstrates the alterations in actors, resources and activities within B2B networks that are precipitated by digital transformation.

A comprehensive review of extant literature has been undertaken, with a view to identifying potential avenues for future research in this field. The following avenues, which correspond to the five clusters defined, are delineated below.

Alongside specific suggestions for each cluster, it is critical to emphasise the universal need for methodological development. Our findings indicate a substantial preference for qualitative methodologies over quantitative ones, which advocates for a balanced blend of methods to fully comprehend the multi-faceted dimensions of digitalisation in the B2B landscape. Moreover, the scarcity of longitudinal studies underscores the need for additional research to chronicle the progression of digital transformation over time. Another potential area of exploration pertains to the theoretical framework of digital transformation in B2B sectors. As evidenced by our analysis, applied theory in this sphere remains relatively sparse, thereby offering ample opportunities for developing more rigorous theoretical underpinnings to effectively guide future research and practical applications.

Considering that digital transformation and its outcomes in the B2B sector differ from those in the B2C sector (Subramani & Walden, 2001; Wielgos et al., 2021), there is a necessity for more extensive empirical research to yield a deeper understanding of digitalisation, its characteristics, and its impacts within the B2B environment. We advocate for expanding the range of comparative studies to encompass factors that extend beyond the size of the firm, the industry, and geographical reach.

5.1. Red cluster— navigating digital transformation in B2B context: challenges and opportunities

5.1.1. Digital actors

The varying roles of individual actors, including partners, stakeholders, industry experts, clients, and others, present intriguing avenues for further exploration, particularly in *how their engagement and agency influence the process of digital transformation within the B2B industry*. Similarly, the behavioural changes and emerging patterns of these actors due to digitalisation warrant further study. For instance, contrasting the behaviours of traditional customers and digital users or assessing the effectiveness of user engagement could prove illuminating. There is also potential to investigate the role of managers in the decision-making process of digital transformation, including *how personal attitudes, beliefs, and cognitive biases influence digital transformation, and the resultant impacts on the overall process and business performance*. Furthermore, the rise of digital intermediaries (Chircu & Kauffman, 2000; Tang et al., 2011) provides a compelling focus for research, particularly their role in facilitating connections and exchanges, as well as their contributions to the successful adoption and usage of digital resources in the B2B ecosystem. This research may benefit from more quantitative and longitudinal studies (Salo et al., 2008) that focus on causality (Mishra et al., 2021).

5.1.2. Digital resources

In the domain of digital resources within B2B firms, future research could delve into several key areas. Firstly, broadening the focus to incorporate a wider variety of digital technologies, including machine learning, artificial intelligence, virtual and augmented reality, Internet of Things (IoT), and big data analytics, will provide deeper insights into the impact of digitalisation on B2B entities. Secondly, exploring the broader impact of digital transformation on business performance can provide insights, such as *how B2B firms utilise digital resources to establish and enhance collaborations, partnerships, and alliances within their ecosystems*. Moreover, questions around the effective management of these complex technology ecosystems and the challenges and opportunities associated with integrating multiple digital technologies can offer promising directions for future research.

5.1.3. Digital activities

The literature review indicates a need for further exploration of the digital transformation challenges faced by B2B firms, specifically addressing the digitalisation paradox (Gebauer et al., 2021) and potential solutions to alleviate it. Digital technologies' role in fostering business agility amid market volatility (Zahoor et al., 2022) is another promising research direction, especially examining *how digital transformation aids in navigating market disruptions and identifying the most appropriate digital solutions for varying circumstances*. Given that digitalisation is progressively driving businesses towards virtual operations, it's essential to address specific threats and challenges tied to these shifts, such as the lack of legal and regulatory norms that contribute to business uncertainty (Lohmer & Lasch, 2020). These findings underscore the need for research that improves our understanding of strategies enhancing firm resilience across market types, ensuring market transparency, robust operational security, and effective IP protection.

5.2. Green cluster—the impact of digital transformation on B2B marketing and selling activities

5.2.1. Digital actors

Comprehensive exploration is encouraged in future research regarding the actors involved in digital B2B marketing and sales. One potentially fruitful avenue for academic investigation involves examining the role of salespeople in formulating and implementing B2B digital marketing strategies, especially in the realm of social selling (Ancillai et al., 2019). Insights into *how salespeople effectively utilise digital platforms and interact with customers could elucidate social selling*

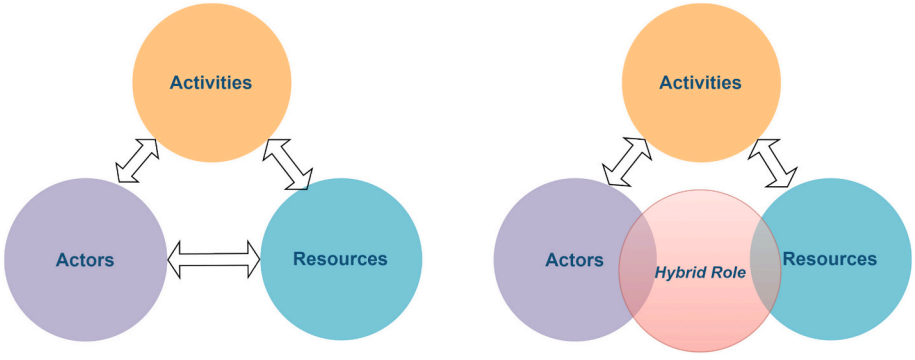

Fig. 4. Redefined A-R-A model through digital transformation.

dynamics and their implications for customer acquisition and management. Moreover, the customer's role should not be discounted. Specifically, *how B2B buyers perceive social selling efforts and how such perceptions impact their digital engagement with salespeople merit investigation.*

5.2.2. Digital resources

Similar to the previous cluster, research seems to have limited analysis to one or two common digital and media tools (Drummond et al., 2020; Juntunen et al., 2020). Therefore, we call for additional research that encompasses a wider variety of digital and social media tools, including online blogs and content communities. Another potential area of research is the efficacy of digital communication channels like e-mail, virtual reality, and video conferencing in B2B stakeholder engagement. Questions such as *how different digital communication channels supplement each other in B2B firms' stakeholder engagement strategies and how these firms adapt their communication strategies via digital channels may yield valuable insights*. Regarding marketing-related technologies, future research might explore marketing automation software platforms, particularly the effect of specific content delivery criteria on marketing efficiency and customer targeting. Studying the use and impact of mobile advertising could also enhance our understanding of its influence on buyer behaviour and decision-making in B2B contexts. Another research direction is examining firm-led (e.g. paid media) and market-led (e.g. earned social media, organic search) digital communication strategies in B2B firms. A research question could be: *What are the preferred channels and content formats used in firm-led and market-led digital communication strategies by B2B firms?*

5.2.3. Digital activities

Despite evidence of improved marketing performance caused by digital transformation, knowledge remains scant regarding the antecedents, moderators, and outcomes of the process, for instance, trust or willingness to recommend a supplier's brand (Karampela et al., 2020), the impact of digital marketing capabilities on business performance (Fready et al., 2022; Hu & Olivieri, 2022). For instance, questions about measuring the effectiveness of digital and social media, the current relevance of traditional marketing capabilities, and *how the use of digital and social media varies by firm size and age could be valuable. Another potential area to explore is content creation within digital marketing strategies*. More specifically, the research could investigate the role of different stimuli and content formats (Järvinen & Taiminen, 2016) and digital paid advertisements (Vieira et al., 2019) in fostering seller-buyer relationships and enhancing customer engagement. Moreover, the concept of social selling and its implications for B2B firms presents a promising research direction. Inquiring into *how social selling affects customer engagement, buyer acquisition, and overall sales performance could offer actionable insights to refine digital sales initiatives*. Potential research questions might include: *What specific digital channels and tactics drive stakeholder engagement? How does social selling impact a firm's revenue generation when compared to traditional sales approaches?*

5.3. Blue cluster— digital servitisation and its implication within the B2B sector

5.3.1. Digital actors

Future research in this field could investigate the role of digital intermediaries, particularly digital platforms, in facilitating business interactions between various internal and external actors. Key questions include: W*hat role do these platforms play in promoting data and knowledge sharing among actors? How do digital intermediaries shape the dynamics of B2B relationships, both within and outside organisations? What factors contribute to successful partnerships facilitated by these platforms?*

Digital platforms as independent actors present several promising avenues of inquiry, including platform ecosystem dynamics, governance, platform business models, security, and trust. Additionally, future research could explore the disruptive impact of digital platforms on traditional B2B industries, such as the extent to which platform entry affects incumbent business models, supply chains, and value propositions. Similarly, the regulatory challenges associated with the rising influence of digital platforms in B2B industries remain under-explored. Therefore, it would be beneficial to evaluate the role of government policies and industry standards in promoting fair competition, consumer protection, and data governance in platform-driven ecosystems.

5.3.2. Digital resources

In the Blue cluster, the digital platform is the most commonly utilised digital resource. As in previous research, digital platforms could be considered either as part of the servitisation process (Gebauer et al., 2021) or as a standalone phenomenon, including digital industrial platforms (Pauli et al., 2021). These perspectives open potential directions for further research. Specifically, more evidence is needed on the role of platforms in the digital transformation of industrial firms. Investigating the nature of platforms themselves, including developing a consensus definition and classification of platforms (Veile et al., 2022), identifying phases of their evolution (Jovanovic et al., 2021), or exploring the mechanism of the platform's impact on value co-creation practices (Hein et al., 2019) through the integration of new variables (He & Zhang, 2022) could also prove beneficial.

5.3.3. Digital activities

The success or failure of digital servitisation hinges on specific organisational and network capabilities that drive a service-centric approach (Galvani & Bocconcelli, 2022). It would be fruitful to explore the role of these capabilities in greater depth, including the potential that some capabilities lead to better outcomes than others. *How should these capabilities evolve in line with the firm's strategic shift? What internal structural changes would support the adoption of new technologies? From an ecosystem perspective, how does the shift to a service-oriented approach affect stakeholder interactions?*

To enhance our understanding of digital servitisation, empirical research is required to assess the benefits and challenges of its implementation. For instance, the degree to which newly adopted mechanisms influence the process of value co-creation (Lenka et al., 2017) or business model alterations (Paiola et al., 2022) could be examined. Future studies might consider the dimensions of value—strategic, financial, and marketing—that are related to performance outcomes. Furthermore, the transition to a service-centric logic faces uncertainties from both internal and external environments. Investigating potential improvements to risk management practices in the future could be insightful.

5.4. Yellow cluster— the role of digital technologies in the transformation of B2B supplier-buyer relationships

5.4.1. Digital actors

Future research should explore the involvement of various actors in these relationships from an ecosystem perspective. Key areas of interest might include: *How does digital transformation enhance firms' relationships with external actors such as partners and government structures? How does the role of other stakeholders shift in the digital context? Which digital capabilities alleviate tensions, and which complicate the firm's relationships with others?*

Additionally, a more detailed investigation into the role and impact of chatbots as virtual conversational agents in B2B interactions could be beneficial. Potential research directions might cover topics such as the effectiveness of chatbots in promoting communication, engagement, and management of relationships between B2B firms and their respective suppliers or buyers.

5.4.2. Digital resources

As discussed in the Yellow cluster, alongside social media platforms, firms can utilise chatbots or video streaming to increase buyer

engagement. Potential research questions could include: *To what extent do chatbots enhance interaction with customers and personalise the experience in a B2B context? How do live video streaming platforms influence the recreation of in-store shopping experiences for online B2B consumers?*

Moreover, future studies could explore the effectiveness of digital transformation within B2B selling activities. For instance, understanding how e-marketplaces facilitate secure transactions within the digital marketplace could be beneficial. *What role does PKI technology play in ensuring data security and how can B2B transaction practices be improved?* New research avenues might also be opened by studying the integration of AI and its impact on the automation of routine tasks and decision-making.

5.4.3. Digital activities

While previous literature generally emphasises the beneficial integration of social media platforms as an efficient channel for communication and sales, there is a gap in understanding customer behaviour outcomes (Zhang et al., 2020), their indicators, and how to measure them. We propose *providing more evidence on business performance results, such as exporting activity* (Eid et al., 2020). It would be interesting to explore which types of digital media are associated with specific tasks (Murphy & Sashi, 2018). In addition, considering social media as a component of supply chain digitalisation (Agnihotri et al., 2022), future studies could focus on its interactions with other digital technologies, such as big data analytics.

Exploring the issue of trust in supplier-buyer relationships in the digital marketplace is another potential research area. Specifically, *investigating the dynamics of trust in cyberspace and the perceived effectiveness of the marketplace in fostering trust between suppliers and buyers could be beneficial*. Future research should address this issue, taking into account various dimensions of trust and cultural settings. Another way to enhance trust is to build a strong, well-known brand. Thus, future research could expand the framework of bolstering an organisation's brand among digital users. For example, Gustafson and Pomirleanu's (2021) study introduced the role of brand narratives from an ecosystem perspective. Further analysis could extend the brand legitimacy framework by applying different approaches. Simultaneously, trust in the digital environment is relatively fragile and requires more attention to explore potential protective solutions. In this regard, issues of ethics, data ownership, misuse, and transparency should be a focus of future research (Behera et al., 2021).

5.5. Purple cluster—digital transformation of value-added processes in B2B environments

5.5.1. Digital actors

Digital transformation involves a larger number of actors, adding complexity to B2B creation and distribution processes (Corsaro & Maggioni, 2022). This situation calls for further research to advance the conceptual framework in varying ecosystem settings. Moreover, it would be interesting to define the interactions observed in digitally value-added processes, given the involvement of multiple actors. *To what extent can the adoption of digital technologies result in mutual benefits for firms?* The answer to this question might involve the analysis of non-financial performance measures of value generation (Ramos et al., 2023).

5.5.2. Digital resources

Future research offers an opportunity to explore the diverse applications and implications of AI technologies. A potential research question might focus on investigating the effectiveness of different types of AI (Rustholllkarhu et al., 2022) in the performance of specific tasks and decision-making processes across industries. Moreover, understanding the limitations and challenges associated with adopting AI in various organisational contexts can help pinpoint potential areas for improvement and develop strategies to address them (Leone et al., 2021). *Examining the ethical considerations and potential biases in AI algorithms could also be a crucial aspect of future research, ensuring that AI technologies are utilised responsibly and equitably.*

Another line of research could examine the impact of machine learning. Assessing the effects of machine learning algorithms on different business aspects, such as customer engagement, supply chain management, and sales strategies, can reveal the potential benefits and challenges of adopting this technology. Additional research questions might include: *What is the impact of using machine learning solutions in B2B firms on overall agility, competitiveness, and innovation, as compared to traditional decision-making processes? How does implementing machine learning influence human decision-making roles within the organisation?*

5.5.3. Digital activities

Based on the analysis conducted, we suggest exploring other value processes besides value creation and co-creation, such as value co-destruction (Jayashankar et al., 2020). The study's scope could be expanded by analysing the interactions between value-related processes (Corsaro & Anzivino, 2021), and considering the role of contextual factors in the culture of the firm or country (Keegan et al., 2022). For example, *which factors may be more effective in driving value-creation processes in emerging markets? What tensions are involved in capturing value in international collaborations?*

Future research should investigate the consequences of digital transformation and its impact on relationship management, key account management, and sales activities, including ethical perspectives (Rustholllkarhu et al., 2022). In this regard, it will be insightful to focus on the impact of AI technologies on the customer journey and value co-creation. For example, *how does integrating AI simplify the customer journey and enhance value co-creation in B2B interactions? What role does AI play in co-creating value when value destruction occurs?* Another research line could explore the impact of digital sales interactions on value creation and competitive advantage in B2B firms. *Specifically, how does adopting digital sales strategies contribute to enhancing competitive advantage, and how does it influence sales performance?*

Table 5 summarises the main topics discussed and main possible future avenues from the network perspective within each of the five clusters analysed in our review.

6. Conclusions

This paper presents an extensive analysis grounded in bibliometric analysis and a systematic literature review on digital transformation within the B2B context. Our study reveals a significant increase in digital research since 2020, compared to previous years. Through synthesising and analysing the literature from a network perspective, we performed a descriptive and thematic analysis, identifying five emerging themes. These themes comprise the challenges and opportunities of digital transformation, the impact of digitalisation on marketing and sales strategies, the dynamics of supplier-buyer relationships facilitated by digital technologies, the impact of digital servitisation, and the transformation of value-added processes. These insights offer not only a valuable understanding of the present state of digital transformation in the B2B sector but also suggest potential avenues for future research in this evolving area.

The present study contributes to three main areas of understanding of digital transformation in the B2B environment, as supported by the findings. First, our study engages in the ongoing debate on the implementation of digital technologies in the B2B environment. In contrast to earlier reviews that concentrate on particular digital technologies such as Industry 4.0, social media, or artificial intelligence, our study synthesises extant literature to provide a comprehensive understanding of the field, integrating multiple technologies. Emerging themes such as firm performance, marketing and sales activities, digital servitisation, supplier-buyer relationships and value-based processes are highlighted, thereby underscoring critical areas that are shaping state of the art.

Table 5
Main topics discussed and future research directions.

Cluster	Main topics	Exemplary references	Main possible future research avenues
Red Cluster	The impact of digital transformation on B2B firm performance	Foster, 2005 Hakola, 2013	How are network relationships changing with the involvement of digital actors? How does including additional digital technologies enhance our understanding of digital transformation and how it affects B2B performance?
	The challenges of digital transformation in the B2B sector	Day et al., 2003 Dehning et al., 2004 Zahoor et al., 2022	To what extent is the introduction of digital value transforming firms' activities?
Green Cluster	The transformation of marketing practices through the use of digital technologies	Drummond et al., 2020 Juntunen et al., 2020	How do salespeople effectively use digital technologies in B2B marketing and selling activities?
	Digital approach to B2B sales	Ancillai et al., 2019 Fraccastoro, Gabrielsson and Chetty, 2021a	To what extent do different digital technologies complement each other in a B2B stakeholder engagement strategy? How can the effectiveness of digital transformation be measured in terms of the performance it delivers?
Blue Cluster	Digital servitisation and its role in transforming B2B business processes	Pauli et al., 2021 Veile et al., 2022	How does digital platforms' dual role as actors and resources affect the network ecosystem?
	The dual role of digital platforms in the B2B context	Paiola et al., 2022 Veile et al., 2022 Peruchi et al., 2022	How can we develop a definition and classification of digital platforms to better understand their nature and evolution over time in B2B contexts? To what extent does the degree of digital transformation have an impact on the process of value co-creation and on the change of the business model?
Yellow Cluster	Impact of digital transformation on customer behaviour	Agnihotri et al., 2022 Crisafulli et al., 2022	How does the shift from supplier-led to buyer-led value creation in digital interactions influence customer behaviour and decision making in B2B relationships?
	B2B firms' strategic benefits from digital technologies	Behera et al., 2021 Kauffman & Pointer, 2022	How is the customer experience affected by digital customisation? What is the impact on transaction efficiency, network trust and overall performance of integrating digital technologies into buyer-seller relationships?
Purple Cluster	Complexity of value creation in the digital B2B context	Corsaro & Anzivino, 2021 Rusthollkarhu et al., 2022	How does including human-like technology agents affect individual-level B2B buyer-seller relationships?
	The impact of digital transformation on the value-related processes	Bharadwaj and Shipley, 2020a Taylor et al., 2020	To what extent are automation technologies and AI impacting B2B firms' value-added processes? How does digital transformation, particularly AI usage, simplify the B2B customer journey and contribute to the value co-creation process?

Secondly, the present study adopts a network perspective, utilising the A-R-A model as a conceptual framework to examine the impact of digital transformation on the B2B environment. This approach, rooted in the interconnected roles of actors, resources, and activities, has demonstrated how digital transformation introduces new actors within networks, expands the range of resources, and reconfigures operational processes, consequently enabling new forms of interactions. Our findings indicate the emergence of hybrid roles played by digital technologies that blur the lines between actors and resources. In light of these findings, a redefined A-R-A model has been proposed to reflect the evolving dynamics of actors, resources and activities driven by digital transformation. Finally, future research directions have been proposed to further advance the understanding of digital transformation in B2B contexts and contribute to the expanding body of literature in this field.

Like any literature review, this research has some limitations. First, a subjective element is inherent in conducting a literature review in terms of selecting publications, analysing and positioning articles, and interpreting clusters. Second, we acknowledge potential criticism of the thematic analysis and future research avenues. However, we emphasise that our analysis followed a transparent, systematic process, minimising selection bias. We further stress that digital transformation in the B2B context is still in its growth phase and might lack a defined strategic direction. Our study indicates that the interaction between digitalisation and the B2B industry opens several research paths for further investigation.

CRediT authorship contribution statement

Yuliia Kyrdoda: Writing – original draft, Writing – review & editing, Data curation. **Giacomo Marzi:** Writing – original draft, Methodology, Project administration, Formal analysis, Writing – review & editing, Supervision, Conceptualization. **Donata Vianelli:** Writing – original draft, Funding acquisition.

Declaration of competing interest

None.

Data availability

Data are available on request.

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