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Maria Petrescu
Embry-Riddle Aeronautical University, petrescm@erau.edu

Anjala S. Krishen
University of Nevada, Las Vegas

Sheen Kachen
University of Illinois at Chicago

John T. Gironda
Nova Southeastern University

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AI-based Innovation in B2B Marketing: An Interdisciplinary Framework Incorporating Academic and Practitioner Perspectives

1. Introduction

Artificial intelligence (AI) is disrupting marketing and global economic marketplaces and has become a source of value for a broad range of businesses (Ransbotham et al., 2019). AI influences human and business activities, changing how companies make strategic decisions by incorporating neural network computing and machine learning into decision-making processes. Recent highly cited research indicates that business researchers and practitioners are becoming increasingly interested in AI (Dwivedi et al., 2021a; Paschen, Kietzmann, & Kietzmann, 2019; Syam & Sharma, 2018; Wang, Xiong, & Olya, 2020). Past research emphasizes the benefits of AI for business-to-business (B2B) transactions, recognizing the potential of artificial neural networks to assist industrial marketers with market segmentation, sales, and promotional activities (Fish, Barnes, & Aiken, 1995). AI is both an opportunity and an obstacle for established and startup companies using big data and formulating new innovative strategies and business models, including in a B2B environment (Bergstein, 2019; Davenport et al., 2020; Grewal et al., 2020; Jabbar, Akhtar, & Dani, 2020).

AI has enabled firms to analyze big data better, make predictions, and innovate in business strategies and models (Duan, Edwards, & Dwivedi, 2019). Although the benefits and beneficiaries of the changes AI has wrought are yet unclear, it affects competitive dynamics, economic systems, and social relations (Bergstein, 2019; Brynjolfsson & McAfee, 2014; Stone et al., 2016). There are still many challenges to implementing AI, considering that only 37% of companies have incorporated it into their offers and processes, and less than 15% use AI-based capabilities in their work (Jovanović, 2021). Furthermore, many AI initiatives fail, and few businesses (sometimes below 50%) that invest in AI report significant business gains, especially in the early years (AIRS, 2020; Ransbotham et al., 2019).

Rather than focusing only on technology and products, there is an opportunity for marketing researchers to interrogate further AI relationships within a framework of B2B innovation (Davenport et al., 2020; Grewal et al., 2020; Huang & Rust, 2017; Lemon & Verhoef, 2016; Novak & Hoffman, 2019; Saura, Ribeiro-Soriano, & Palacios-Marqués, 2021). It is essential to understand how opportunities for innovation in the AI space can be utilized and how the risk that accompanies those innovations can be minimized in the context of reimagining AI-enabled business processes in a B2B environment (Paschen, Wilson, & Ferreira, 2020). Such research is fundamental as the fourth industrial revolution pushes the boundaries of digitization, machine learning, robotics, and AI (Syam & Sharma, 2018).

Researchers have emphasized the need to develop comprehensive frameworks in B2B marketing that can aid in the development of strategic roadmaps charting the complexities of new technologies, especially AI (de Jong et al., 2021; Jabbar, Akhtar, & Dani, 2020; Lilien, 2016; Lindgreen et al., 2021). Marketing researchers, primarily through the *Industrial Marketing Management* (*IMM*) journal, have contributed to advancing the literature on AI in a strategic context. While research on these topics is increasing, the academic literature remains fragmented, especially regarding AI's role in B2B marketing innovation. Therefore, there is a need for a more comprehensive and integrative framework regarding numerous aspects of AI-based innovation in B2B marketing, including governance, strategy, organizational policies, and control, as well as a need to incorporate various industries and functional areas (Wang, Xiong, & Olya, 2020).

Our objective is to close the gap between marketing theory and practice and develop a comprehensive framework that strategically uses AI's strengths for B2B marketing innovation. Therefore, we perform a comprehensive review and provide an integrative paradigm (e.g., MacInnis, 2011) on the management of AI-based innovations in B2B marketing. Our conceptual contributions are based on analyzing previous knowledge, synthesizing it, and revealing novel insights for the AI-related B2B literature. We first investigate AI applications and adoption challenges in a B2B environment to uncover critical areas of potential use of AI in B2B marketing innovation and co-creation. Next, we propose an integrative framework for using AI for B2B marketing innovation to lessen the gap between theory and practice. Finally, we formulate research questions for future studies on the use of AI for B2B marketing innovation and knowledge co-creation. For our theoretical framework, we draw from service-dominant logic (SDL) (Vargo & Lusch, 2017), transaction cost economics (TCE) (Williamson, 1998), and knowledge theory (Newell, 1982, 1993).

This paper takes a perspective anchored in marketing value and knowledge and contributes to existing work by investigating how B2B organizations innovate as they engage with new AI technologies. To help achieve this objective and develop our framework, we utilized a mixed-methods approach and conducted two studies. The first study involves a bibliometric analysis of AI in the B2B literature, designed to identify primary topics and their relationships. The subsequent study uses content analysis, conceptual mapping, and quantitative methods to examine top publicly traded B2B companies' annual reports and investigate their adoption of AI. Proceeding sections present an overview of AI in B2B marketing, two studies, a framework for AI-based innovation in B2B marketing, recommendations for research and practice, and concluding remarks.

2. Background: AI in B2B

While it is clear for B2B marketers that AI presents significant opportunities for knowledge and innovation, difficulties in understanding its meaning and operationalization for marketing processes and effective decision-making still exist (Paschen, Kietzmann, & Kietzmann, 2019; Syam & Sharma, 2018). Even the definitions and terms used to discuss AI are sometimes disjointed and confusing; therefore, we start by offering a short overview of the definition of AI.

2.1 Background and Definition of AI

Artificial intelligence refers to the theory and development of machine intelligence that replicates aspects of human intelligence. The characteristics of human intelligence that are replicated include visual perception, reasoning ability, problem-solving, learning from previous experience, communication, perception, and acting (Davenport et al., 2020; Dellaert, 2019; Huang & Rust, 2018; Russell & Norvig, 2016; Yadav & Pavlou, 2020). AI is dedicated to enabling the creation of intelligent machines. Intelligence empowers an entity to function appropriately and anticipate the conditions of its environment. Artificial intelligence is programmed to “self-learn” from data and make predictions and intelligent decisions based on automated machine learning, artificial neural networks, robotic process automation, and text mining (Wang, Xiong, & Olya, 2020).

AI originated as a branch of computer science synthesizing and studying the properties of intelligence. The AI revolution was enhanced by the maturation of machine learning and deep learning and by significant progress in hardware innovation. AI-related disciplines still struggle to create a universally accepted definition of AI (Davenport et al., 2020; Duan, Edwards, & Dwivedi, 2019; Stone et al., 2016).

Business research has investigated AI in various marketing contexts, including service systems, health care, hotels and restaurants, virtual bots, and other practical big data applications (Huang & Rust, 2018; Novak & Hoffman, 2019; Marinova et al., 2017; Ostrom et al., 2015). Cognitive computing, a form of input data-based deep learning AI that blends the best of human and machine learning, is a critical field of AI research with potential for development (Dwivedi et al., 2021a, 2019; Fingar, 2014; Marinova et al., 2017; Vargo and Lusch, 2017).

2.2 AI innovation and B2B functional areas

AI technology is useful in various domains, including manufacturing, robotics, and supply chain management (Dwivedi et al., 2021b, 2019). Artificial intelligence can be a source of competitive advantage, helping B2B organizations enhance business operations and transform big data into insight and knowledge to develop effective marketing strategies (Farrokhi, Shirazi, Hajli, & Tajvidi, 2020; Tarafdar, Beath, & Ross, 2019). Researchers call for more adoption of new technologies in the innovation process in the context of functional power structures, limited marketing resources, and time pressure (de Jong et al., 2021; Lilien, 2016).

As AI applications become more available and applicable to business markets, a comprehensive theoretical framework is necessary to understand how these tools can be utilized in the B2B realm (de Jong et al., 2021). Expectations regarding the effects of AI use are high across various industry sectors, and most businesses estimate that usage will have sizable effects on major functional areas in their organizations (Jovanović, 2021). Therefore, we focus on identifying the critical areas of AI’s potential use in B2B marketing innovation to formulate an integrative paradigm and propose future research directions.

3. Theoretical framework

Figure 1 shows our theoretical perspective anchored in marketing value and knowledge and grounded in SDL (Bocconcelli et al., 2020; Caridà, Edvardsson, & Colurcio, 2019; Hartwig, von Saldern, & Jacob, 2021; Hollebeek, 2019; Vargo & Lusch, 2017), TCE (Habib et al., 2020; Kang & Jindal, 2015; Trada & Goyal, 2020; Williamson, 1998), and knowledge theory (Abubakar et al., 2019; Cortez & Johnston, 2017; Dwivedi et al., 2011; Newell, 1982, 1993; Paschen, Kietzmann, & Kietzmann, 2019). We use a knowledge management perspective, which can improve an organization's competitive advantage and contribute to its bottom-line, allowing organizations to adapt to a dynamic marketplace and form business relationships (Bag et al., 2021; Dwivedi et al., 2011). Structural, cultural, and technological factors such as AI help manage knowledge processes, especially in B2B relationships, where technology can enhance mutual learning and communication (Abubakar et al., 2019; Cortez & Johnston, 2017; Paschen, Kietzmann, & Kietzmann, 2019). Modern paradigms present difficulties for organizations in sharing internal and external knowledge among actors to create value, particularly considering the large amounts of information available and challenges in data protection (Ritala & Stefan, 2021).

(Figure 1 about here)

Within the context of knowledge sharing and collaborative relationships as resources, we integrate SDL throughout our theoretical framework, as shown in Figure 1. Effective resource integration uses modern technologies and leads to innovation through matching, resourcing, and valuing service ecosystem actors via summative and emergent processes (Bocconcelli et al., 2020; Caridà, Edvardsson, & Colurcio, 2019). The use of SDL in a B2B context is especially timely, considering its potential application in Industry 4.0. In a technology-mediated digital environment and with relatively few studies in an industrial setting, studying SDL as it relates to B2B environments is opportune (Hartwig, von Saldern, & Jacob, 2021; Hollebeek, 2019).

Our theoretical lens is further explained by TCE, which discusses aspects related to business-to-business contracting, monitoring, and enforcement costs of conducting exchange activities (Williamson, 1998). TCE focuses on the risks of opportunism in B2B relations and the effects of asset (resource and relationship) specificity, as well as behavioral and environmental uncertainty (Kang & Jindal, 2015; Trada & Goyal, 2020). Effective communications help directly reduce opportunism in B2B relationships and weaken its effects on relationship performance (Trada & Goyal, 2020). As such, it is imperative to consider interfirm economic and sociological governance relationships (Shahzad et al., 2018). We use TCE to explain short-term, opportunistic relationships where actors must rely on transactional forms of governance (Habib et al., 2020), as integrated into the theoretical framework presented in Figure 1.

4. Research Methodology

To formulate an integrative framework regarding AI-based innovation in B2B marketing, we use a mixed-methods approach based on bibliometric analysis and quantitative and qualitative data of top B2B brands' annual statements. We begin with a bibliometric analysis of research articles discussing AI in a B2B context that we evaluate through social network analysis and conceptual mapping. We then evaluate the top Fortune 1000 publicly traded B2B companies' annual reports to assess their focus on AI with content analysis, conceptual mapping, and quantitative analysis.

4.1. Study 1: Bibliometric analysis

B2B publications in top marketing journals remain scarce and tend to appear in specialized journals, such as *Industrial Marketing Management* (Lilien, 2016; Reid & Plank, 2000). Using bibliometric analysis, we identify essential topics and network relationships that academics and practitioners emphasize in this field of research (Ferreira, 2018; Ferreira et al., 2016; Kapoor, Dwivedi, & Williams, 2014). To begin, we downloaded articles from Web of Science (WoS) related to AI and B2B topics and keywords. We refined the results to include only peer-reviewed academic journals on established research ranking lists such as ABS and ABDC or Q1-3 in the Scimago Journal Rank (i.e., https://www.scimagojr.com/) for journals not included on business lists. We manually checked the articles' titles and keywords to ensure no error-based inclusion occurred due to algorithm and keyword bias. Manual checking reduced the list of articles used in the bibliometric analysis to 73. Appendix Table A1 provides a list of the articles. The data file used for the bibliometric analysis included the full record for each article with author name, publication year, title, journal name, list of studies referenced, number of citations, discipline, keywords, and abstract. We performed network analysis and created bibliometric maps of citations using VOSviewer. The network visualization of keyword co-occurrence presented in Figure 2 and Table 1 is based on the number of co-occurrence links between terms (Van Eck & Waltman, 2010) and shows the characteristics of research on AI in a B2B context.

(Figure 2 and Table 1 about here)

Table 1 quantitatively presents three main clusters of topics discussed, namely, (1) performance, (2) innovation, and (3) focus on technology (Farrokhi, Shirazi, Hajli, & Tajvidi, 2020; Paschen, Kietzmann, & Kietzmann, 2019). The total link strength attribute indicates the normalized total strength of the co-occurrence links of a given keyword with the other terms included in the analysis (Van Eck & Waltman, 2010). Results emphasize the various capabilities of AI-based innovation from a functional perspective.

In the second part of the bibliometrics analysis, we focused on creating a map of the co-citation network based on articles' sources, indicating the relatedness of journals in co-citation links, as presented in Figure 3 and Table 2. As the results show, four categories of journals focus on AI in a B2B context. First, there are journals more oriented towards technology and quantitative research, focusing on marketing models, machine learning, and neural networks. Other journals focus on marketing and operational strategies. Another cluster focuses more on B2B relationships and innovation in the field, with more specialized journals led by *Industrial Marketing Management.* The last cluster is pioneered by the *Journal of Personal Selling and Sales Management* and highlights the use of AI in personalized communication and forecasting sales.

(Figure 3 and Table 2 about here)

Finally, we performed a lexical co-occurrence content analysis using Leximancer on the full text of the 73 WoS articles to obtain more insights about the AI concepts and themes reflected in the bibliometric analysis. Leximancer extracts a three-level network model of meaning from data; it is entirely data-driven and offers the combined benefits of deep learning and user control (Krishen et al., 2014; Smith & Humphreys, 2006; Wilden et al., 2017). Leximancer uses a Bayesian learning algorithm and machine learning to derive concepts and themes (Krishen, Agarwal, & Kachroo, 2016; Kunz, Heinonen, & Lemmink, 2019). Its clustering algorithm extends the latent Dirichlet allocation (LDA) approach by including two stages of nonlinear machine learning to statistically extract strong semantic patterns and overlap between clusters (Wilden et al., 2017; Wilk, Soutar, & Harrigan, 2019). The conceptual map represents a graphical overview of the material with the text's central concepts and relationships.

The size of the concepts is a function of their prominence relative to the others (Krishen, Berezan, & Raab, 2019; Smith, 2007; Smith & Humphreys, 2006). The lines connecting the concepts indicate the semantic proximity of the concepts and represent the joint probability divided by the product of the marginal probabilities, combining strength and frequency scores with Bayesian statistics. The prominence scores included in Table 3 are absolute measures of correlation between concept categories and attributes. A score of >1.0 indicates a purposeful relationship (Smith, 2007; Smith & Humphreys, 2006).

(Figure 4 and Table 3 about here)

In the conceptual mapping analysis results, some of the previously emphasized themes in the bibliometric analysis, like the importance of technology, marketing, and information, reoccur. Aspects of governance and strategy are again reflected, focusing on data, models, processes, actors (buyer, customer), and service.

As described in the analyses above, Study 1 contains three separate analyses that evaluate AI adoption and B2B relationships in academic research. Figures 2, 3, and 4 of our paper illustrate the bibliometric analyses conducted on data drawn from WoS academic articles. The distinction between the three figures is as follows; Figure 2 depicts relationships between keywords and clusters using VOSviewer, Figure 3 shows relationships between sources using VOSviewer, and Figure 4 provides a conceptual mapping of related themes in the academic literature using Leximancer, as summarized in Table 5.

Figure 2 and Table 1 identify performance, innovation, and technology as the leading clusters in the bibliometric keyword analysis. Tending to emphasize functionality and strategy, the most salient relationship presented in Figure 2 appears between technology-related terms, including machine learning, big data, and others. Similarly, strong relationships appear between management and knowledge and AI and knowledge, though these keywords are not as strongly linked to their cluster as is machine learning to technology. Figure 3 shows the prominence of one journal as a clear and uncontested leader in this field of research: *Industrial Marketing Management.* While Figures 2 and 3, corresponding to Tables 1 and 2, used VOSviewer as an analysis method, we used Leximancer to conduct additional analysis on the WoS data, as illustrated in Figure 4.

Three sets of analysis (citation networks, co-citation networks, and concept mapping) indicate that B2B innovation and knowledge is prominent in the academic literature. Some of the most highly cited articles contained in our bibliometric analysis, Bohanec, Borštnar, & Robnik-Šikonja (2017), Paschen, Kietzmann, & Kietzmann (2019), and Paschen et al. (2019) (citation counts of 104, 111, and 92, respectively, as of February 14, 2022), all of which were written in the past five years, reference the importance of models, knowledge, technology, and learning as related to AI. The second key theme in the academic literature centers on innovation within firms as an investment in their actors or agents and is present in the research of Gordini and Veglio (2017), Wu and Sun (2002), and Backhaus et al. (2010) (citation counts of 110, 48, and 31, respectively, as of February 14, 2022). B2B actors and agents, as part of a firm's investment in innovation, lead the customer retention, recommendation, and co-creation effort. The highly cited research of Kumar et al. (2004) and Kamp et al. (2017) (citation counts of 90 and 77, respectively, as of February 14, 2022) discusses negotiating service contracts and servitization in user-supplier relationships as essential exchanges in the AI innovation process. Our findings indicate that technology, a key environmental resource, is the third central theme in the academic literature. This theme is most present in the highly cited work of Jagdev et al. (2008) and Reyes-Moro et al. (2003) (citation counts of 42 and 38, respectively, as of February 14, 2022).

We also include a timeline representation of the evolution of research on AI in B2B based on the publication year of the articles we analyzed. As Figure 5 shows, the research on our topic of interest has drastically evolved in the last several years, explaining the relatively low number of high-quality, peer-reviewed articles available for inclusion in this study. Considering the objectives of this paper, we further explore findings in our bibliometric analysis by evaluating corporate practices regarding AI.

(Figure 5 about here)

4.2. Study 2: Analysis of B2B corporate communications

This second study evaluates the top publicly traded B2B companies' annual reports to explore their focus on AI using content analysis, conceptual mapping, and quantitative analysis. Research finds that AI expectations are high across industries, company sizes, and geography, hence we focus on a group of diverse companies. In 2020, we downloaded annual statements from 2019 for 71 Fortune 1000 publicly traded B2B companies in aerospace, engineering, services, and materials (information for the companies is included in the second table in the Appendix; the statements consisted of a total of 7,749 pages). We included all companies present on the Fortune 1000 list from these industries to provide a heterogeneous sample and eliminate bias potential. As a continuation of the findings from Study 1, and based on previous literature, we read annual statements and coded them by their context–functional area mentioning AI. In this process, we considered that businesses expect sizable effects of AI on information technology, operations/manufacturing, supply chain management, and customer-facing activities. We then used content analysis in Leximancer to identify main topics in the annual statements, as shown in Figure 6 and Table 4.

(Figure 6 and Table 4 about here)

Study 2 results underline the importance of knowledge, learning, capabilities, and solutions for AI in B2B. The companies' annual statements focused on AI are related to their ability to implement AI and use it for knowledge creation in multiple functional areas. Following this coding, our semantic content analysis of the relevant portions of the 7,749 pages of annual reports of top corporations revealed knowledge, investment, overcoming opacity, and AI capabilities as the themes present in the AI-related mentions.

While Study 1 drew data from WoS, Study 2 utilized data from B2B annual reports to conduct a bibliometric analysis. Thus, as we previously discussed, the noticeable and significant difference between Studies 1 and 2 is that, while Study 1 regards academic sources, Study 2 analyzes sources derived only from business practitioners as disclosed in annual reporting. Figure 6 uses data drawn from B2B annual reports and statements to map concepts and themes. The nine emergent themes produced from the bibliometric analysis are: knowledge, learning, technology, computer, business, investment, opacity, capabilities, and artificial. Each of these themes arose from several important concepts, as illustrated by the concepts intelligence and science inside the theme, artificial, and the concepts analytics and data inside the theme, learning. Our initial coding of corporate annual statements in Study 2 identified AI as a key discussion component of several highly ranked corporations. The highest number of mentions for AI was present in the statements of Parsons, Verisk Analytics, ASGN, Zebra Technologies, General Dynamics, Maxar Technologies, Robert Half International, and Fidelity National Information Services. These companies represent a large cross-section of the aerospace, services, industrials, and engineering industries. Among these, Parsons, Verisk Analytics, and ASGN mentioned AI fourteen, ten, and ten times, respectively (see Appendix Table A2). Strategic implementation of technology and analytics is an essential component of business across all three of these firms. While Parsons specializes in defense, Verisk in data analytics, and ASGN in industrials, each firm prioritizes the pursuit of rigorous research and development in the AI space. The most significant similarity between these firms, aside from market capitalization, revenue, and size, is their pursuit of technological advancement. The Fortune 1000 firms in our analysis operate in engineering, service, materials, or aerospace industries, with Parsons composing the most highly cited group.

5. Discussion: A framework of AI in B2B marketing innovation

The results of Study 1 and 2 emphasize both a research and practice interest in the implementation and exploitation of AI in different functional areas of the B2B environment. Our findings indicate that academic and practitioner insights on AI innovation collectively form the elements of a marketing ecosystem framework. In the academic literature we analyzed, Study 1 highlights the importance of performance, innovation, technology, and relationships with B2B actors. These themes are also present in the firm-specific annual statements from Study 2, where knowledge ties to learning and technology, innovation links with business and investment, environment includes opacity, tech, and computer, and communication is present in capacities and AI. Table 5 summarizes the key themes and clusters extracted in our analyses, in relation to our theoretical framework, based on an ecosystems view of innovation and knowledge co-creation that combines SDL (Vargo & Lusch, 2017), TCE (Williamson, 1998), and knowledge theory (Newell, 1982, 1993).

(Table 5 about here)

The use and implementation of AI technologies within B2B organizations are part of a critical set of digital marketing capabilities (Krishen et al., 2021). In addition to being challenged with handling big data and positive customer reviews, AI and machine learning represent the third-largest capabilities gap for B2B firms (Herhausen, Miocevic, Morgan, & Kleijnen, 2020). If obstructed with business model modifications, three different types of barriers (confidence, mixing, and collaboration) can increase revenue generated by digital offerings such as AI. B2B organizations must (1) match customer needs with digital offerings, (2) advance from descriptive to prescriptive analytics, and (3) build ecosystems for storing, analyzing, and combining data to produce data-driven solutions (Gebauer et al., 2020). From a sociological and experiential consumer context, Puntoni, Reczek, Giesler, and Botti (2021) identify both positive and negative effects of AI capabilities like listening (served vs. exploited), predicting (understood vs. misunderstood), producing (empowered vs. replaced), and interacting (connected vs. alienated). In the context of big data, Elia, Polimeno, Solazzo, and Passiante (2020) classify value as informational, transactional, transformational, strategic, and infrastructural. In line with this sociological framework, Makarius, Mukherjee, Fox, and Fox (2020) identify two functionalities of AI, content changing and context changing. For content-changing AI, the novelty or innovativeness of AI varies between individuals as controlling, collaborating, or checking. For context-changing AI, individuals serve as conductors, co-creators, and comprehenders.

However, an aspect that repeatedly surfaces in both the bibliometric results and the analysis of annual statements is the lack of structure and governance when using AI to generate knowledge and build innovation. While there are numerous mentions of the components of governance frameworks and business ecosystems, including actors, resources, service, agents, environment, and process, there is an apparent lack of structure. AI governance frameworks can help businesses learn, manage, monitor, and internalize AI adoption (Davenport et al., 2020; Dwivedi et al., 2021a; Grewal et al., 2020).

Considering the insights from the analysis of research and practice documents and previous literature, we propose an integrative framework of AI-based innovation in B2B marketing. Based on the elements discovered in our methodology section, we draw from our theoretical foundation - SDL (Vargo & Lusch, 2017), TCE (Williamson, 1998), and knowledge theory (Newell, 1982, 1993), to propose the framework in Figure 1 and Table 5 and provide recommendations. Considering the difficulties in managing AI for B2B marketing innovation and the need for a collaborative approach between human resources, technology, and business organizations (Duan et al., 2019; Dwivedi et al., 2021b; Wang, Xiong, & Olya, 2020), our model proposes a co-creation-based approach in the B2B marketing ecosystem. This framework can consider all problematic elements emphasized by researchers and practitioners.

Research has studied AI agents and actors, as shown in our results; however, this has not been done in a structured, systematic manner (Farrokhi, Shirazi, Hajli, & Tajvidi, 2020). As reflected in our analysis, concerns about relationships within organizations and among B2B partners proliferate. Nonetheless, in the form of agents, software, and hardware, AI technologies and machines appear in results and are also reflected in theoretical discussions related to the marketing ecosystem in SDL (Vargo & Lusch, 2017). Thus, we must consider technology and machines similar to individuals and organizations as essential actors in an ecosystem. This logic transfers into the resources section of the ecosystem, wherein the SDL logic, both operant and operand resources should co-exist for more effective implementation, acceptance, and innovation potential of AI in B2B transactions.

Exchange is the critical activity in the three theoretical frameworks we are using, whether we are focusing on transactional exchange in TCE (Williamson, 1998), value exchange or co-creation (Vargo & Lusch, 2017), or knowledge sharing (Newell, 1982, 1993). In this framework, we focus both on service and intelligence exchange, in addition to updates that reflect the potential of AI for exploiting the benefits of big data and extracting valuable intelligence (Chen, Chiang, & Storey, 2012; Vargo & Lusch, 2017).

Perhaps the most critical aspect in the proposed framework, the governance, or institutions part of the ecosystem, demonstrates the contemporary situation of modern, AI-based economies. Our analysis results still reflect some governance problems in implementing AI. These problems are generated by traditional transactional issues, including conflict, mutuality problems, and a lack of order and structure in drawing knowledge and innovating with AI. Considering these aspects, interactions and relationships based on mutuality and knowledge co-creation can enhance AI's adoption and generate marketing innovation in the B2B ecosystem.

The knowledge level is essential to consider in the B2B-AI framework; it represents the nature of knowledge as the medium of a system-level and is commonly used in practice by the computer science community when discussing AI (Newell, 1982, 1993). AI is measured in terms of ideal performance termed rationality, rather than similarity to human behavior (Paschen, Kietzmann, & Kietzmann, 2019; Russell and Norvig, 2016). Given the characteristics of bounded rationality, including limited information, unforeseen circumstances, and cognitive capabilities, one can draw parallels with bounded rationality and AI (Simon, 1985, 1996; Williamson, 1998). In the context of AI, perfect rationality is considered the possible upper bound of performance of any possible system based on how a perfectly rational system would act (Farrokhi, Shirazi, Hajli, & Tajvidi, 2020).

6. Implications, Limitations, and Future Research

For AI to be effectively used to innovate in a B2B marketing context, a systematic framework of analysis, implementation, and governance of resources and capabilities must occur (Duan et al., 2019; Dwivedi et al., 2021b).

6.1 *Implications for research*

Marketing research focused on AI in a B2B context must include integrative studies that consider AI in an organization's complex marketing ecosystem, moving beyond only discipline-specific fragmented research. Also, while the technical aspects of AI in business seem to be well represented, as shown by the diversity of IT and MIS-oriented journals present in our analysis, a broader theoretical marketing-based view on AI can contribute to the additional development of innovation in marketing (e.g., Krishen et al., 2021). Nevertheless, how AI is implemented and successful in B2B functional areas seems important for practitioners but is under-researched in academia. Clarifying the role of AI as an innovation enhancer, knowledge co-creator, and rationality facilitator can contribute to marketing theory and practice.

Table 6 presents our final contribution and theoretical and managerial research questions based on the themes and clusters we identified in both academic and practitioner AI innovation-based literature. As a combination of human knowledge creators with bounded rationality and AI-based agents with computational rationality, knowledge creation and B2B actors are vital components of this framework (Bag, Gupta, Kumar, & Sivarajah, 2021). A transparent use and integration of environmental and corporate resources combined with service and intelligence exchange can ultimately lead to a governing ability to co-create mutually beneficial AI innovations.

6.2 Implications for practice

Based on the integrative framework that we propose, practitioners can easily manage some obstructions mentioned in annual statements, including performance, processes, agents, and business models. Using an ecosystems approach and basing their strategy on intelligence co-creation and knowledge sharing, they can generate further innovation for all B2B ecosystem members and formulate more effective governance structures.

6.3 Limitations and future research

The limitations of our framework and findings provide direction for future studies. One main limitation of our findings centers on the selection of articles represented in our first study. Whereas 73 journal articles are somewhat representative of the AI-based B2B innovation literature, many other specialty journals were not present in our analysis due to our chosen inclusion framework of highly ranked journals. Future bibliometric analysis on B2B AI-based innovation can include specialty journals across a wider breadth of disciplines to enhance our findings (e.g., analytics journals). A second inherent limitation of our first study, derived from the bibliometric tool utilized, is that the focus of such tools is more on the social networks of academic research and less on theories and frameworks (Paul & Criado, 2020). As such, we augmented the VOSViewer analysis with a semantic content analysis tool to supplement our findings. However, a potential limitation of our semantic analysis is that the tool we utilized (Leximancer) identifies key themes and concept connections through an unguided methodology for both Studies 1 and 2. Future research could hand code the abstracts from the key articles we identified (Study 1) and relevant portions of the corporate annual reports (Study 2) to uncover theme-based connections and enhance the taxonomy and framework we propose.

7. Conclusions and Contributions

The adoption of AI and encouragement of innovation surrounding nascent technologies in B2B operations and platforms represents the transformative nature of marketing and business environments. This paper uses data from both academic and business contexts to study ideas around AI. One of our primary intellectual contributions to this field of research is identifying the focal ideas and presenting the B2B marketing ecosystem for the AI innovation framework. We mapped the relationships between the bibliometric analyses conducted, their data source, the figure corresponding to them, our mode of analysis, and the primary themes they linked within the data (see Table 5). Our findings indicate that academic and practitioner insights on AI innovation collectively form the elements of a marketing ecosystem framework.

Our contributions are based on three main areas of our work. First, we investigated AI applications and adoption challenges in B2B settings and emphasized the importance of themes such as performance, innovation, marketing and technology, service solutions, and value co-creation. Second, we formulated an integrative framework related to AI-based innovation in B2B marketing to help close the gap between theory and practice. In this regard, we identified and integrated critical elements for implementing AI, based on an ecosystems theoretical structure that incorporated knowledge theory, SDL, and TCE. We emphasized the role of AI as an innovation enhancer, knowledge co-creator, and rationality facilitator. Finally, we formulated theoretical and managerial research questions that will be helpful for future studies and in the advancement of the literature on AI in the B2B marketing ecosystem (see Table 6).

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Figure 1: Framework for Use of AI in B2B Marketing Innovation

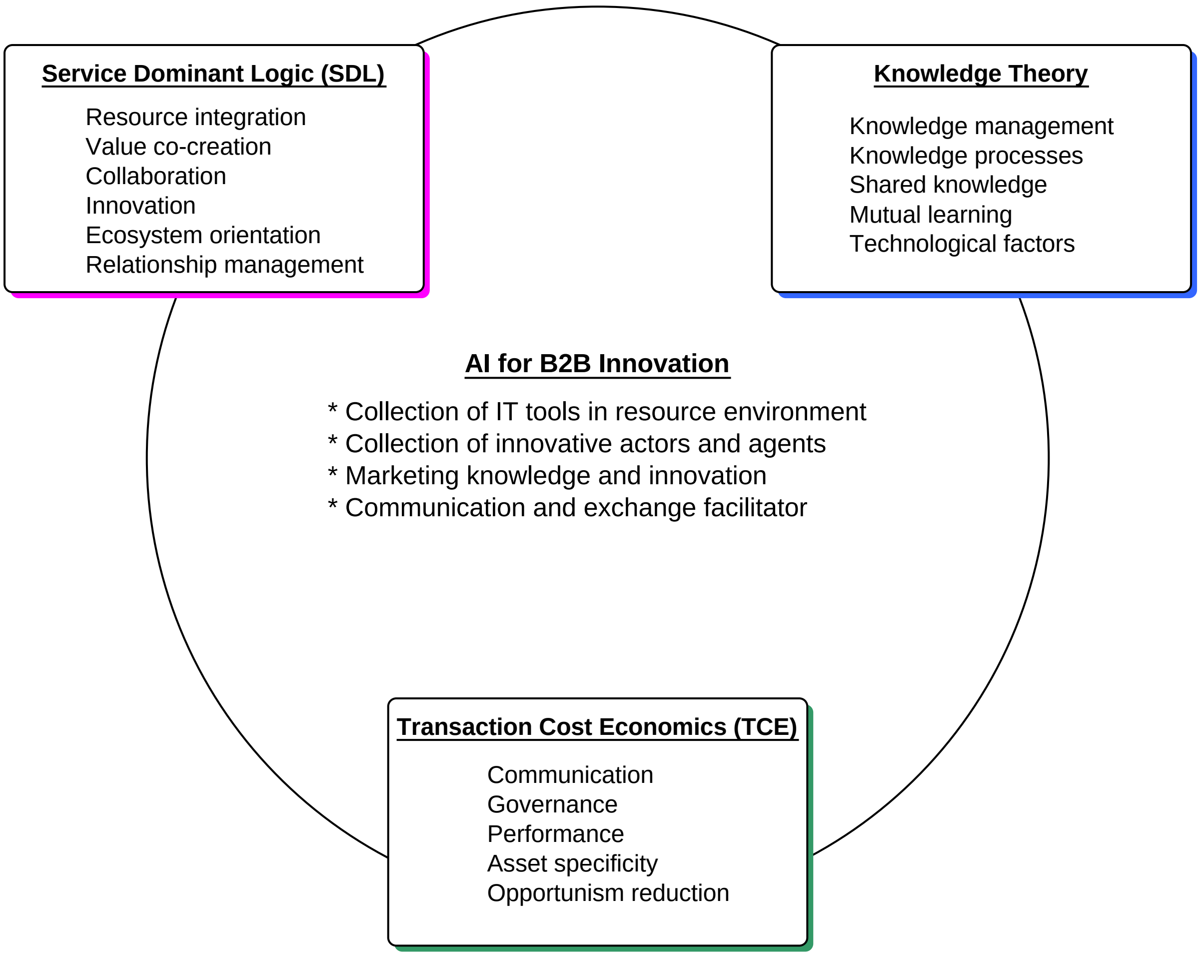

Figure 2: Keyword co-occurrence results

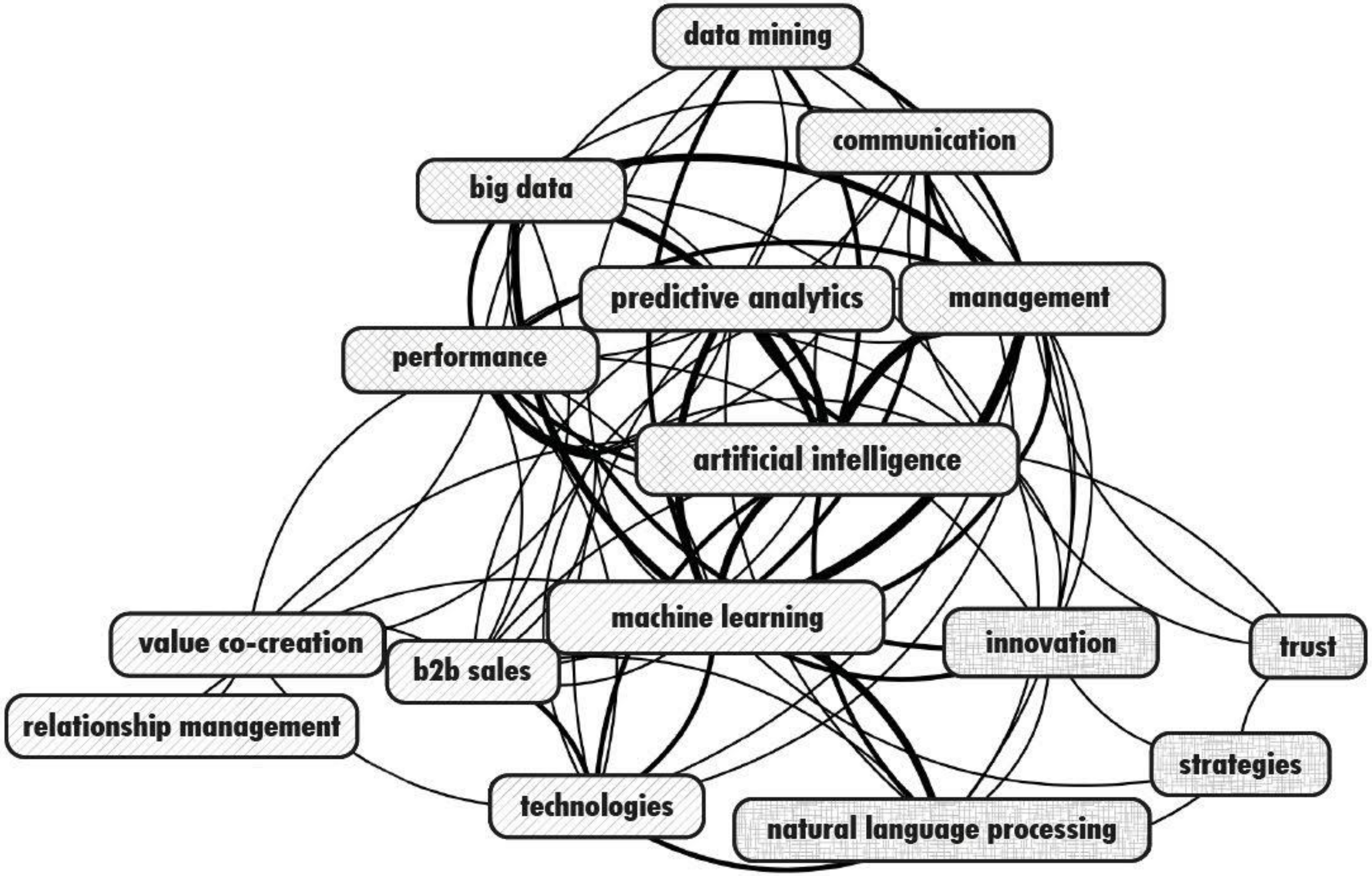

Figure 3: Source co-citation results

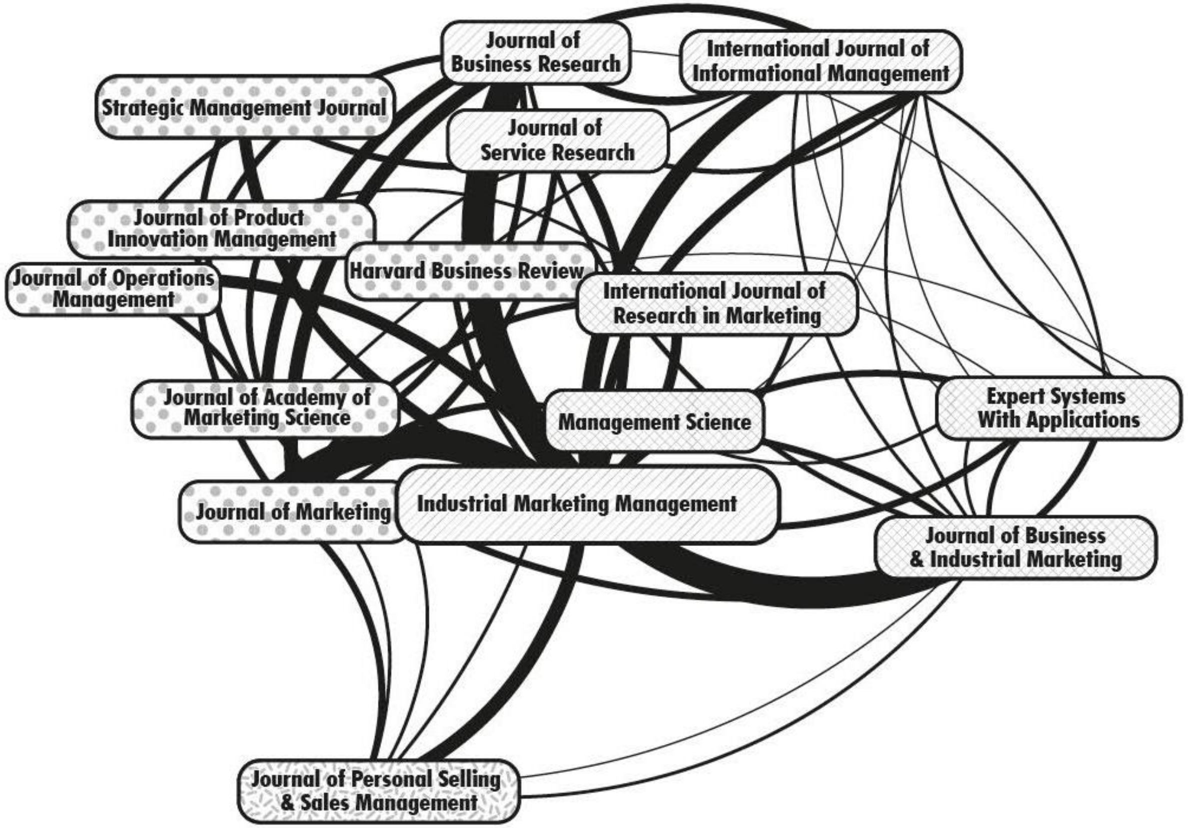

Figure 4: Conceptual mapping analysis

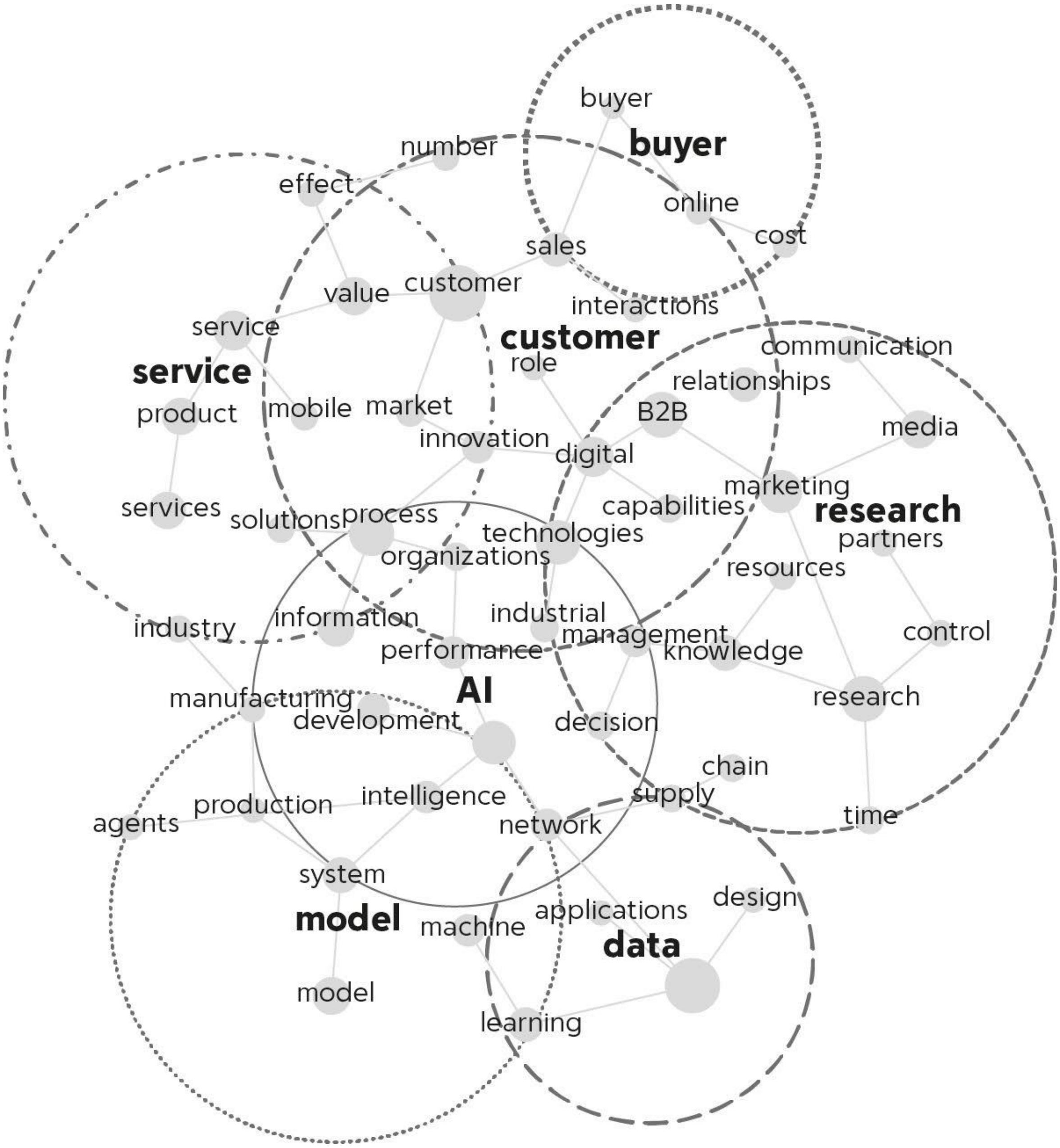

Figure 5: Timeline publications

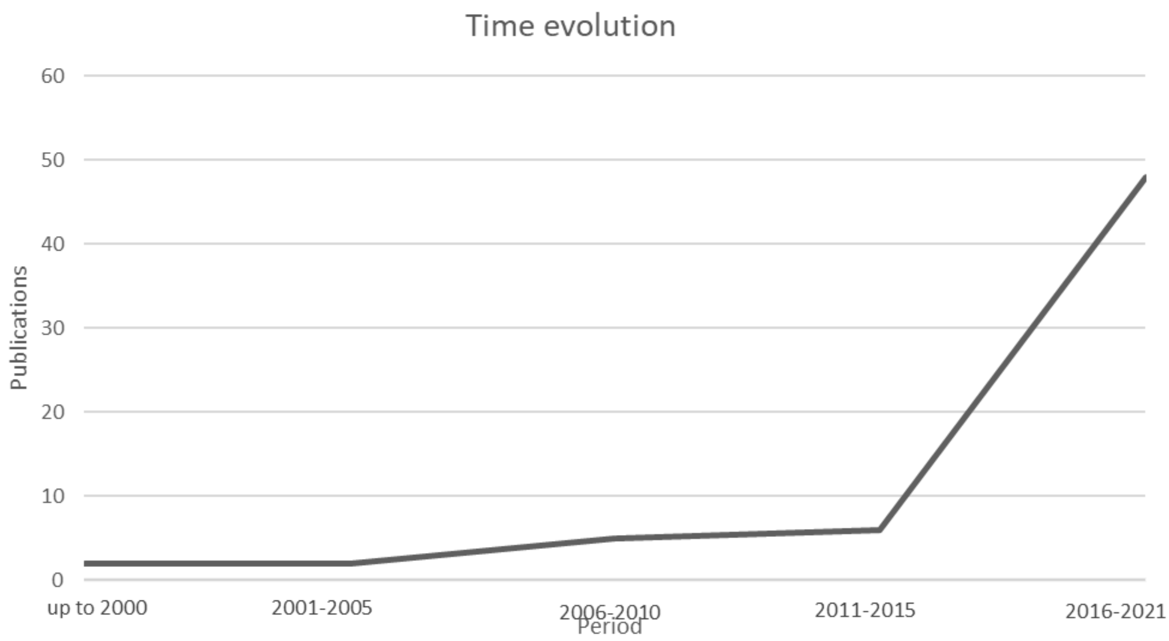

Figure 6: Conceptual mapping analysis annual statements

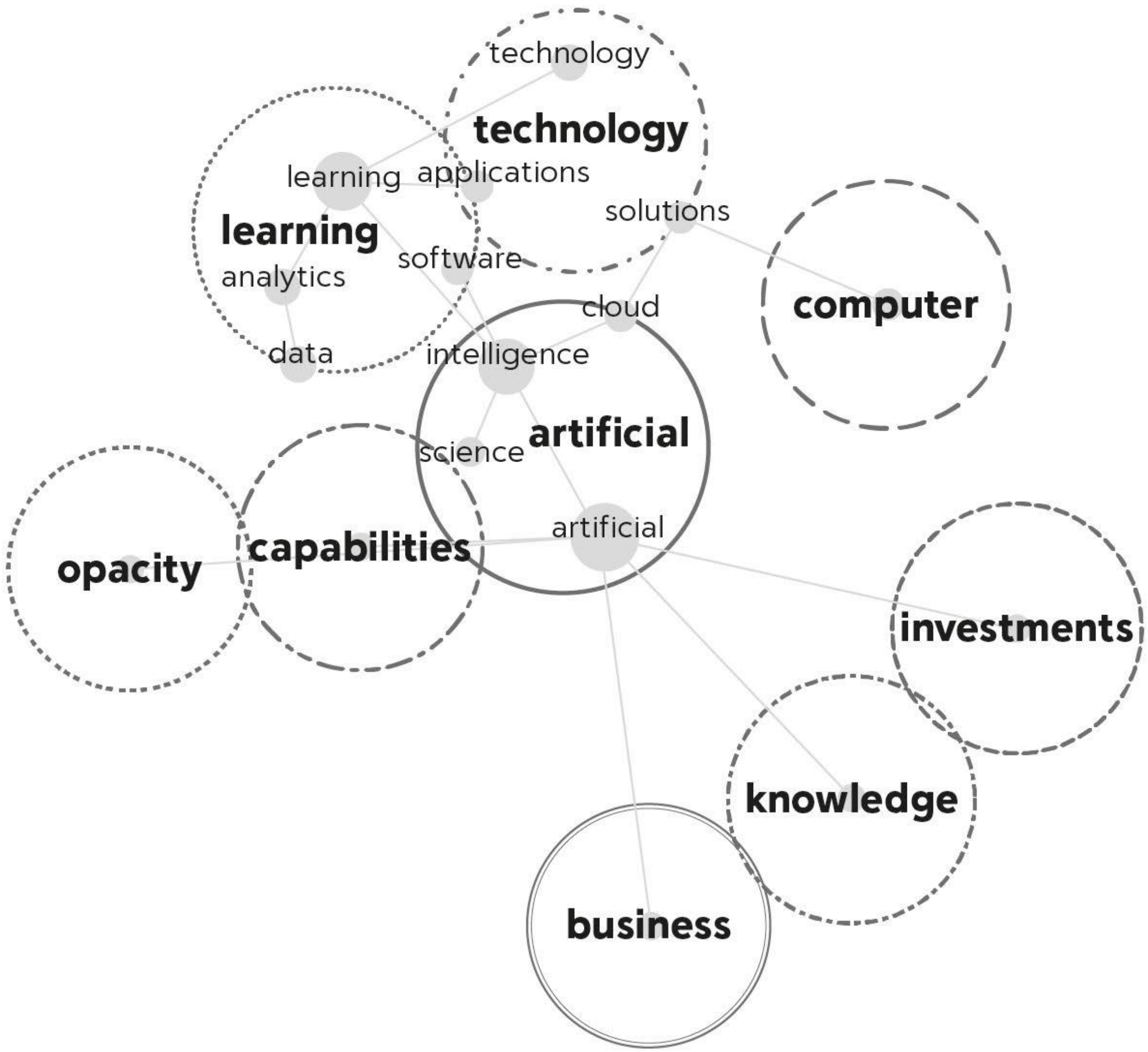

Table 1: Keyword co-occurrence results

Keyword	Cluster	Link strength	Norm. citations
artificial intelligence	Performance	29.00	2.28
big data	Performance	18.00	2.74
communication	Performance	12.00	0.27
data mining	Performance	12.00	0.82
management	Performance	25.00	1.51
performance	Performance	19.00	0.60
predictive analytics	Performance	17.00	1.49
social media	Performance	17.00	1.04
innovation	Innovation	10.00	1.70
knowledge	Innovation	19.00	3.20
natural language processing	Innovation	13.00	3.39
strategies	Innovation	4.00	1.32
trust	Innovation	4.00	1.18
B2B sales	Technology	11.00	1.67
machine learning	Technology	31.00	1.48
relationship management	Technology	2.00	0.25
technologies	Technology	14.00	3.00
value co-creation	Technology	7.00	4.55

Table 2: Source co-citation results

Journal	Citations	Link strength	Cluster
Industrial Marketing Management	266	7986	Innovation
Journal of Marketing	135	4893	Strategy
Journal of the Academy of Marketing Science	64	3068	Strategy
Journal of Business Research	59	3069	Innovation
Journal of Marketing Research	54	2045	Strategy
Journal of Business and Industrial Marketing	52	2102	Technology
Expert Systems Applications	45	749	Technology
Journal of Personal Selling and Sales Management	38	1158	Sales
European Journal of Operations Research	35	808	Technology
International Journal of Information Management	33	1566	Innovation
Strategic Management Journal	33	1287	Strategy
Decision Support Systems	32	829	Technology
Journal of Service Research	30	1223	Innovation
Management Science	30	950	Technology
Harvard Business Review	28	715	Strategy
International Journal of Research in Marketing	27	1130	Technology
Business Horizons	24	627	Technology
Journal of Production Innovation Management	24	1264	Strategy
Marketing Science	23	754	Technology
Journal of Operations Management	21	1164	Strategy
Journal of Retailing and Consumer Services	21	1257	Innovation

Table 3: Concept prominence scores for AI studies

concept	data	customer	research	AI	service	model
customer	1.012					
research	1.270	0.925				
AI	1.498	1.343	1.344			
service	0.701	2.398	0.606	0.748		
model	1.374	0.647	1.204	1.109	0.622	
buyer	0.683	1.242	0.964	0.243	0.893	0.533

Table 4: Concept prominence annual statements

concept	artificial	learning	technology	capabilities	opacity	computer	knowledge	investments
learning	2.220							
technology	2.220	2.442						
capabilities	2.220	3.192	1.672					
opacity	2.220	2.619	0.000	0.000				
computer	2.220	0.982	0.000	0.000	0.000			
knowledge	2.220	0.982	0.000	0.000	0.000	0.000		
investments	2.220	0.982	0.000	0.000	0.000	0.000	0.000	
business	2.220	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 5: Matrix of Themes from Studies 1 and 2

Study	Data Source	Analysis	Figure	Themes/ Clusters	B2B Marketing Ecosystem
1	Web of Science (WOS) Data	VOSViewer	2	Performance, Innovation, Technology	knowledge, TCE, co-creation
			3	Technology, Strategy, Innovation, Sales	knowledge, resources
		Leximancer	4	AI, service, customer, buyer, research, model, data	co-creation, service, actors, resources
2	B2B Annual Report Data	Leximancer	6	Business, Investments, Opacity, Knowledge, Learning, Tech, Computer, Capability, Artificial	knowledge, resources, asset specificity, co-creation

Table 6: Proposed Theoretical and Managerial Research Questions across Themes

Theoretical Framework*	Main Theme	Theoretical and Managerial Questions
Knowledge, SDL	AI as a B2B marketing knowledge and innovation enhancer	How does AI enhance knowledge in the B2B marketing ecosystem? Which are the critical areas of potential use of AI in B2B marketing innovation and value co-creation? How can AI improve the internal knowledge creation process in various functional units? What aspects influence the ability to implement and use AI for knowledge creation in multiple organizational function units?
TCE, SDL	AI as a B2B collection of innovative actors and agents	How do B2B actors interact in the AI-based innovation creation process? What are the roles of B2B partners in AI implementation? What are the potential costs (e.g. opportunism) and benefits (e.g. cooptition) associated with B2B partnering during AI implementation?
SDL	AI as a collection of information technology and tools within the resource environment	Which type of AI is the most effective in enhancing innovation? Which AI tools are more relevant for B2B marketing practitioners? What are the most efficient and effective analytics for assessing the efficacy of AI tools for B2B corporations?
SDL, TCE, Knowledge	AI as a communication and exchange facilitator	How can AI contribute to the integration of different types of rationality in the innovation process? Which aspects related to governance and strategy that can be further developed? How can AI as an innovation enhancer, knowledge co-creator, and rationality facilitator contribute to marketing theory and practice? How can AI be used to reduce the levels of bounded rationality?

* SDL - Service-Dominant Logic
TCE – Transaction Cost Economics