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Research paper

Digital mediation in business-to-business marketing: A bibliometric analysis

Bipul Kumar[a], Arun Sharma[b,*], Sanket Vatavwala[a], Prashant Kumar[c]

[a] Marketing Department, Indian Institute of Management Indore, Prabandh Shikhar, Rau-Pithampur Road, Indore 453331, India
[b] Miami Business School, University of Miami, Coral Gables, FL 33124, USA
[c] Institute of Management Technology Dubai, Dubai International Academic City, P.O. Box 345006, Dubai, United Arab Emirates (UAE)

ABSTRACT

Digital mediation in business-to-business marketing is becoming increasingly important to firms, due to customer needs and evolving technological environments. The extensive research in this area for the past twenty years has created a need to synthesize extant research. This paper examines the literature in the domain, to create a classification scheme for subdomains and to explore future research directions. This study reviews 119 relevant articles published in 29 journals between January 1999 and March 2019, to detail the domain. In addition to providing details on most cited articles and published authors, our analysis classifies the digitally mediated business-to-business marketing literature into four subject clusters—a framework for digitally mediated business-to-business marketing, the digital business-to-business marketplace, value creation through digital marketing, and the use of social media for business-to-business marketing. Four shifts in the literature are described: the emergence of Internet research and business-to-business technology; the evolution of e-commerce; the focus on social media; and the broadening of research. Finally, directions for future research are identified and discussed.

1. Introduction

The use of technology in business-to-business marketing is an area of increasing research interest (e.g., Schultz, Schwepker, & Good, 2012; Rapp, Beitelspacher, Grewal, & Hughes, 2013; Agnihotri, Dingus, Hu, & Krush, 2016; Guesalaga, 2016) The research on digital mediation in business-to-business marketing, concentrates on technologies used in marketing processes (i.e., digital marketing), as well as how technology affects processes and relationships. Digital marketing focuses on the use of technology (e.g., Kannan & Li, 2017), and digital mediation takes a broader perspective and focuses on the use of technology, as well as on how technology affects processes or relationships (c.f., Yadav & Pavlou, 2014).

The literature on digital mediation in marketing includes four papers that evaluate the extant research in the area. Two of these papers focus primarily on consumer behavior, and the other two concern the impact of specific technologies on digital mediation. Yadav and Pavlou (2014) and Kannan and Li (2017) develop frameworks for digital marketing and mediation but primarily focus on consumer markets. With respect to business-to-business marketing, the emphasis of literature reviews is on digital mediation through a single technology. Martínez-López and Casillas (2013) focus on artificial intelligence, and Salo (2017) focuses on social media in business markets. No research has comprehensively examined the entire literature on digital mediation in business-to-business marketing.

Substantial research in the domain of digital mediation in business-to-business marketing has appeared in recent years, reflecting the increased research interest in the area. Our research identifies 119 research papers published in the last twenty years, with 50 articles published between 2015 and March 2019. The propagation of research emphasizes the need to synthesize that research and derive areas for future research.

The focus of this study is a bibliometric analysis of the literature on digital mediation in business-to-business markets. Bibliometric analysis examines a complete set of research in a given area from an objective, quantitative perspective (Merigó, Mas-Tur, Roig-Tierno, & Ribeiro-Soriano, 2015). This paper first examines research on digital mediation in the business-to-business marketing literature, identifies the subdomains, and conducts a content (i.e., text) analysis and visualization of the literature. Text analysis is the process of extracting meaningful value from text data to better understand the content of the research domain (Hofmann & Chisholm, 2016), and visualization represents the content of the research domain in a visual form. The overall goal is to understand the content and characteristics of existing research in the domain, with a view to providing direction for scholars as well as for practitioners.

The paper starts with the introduction of the research, followed by a discussion of the background of the study, a brief description of bibliometric analysis, and a comparison of existing review articles on the subject. The subsequent section profiles key journals, authors, and

* Corresponding author.
E-mail addresses: bipulk@iimidr.ac.in (B. Kumar), asharma@bus.miami.edu (A. Sharma), f17sanketv@iimidr.ac.in (S. Vatavwala), ctech.prashant@gmail.com (P. Kumar).

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contributing institutions in the literature of digitally mediated business-to-business marketing. Then, a discussion of co-citation analysis leads to the identification of prominent subdomains of the research and re-verification using a multimethod approach (i.e., metric multi-dimensional scaling and exploratory factor analysis). The following section describes the findings of content analysis to better explain the evolution of the literature over time. The final section provides directions for future research and implications.

2. Background of the study and research focus

2.1. Digital mediation in business-to-business marketing

Two descriptors characterize the use of technology in marketing processes and outcomes—digital marketing and digital mediation. "Digital marketing" focuses on the use of technology in marketing processes, and "digital mediation" examines the use and the effect of technology on processes and outcomes. In this regard, Kannan and Li (2017) define digital marketing as "an adaptive, technology-enabled process by which firms collaborate with customers and partners to jointly create, communicate, deliver, and sustain value for all stakeholders" (p. 23). Digital mediation is a more expansive perspective and focuses on both the digital marketing and how technology mediates the marketing process or relationships (e.g., Yadav & Pavlou, 2014).

Four research articles explore the extensive literature in the area of digital mediation (Kannan & Li, 2017; Martínez-López & Casillas, 2013; Salo, 2017; Yadav & Pavlou, 2014). These articles provide deep insight and have a specific focus. Classifying articles according to focus yields two categories—articles that primarily address consumer markets, and articles that address a specific technology. Focusing primarily on consumer markets, Yadav and Pavlou (2014) develop a framework and examine 124 articles that predominantly address business and consumer interactions, with limited focus on business-to-business markets. Similarly, Kannan and Li (2017) develop a framework and explore digital marketing research from the perspective of consumers. Focusing primarily on a specific technology in business-to-business markets, Martínez-López and Casillas (2013) survey research that examines artificial-intelligence-based systems in industrial marketing. In another major study, Salo (2017) explores social-media research in business-to-business marketing. There is no comprehensive examination of digital marketing or digital mediation in business-to-business markets, a critical need as the use of technology in business-to-business marketing increases.

Our focus is on examining the research on digital mediation in business-to-business markets, profiling the research, identifying its subdomains, utilizing content analysis to visualize the evolution of the literature and highlighting directions for future research. We use bibliometric analysis to achieve these goals.

3. Bibliometric analysis

Bibliometric analysis examines a complete set of research in a given area from an objective, quantitative perspective and evaluates developments in knowledge of a specific subject, assessing the scientific quality and influence of works and sources (Merigó et al., 2015). A bibliometric approach avoids biases induced by the involvement of the researcher in conducting the review and represents a holistic view of the scholarly community (Kumar, Sharma, & Salo, 2019; Nerur, Rasheed, & Natarajan, 2008). Bibliometric methods have been used extensively in various research areas, such as reviews of key-account management (Kumar et al., 2019), business-to-business marketing (Backhaus, Lügger, & Koch, 2011), strategic-management research (Ramos-Rodríguez & Ruíz-Navarro, 2004), and structure of consumer research (Hoffman & Holbrook, 1993).

This study follows the steps in bibliometric analysis that previous research suggests (Dagnino, Levanti, Minà, & Picone, 2015; Kumar et al., 2019; Paesbrugghe, Sharma, Rangarajan, & Syam, 2018; Randhawa, Wilden, & Hohberger, 2016). The four stages of analysis are: 1) sample selection and citation analysis to profile the literature; 2) document co-citation analysis to identify subdomains in the research area; 3) text analysis to understand the shift in the literature; and 4) text analysis to arrive at future research directions.

Choice of Database: We have used Google-Scholar data for citation analysis and ProQuest data for document co-citation analysis. These choices were based on the comprehensive nature of the databases, as well as their extensive use in extant research (e.g., Aguinis, Suárez-González, Lannelongue, & Joo, 2012; Bontis & Serenko, 2009; Franco-Santos et al., 2007; Gebauer & Reynoso, 2013; Harman, Koohang, & Paliszkiewicz, 2014; Hosein Rezazadeh Mehrizi & Bontis, 2009; Jamal, Smith, & Watson, 2008; Law & van der Veen, 2008; Luo & Zhang, 2016; McKercher, 2008; Nkomo, 2009; Read, Sarasvathy, Dew, & Wiltbank, 2016; Sidorova, Evangelopoulos, Valacich, & Ramakrishnan, 2008).

4. Literature review

Following Tranfield, Denyer, and Smart (2003), Salo (2017), and Kumar et al., 2019, we first focus on literature selection and identifying key constructs in digital mediation in business-to-business marketing, adopting the three stages of Salo (2017). In the first phase, we identified a need for a review of the literature on digital mediation in business-to-business literature, because knowledge production in the area is increasing. In the second phase, we developed protocols for conducting a literature review, followed by a third phase in which a review protocol with inclusion and exclusion criteria was developed.

All studies with a focus on digital mediation in business-to-business markets were included; studies on business-to-consumer digital mediation were excluded (c.f., Salo, 2017). Protocols were created for identifying existing research in the domain and collecting information about the literature. Keyword searches were conducted on words such as Internet, World Wide Web, Web 2.0, digital, digitization, social media, e-commerce, electronic commerce, web analytics, automation, machine learning, CRM, artificial intelligence, cybersecurity, business-to-business marketing, and industrial marketing. The keywords are based on examining the keywords in abstracts of digital-intermediation papers and previous literature surveys (e.g., Kumar et al., 2019; Salo, 2017).

A manual search was conducted of the major journals in the field of marketing and at the interface of marketing and information technology. The search included the following journals: *Industrial Marketing Management, Journal of Business-to-Business Marketing, Journal of Business and Industrial Marketing, Journal of Business Research, Journal of Marketing, Journal of Marketing Research, Marketing Science, Journal of the Academy of Marketing Science, Journal of Service Research,* and *Journal of Marketing Management*. In addition, we used the keywords to search the following databases: Scopus, Google Scholar, Business Source Premier, ISI Web of Science, and Social Science Citation Index. Both methods used the same keywords to ensure accessing all published works on the topics. Next, unpublished articles were searched using ProQuest Digital Dissertations and proceedings of conferences, such as the INFORMS marketing-science conference, the IMP conference, and the Academy of Marketing Science conference. The timeline for searching the articles was from January 1990 to March 2019, as the Internet emerged most decisively in the decade of the 1990s. This process resulted in 119 independent research studies that explored digital mediation in business-to-business marketing.

In the next stage, we used the title of the article, authors' name and affiliation, the name of the journal, and publication dates for further analysis. From 1999 to March 2019, 59 articles on digital mediation in business-to-business marketing were published in *Industrial Marketing Management*, followed by 17 articles in *Journal of Business and Industrial Marketing* and 6 articles in *Journal of Business-to-Business Marketing*. Twenty-six articles on the subject were published during the years 1999

to 2004; that is, 21.48% of the total number of publications through March 2019. Most of the publications (50, or 42.01%) on digital mediation in business-to-business marketing were published during the last five-year period from 2015 through March 2019, which also indicates the recent growth of studies in this direction. A special issue of *Industrial Marketing Management* on social media in business-to-business marketing also contributed to the growth of research publications in recent years.

The question arises as to whether about half of the articles being published in *Industrial Marketing Management* means that the journal is the most important in terms of number of citations. We used bibliographic coupling, which links documents that reference the same set of cited documents and can provide two outputs. First, bibliographic coupling reflects the importance of the journal in terms of citations of its articles. Second, bibliographic coupling can provide details of journals closely related to each other by virtue of co-citation. We used VOSviewer, a bibliometric software tool that is extensively used by researchers to examine bibliographic coupling (e.g., Martínez-López, Merigó, Valenzuela-Fernández, & Nicolás, 2018; Valenzuela, Merigó, Johnston, Nicolas, & Jaramillo, 2017). The VOSviewer provides a graphical representation of citations, shown in Fig. 1.

In the figure, the size of the circle suggests the importance of the journal in terms of citations. *Industrial Marketing Management* is the most important, followed by the *Journal of Business and Industrial Marketing*, in a manner that parallels the number of papers in each journal. Second, the colors of the circles indicate journal clusters and suggest frequent citation of the articles in these journals. There are four clusters and, similar to the function of the colors, the distance between circles indicates instances of the journals being cited in the same paper. In this regard, *Industrial Marketing Management* and *Journal of Business and Industrial Marketing* are cited frequently in articles, but *Journal of Business to Business Marketing* and *Public Relations Review* are cited in the same article infrequently.

4.1. Trend analysis

To understand the trend of the research, we graphically present all 119 articles that this study considers. For the sake of clarity, we divided the articles into four time periods: 1999–2004 (26 articles), 2005–2009 (15 articles), 2010–2014 (28 articles), and 2015–2019 (50 articles). We report on journals with three or more articles in a time period (to reduce complexity). As Fig. 2 shows, *Industrial Marketing Management* published the most articles in all time periods except 2005–2009, when the *Journal of Business and Industrial Marketing* published more in the area of digital mediation in business-to-business markets. Starting in 1999, the number of articles increased particularly in 2002, and 11 articles predominantly address the impact of the Internet on business-to-business marketing. The research in the area declined but then increased in the period 2010–2016 (59 articles), with the predominant focus on the use of social media in business-to-business marketing. From 2017 to 2019 (19 articles), the focus shifted to social media and emerging technologies, such as machine learning, artificial intelligence, and Internet of Things.

5. Research profiling

We wanted to generate a deeper understanding of the authors, the institutions, and the impact of specific research in the area of digital mediation in business-to-business markets. We used research-profiling methodology (Martín-Martín, Orduna-Malea, & Delgado López-Cózar, 2018), which includes details of the authors, extraction of author-level metrics, and analysis, as well as the impact of journals in the area, with measures such as the number of publications and citation counts. The key metric is the citation rate. First, the average citation rate per year shows how the age of the article affects its citation rate (Canabal & White III, 2008). Calculating the average citation rate per year calls for dividing the total number of citations by the number of years since the article was first published (Yan & Ding, 2010). Second, author and institution impact can be assessed using a weighted number of articles, weighted citation count, and weighted citation count per year. Calculating weighted counts for an article co-authored by two authors calls for counting each author as one-half of the article's authorship. The sum of the weighted counts for each author and institution is calculated similarly to the methods used in recent studies in marketing (Chan, Lai, & Liano, 2012; Kumar et al., 2019). The process led to production of a list of the most impactful journals, authors, articles, and institutions in the area of digital mediation in business-to-business marketing. The formulae used to calculate citation metrics appear in Appendix A.

5.1. Results

All articles accessed through Google Scholar were reviewed to assess

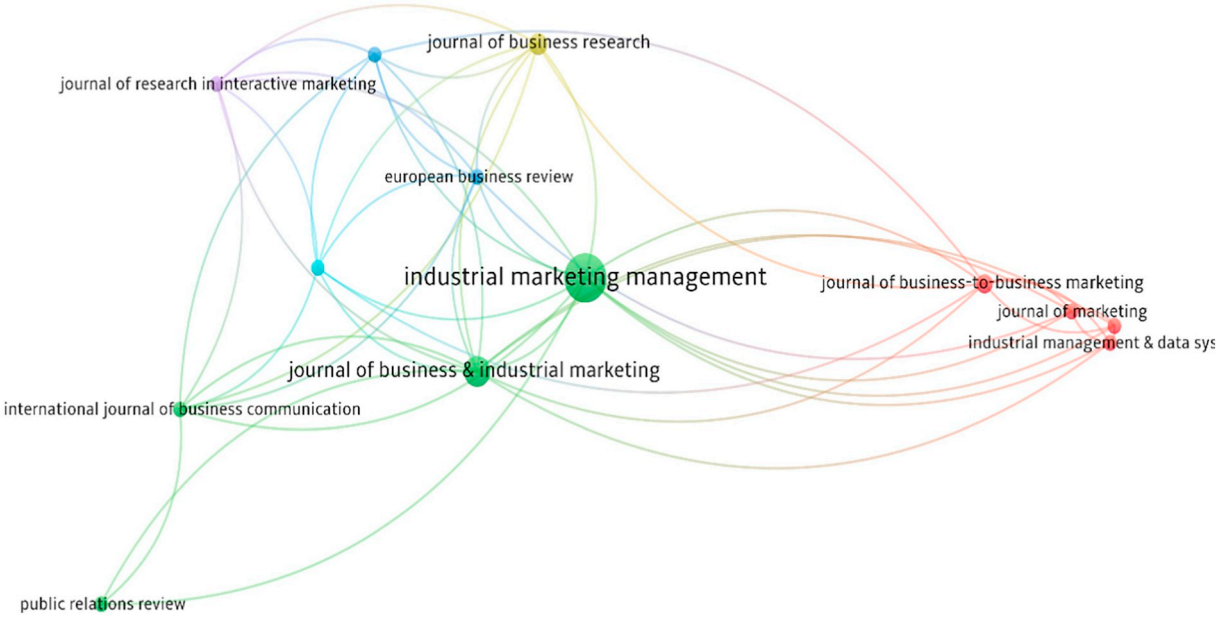


Fig. 1. Bibliometric coupling based depiction of prominent journals.

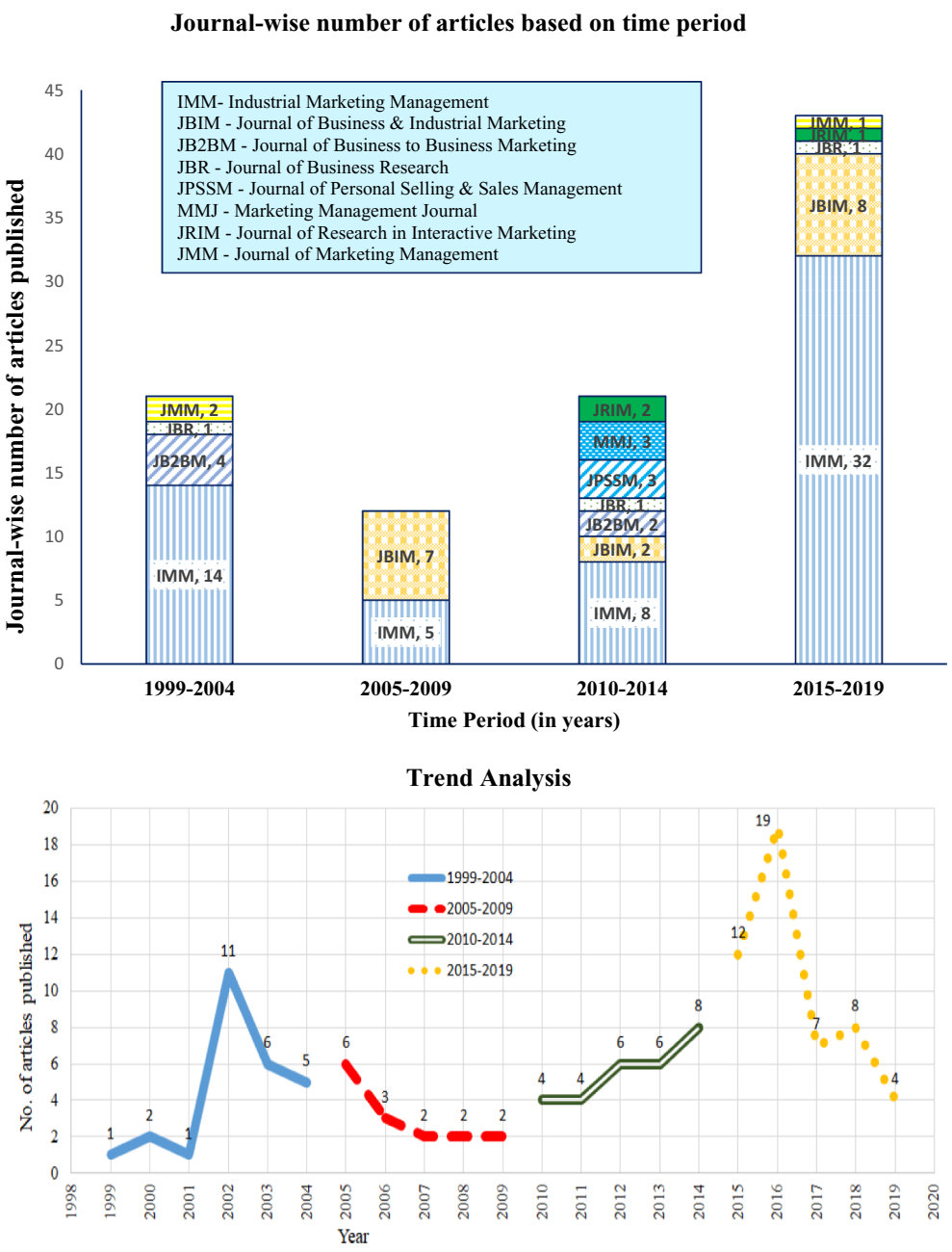


Fig. 2. Journal-wise number of articles based on time period.

journal impact using frequency count and summation of citation counts. First, the impact of journals was assessed using the total number of articles published in each journal, followed by summing the total number of citation counts attained by all the papers published in that journal on the subject of digitally mediated business-to-business marketing. Table 1 shows the leading 10 out of 29 journals. The top journal on both lists is *Industrial Marketing Management*.

Then, the impact of 254 authors associated with 119 articles was assessed by measuring the weighted number of articles, weighted citations, and weighted citations per year (Tables 2 and 3). Authors A. Sharma, R. Agnihotri, and A. Rapp appeared in the top 10 in all three categories. To assess the impact of 158 institutions (affiliations of the 254 authors), we examined the weighted number of articles and weighted citations. Out of 158 institutions, 153 (96.84%) were academic, and 5 (3.16%) were corporate organizations. Table 4 presents the top five institutions. The results show that the University of Miami is the top contributing institution on both indices. The other universities appearing in the top five in both lists include the University of Jyväskylä and the University of Alabama.

There are two methods to examine the impact of articles on the field. The first method examines the total number of citations an article has received. However, recently published articles have fewer years to accumulate citations, due to the shorter time between publication and measurement; therefore, older articles dominate the ranking. To correct this bias, a second method is used where the number of citations per year is used to compare articles. We performed two analyses. First, each of the 119 articles was assessed in terms of total citation count and citation count per year. The top 15 articles for total citations appear in Table 2. Additionally, we used the year 2019 as the reference year for citation count and divided the total number of citations by the age of the article (the number of years between the year the article was published and 2019). Table 3 shows the citation count per year for the top 15 articles, and the majority are on social media.

These results have some important implications. First, 7 out of the

Table 1
Impact of journals.

Rank	Journal	Number of articles	Percentage of articles
1	Industrial Marketing Management	59	49.6%
2	Journal of Business & Industrial Marketing	17	14.3%
3	Journal of Business to Business Marketing	6	5%
4	Journal of Personal Selling & Sales Management; Journal of Business Research; Journal of Marketing Management; Journal of research in interactive marketing; Marketing Management Journal	3	2.5%

Rank	Journal	Number of citations
1	Industrial Marketing Management	5275
2	Harvard business review	1372
3	Journal of Business Research	695
4	Journal of Business & Industrial Marketing	628
5	Journal of Personal Selling & Sales Management	531
6	Journal of Research in Interactive Marketing	347
7	Journal of the Academy of Marketing Science	296
8	International Marketing Review	183
9	Journal of Interactive Marketing	167
10	Marketing Management Journal	163

15 most cited papers were published in *Industrial Marketing Management*, stressing the importance of that journal in the field. Second, the total-citations method favors older articles; the average age of the articles listed in Table 3 is 12 years, and 8 articles were published before 2010. In contrast, the citations-per-year method favored more recent articles, as the average age of an article listed in Table 3 was 6 years, and only one article was published before 2010. Looking at the congruence of the two methods and articles common to both lists, we found six articles on both lists: Kaplan and Sawhney (2000); Michaelidou, Siamagka, and Christodoulides (2011); Trainor, Andzulis, Rapp, and Agnihotri (2014); Rapp et al. (2013); Andzulis, Panagopoulos, and Rapp (2012); and Agnihotri, Kothandaraman, Kashyap, and Singh (2012).

6. Document co-citation analysis

The second objective of this study is to explore and identify the subdomains of digital mediation in business-to-business marketing research. We conducted a document co-citation analysis, reported in the previous section, but understanding the subdomains required using prominent and impactful seminal research in the domain (Small, 1973). Accordingly, the citations per year for each of the 119 articles were examined, and the number of citations per year was plotted on an X-axis, with articles on the Y-axis as a Scree plot, observing the drop in the curve as the cut-off point (Kumar et al., 2019). This process resulted in 50 highly cited articles that were used to understand the co-citation frequencies for each pair of articles. Using the ABI/INFORMS (ProQuest) database, co-citation frequencies were collected for the pair of articles that formed a co-citation matrix (Harzing & Alakangas, 2016). The diagonal values of the matrix (article X and itself) were treated as missing values for analysis (White & Griffith, 1981). In the next step, this co-citation matrix was converted into a proximity value matrix based on Pearson correlation coefficients. The values in this matrix varied from zero (no correlation) to one. The proximity matrix provides the degree to which two articles were cited together in literature and allows us to identify subdomains as clusters (Dagnino et al., 2015; McCain, 1986; Tsay, Shen, & Liang, 2016).

To better understand the subdomains of digital mediation in business-to-business marketing, we used a multimethod analysis that included hierarchical cluster analysis (HCA), metric multidimensional scaling (MDS), and exploratory factor analysis (EFA) (Samiee & Chabowski, 2012). The multimethod analysis enables comparing the findings from three methods and understanding the degree to which the knowledge structure in the domain of digitally mediated business-to-business marketing overlaps three methods. Each method is discussed next.

6.1. Hierarchical cluster analysis (HCA)

We utilized hierarchical cluster analysis to understand the subdomains of research on digital mediation in business-to-business marketing. We used the proximity matrix of 50 prominent and impactful studies as the input for hierarchical cluster analysis. To determine the number of clusters, we used Ward's method, where hierarchical clustering indicates a five-cluster solution based on analysis of variance (ANOVA) and its statistical significance ($p < 0.001$) (Dillon & Goldstein, 1984). Since one of the clusters had only 1 article, that paper was included in the next cluster having similarly themed articles. The final four-cluster solution had 14 articles in cluster 1, 5 articles in cluster 2, 17 articles in cluster 3, and 14 articles in cluster 4. Next, a content analysis of these clusters was based on the respective abstracts of the articles, to examine the number of occurrences of key terms. We used VOSViewer software to obtain the main terms, and each cluster was named, based on this process and further interpretation.

6.1.1. Results

The identified clusters from the analysis—digitally mediated business-to-business marketing; digital business-to-business market place; value creation through digital marketing; and social media for business-to-business marketing—create the framework. The clusters are discussed later in the paper.

6.2. Metric multi-dimensional scaling (MDS)

Both cluster analysis and multidimensional scaling examine how data is organized, with subtle differences. Cluster analysis assumes a categorical representation of the data, whereas multi-dimensional scaling assumes that there are gradual differences among the objects along a continuous dimension. Both analyses are used in categorizing data, and the proximity matrix of co-citation frequencies (with 50 articles) was input for metric multidimensional scaling (MDS) using ALSCAL routines in the IBM SPSS 22.0 software. Stress value—the measure of goodness of fit in multidimensional scaling—is 0.08, which is regarded as a good fit and consistent with other research (Samiee & Chabowski, 2012).

6.2.1. Results

MDS provides results in a two-dimensional figure (see Fig. 3), which

Table 2
Impact of articles based on total number of citations (Top 15).

Rank	Author(s)	Title	Citations	Journal
1	Kaplan and Sawhney (2000)	E-hubs: the new B2B marketplaces	1372	Harvard Business Review
2	Michaelidou et al., 2011	Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands	756	Industrial Marketing Management
3	Trainor et al. (2014)	Social media technology usage and customer relationship performance: A capabilities-based examination of social CRM	376	Journal of Business Research
4	Avlonitis and Karayanni (2000)	The impact of internet use on business-to-business marketing: examples from American and European companies	299	Industrial Marketing Management
5	Rapp et al. (2013)	Understanding social media effects across seller, retailer, and consumer interactions	296	Journal of the Academy of Marketing Science
6	Andzulis et al. (2012)	A review of social media and implications for the sales process	294	Journal of Personal Selling and Sales Management
7	Evans and King (1999)	Business-to-business marketing and the world wide web: Planning, managing, and assessing web sites	280	Industrial Marketing Management
8	Grewal et al. (2003)	The Internet and the price–value–loyalty chain	278	Journal of Business Research
9	Sharma (2002)	Trends in Internet-based business-to-business marketing	206	Industrial Marketing Management
10	Lancastre and Lages (2006)	The relationship between buyer and a B2B e-marketplace: Cooperation determinants in an electronic market context	197	Industrial Marketing Management
11	Holliman and Rowley (2014)	Business to business digital content marketing: marketers' perceptions of best practice	200	Journal of Research in Interactive Marketing
12	Agnihotri et al. (2012)	Bringing "social" into sales: The impact of salespeople's social media use on service behaviors and value creation	196	Journal of Personal Selling and Sales Management
13	Sheth and Sharma (2005)	International e-marketing: opportunities and issues	183	International Marketing Review
14	Agnihotri et al. (2016)	Social media: Influencing customer satisfaction in B2B sales	181	Industrial Marketing Management
15	Sharma and Mehrotra (2007)	Choosing an optimal channel mix in multichannel environments	176	Industrial Marketing Management

Table 3
Impact of articles based on citations per year (Top 15).

Rank	Author(s)	Title	Citations per year	Journal
1	Michaelidou et al. (2011)	Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands	108	Industrial Marketing Management
2	Trainor et al. (2014)	Social media technology usage and customer relationship performance: A capabilities-based examination of social CRM	94	Journal of Business Research
3	Agnihotri et al. (2016)	Social media: Influencing customer satisfaction in B2B sales	91	Industrial Marketing Management
4	Kaplan and Sawhney (2000)	E-hubs: the new B2B marketplaces	76	Harvard Business Review
5	Rapp et al. (2013)	Understanding social media effects across seller, retailer, and consumer interactions	59	Journal of the Academy of Marketing Science
6	Järvinen & Taiminen, 2016	Harnessing marketing automation for B2B content marketing	51	Industrial Marketing Management
7	Holliman and Rowley (2014)	Business to business digital content marketing: marketers' perceptions of best practice	50	Journal of Research in Interactive Marketing
8	Andzulis et al. (2012)	A review of social media and implications for the sales process	49	Journal of Personal Selling and Sales Management
9	Jussila et al. (2014)	Social media utilization in business-to-business relationships of technology industry firms	38	Computers in Human Behavior
10	Guesalaga (2016)	The use of social media in sales: Individual and organizational antecedents, and the role of customer engagement in social media	35	Industrial Marketing Management
11	Siamagka et al. (2015)	Determinants of social media adoption by B2B organizations	33	Industrial Marketing Management
12	Agnihotri et al. (2012)	Bringing "social" into sales: The impact of salespeople's social media use on service behaviors and value creation	33	Journal of Personal Selling and Sales Management
13	Wang, Pauleen, and Zhang (2016)	How social media applications affect B2B communication and improve business performance in SMEs	32	Industrial Marketing Management
14	Swani et al. (2014)	Should tweets differ for B2B and B2C? An analysis of Fortune 500 companies' Twitter communications	30	Industrial Marketing Management
15	Thomas (2013)	Supplier integration in new product development: Computer mediated communication, knowledge exchange and buyer performance	28	Industrial Marketing Management

Table 4
Impact of authors and institutions.

Rank	Author	Weighted number of articles	Rank	Author	Weighted total citation	Rank	Author	Weighted citations per year
1	Sharma, A.	5.25	1	Kaplan, S.	686	1	Rapp, A.	59.73
2	Wilson, D.	2.0	1	Sawhney, M.	686	2	Agnihotri, R.	58.62
3	Karjaluoto, H.	1.58	3	Sharma, A.	539	3	Christodoulides, G.	44.83
4	Iyer, G.	1.58	4	Rapp, A.	309	4	Siamagka, N.	44.33
5	Sheth, J.	1.50	5	Christodoulides, G.	279	4	Michaelidou, N.	44.33
6	Järvinen, J.	1.25	6	Siamagka, N.	277	6	Järvinen, J.	42.99
7	Agnihotri, R.	1.08	6	Michaelidou, N.	277	7	Andzulis, J.	39.83
8	Rapp, A.	1.08	8	Agnihotri, R.	192	8	Sharma, A.	35.34
9	Clarke, R.	1.00	8	Andzulis, J.	192	9	Karjaluoto, H.	31.21
10	Thomas, E.	1.00	10	Grewal, D.	156	10	Trainor, K.	29.6

Rank	Institution	Weighted number of articles	Rank	Institution	Weighted citations
1	University of Miami	6.25	1	University of Miami	631
2	University of Jyväskylä	4.41	2	University of Alabama	556
3	University of Alabama	2.91	3	University of Birmingham	514
4	Clemson University	2.25	4	Athens University of Economics and Business	397
4	Florida Atlantic University	2.25	5	University of Jyväskylä	348

we divided into four quadrants to better interpret the results. We discuss each quadrant in a subsequent section.

6.3. Exploratory factor analysis (EFA)

Both cluster analysis and factor analysis attempt to reduce data in order to understand structures and subdomains. Whereas cluster analysis is used to find groups of similar cases, factor analysis is used to find a smaller group of features that are representative of a dataset's original features. In our context, we wanted to examine the similarities and differences between cluster analysis and factor analysis.

We conducted exploratory factor analysis using as input the proximity matrix of co-citation frequencies of 50 articles. We used direct oblimin rotation since the field of inquiry was expected to display a non-orthogonal relationship, due to publications corresponding to multiple research domains (Samiee & Chabowski, 2012). We considered a factorial weight of greater than 0.4 to include an article in analysis, based on the literature on bibliometric analysis (Wang & Chen, 2013; Ferreira, Fernandes and Ratten, 2016; Tran et al., 2019).

6.3.1. Results

Based on the scree plot, we found four factors as the result of exploratory factor analysis, explaining a 94.08% cumulative variance. Table 5 shows the research articles along with their loadings on the respective factors.

6.4. Clusters and comparison of multimethod (HCA, MDS, and EFA)

We found a convergence of the four broad categories, but there are some differences across the analysis, evident in previous research (Samiee & Chabowski, 2012) and highlighted in Table 6. We describe the clusters obtained in hierarchical cluster analysis and discuss the differences between the methods. While there is broad consensus on the major theme in each cluster, we did find that the results from each analysis included different articles related to the major focus of the cluster. Therefore, the cluster may seem fuzzy, but each analysis highlighted the main themes.

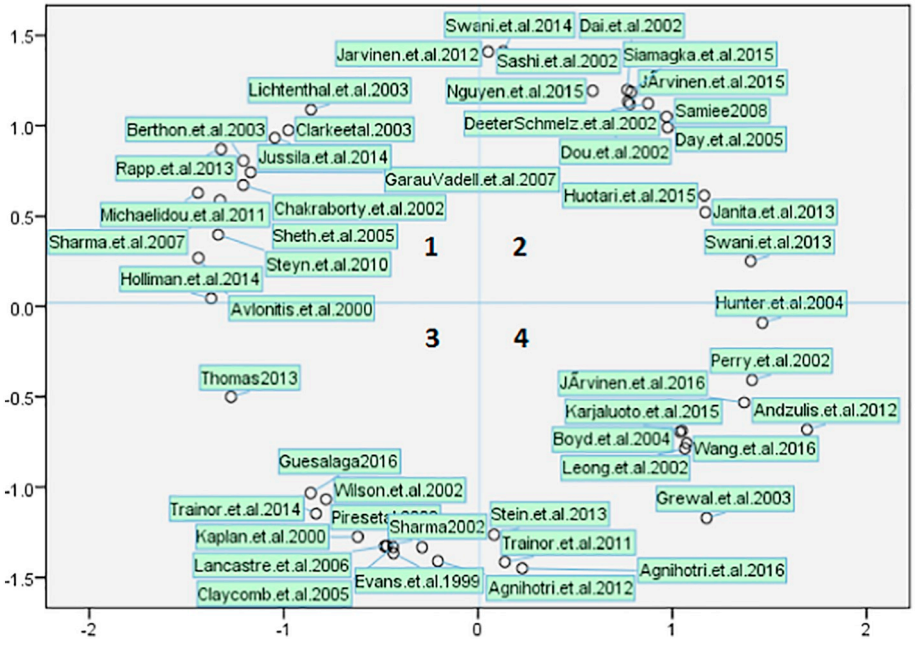


Fig. 3. Metric multi-dimensional scaling.

Table 5
Result of exploratory factor analysis (EFA).

Factor 1		Factor 2		Factor 3		Factor 4	
Article by	Loading	Article by	Loading	Article by	Loading	Article by	Loading
Lancastre & Lages, 2006	.884	Sharma (2002)	.697	Kaplan & Sawhney, 2000	.897	Michaelidou et al. (2011)	.815
Sharma & Mehrotra 2007	.945	Deeter-Schmelz & Kennedy, 2002	.728	Avlonitis & Karayanni, 2000	.516	Trainor et al. (2014)	.897
Wilson & Abel, 2002	.965	Dou & Chou, 2002	.494	Evans & King, 1999	.851	Rapp et al. (2013)	.866
Swani et al. (2013)	.948	Janita & Miranda, 2013	.442	Chakraborty et al. (2002)	.520	Andzulis et al. (2012)	.710
Swani et al. (2014)	.960			Pires & Aisbett, 2003	.696	Grewal et al. (2003)	.828
Järvinen et al. (2012)	.987			Clarke & Flaherty, 2003	.803	Holliman & Rowley, 2014	.936
Hunter et al. (2004)	.945			Claycomb et al. (2005)	.913	Agnihotri et al. (2012)	.755
Sashi & O'Leary, 2002	.960					Sheth & Sharma, 2005	.919
Berthon et al. (2003)	.941					Agnihotri et al. (2016)	.884
Järvinen & Taiminen, 2016	.936					Jussila et al. (2014)	.857
Perry & Bodkin, 2002	.938					Lichtenthal & Eliaz, 2003	.946
Dai & Kauffman, 2002	.964					Siamagka et al. (2015)	.829
Day & Bens, 2005	.917					Trainor et al. (2011)	.403
Thomas (2013)	.987					Guesalaga (2016)	.931
Samiee (2008)	.982					Nguyen et al. (2015)	.921
Steyn, Salehi-Sangari, Pitt, Parent, and Berthon (2010)	.948					Huotari et al. (2015)	.896
Järvinen & Karjaluoto, 2015	.878					Karjaluoto et al. (2015)	.907
Wang et al. 2016	.971						
Garau Vadell & Orfila-Sintes, 2007	.939						
Leong et al. (2002)	.939						
Stein et al. (2013)	.971						
Boyd & Spekman, 2004	.985						

6.4.1. Cluster 1: Framework for digital mediation in business-to-business marketing

Cluster 1 has 14 articles providing an overview of the frameworks for digital mediation in business-to-business marketing. The central focus of the articles in this cluster are the different frameworks, such as a classification grid of industrial buying situations in the e-marketplace (Hunter, Kasouf, Celuch, & Curry, 2004); a framework for business-to-business marketing functions in online space (Dai & Kauffman, 2002); and a framework for CRM data mining in a business-to-business relationship (Stein, Smith, & Lancioni, 2013). We regard frameworks as organizing our understanding of digital mediation in business-to-business marketing. As an example, Dai and Kauffman (2002) synthesize prior research on electronic markets, interorganizational information systems, and adoption of network technologies, to derive a framework for business-to-business marketing functions in online space. The morphology in the domain was also addressed by Hunter et al. (2004), who develop a classification grid of industrial buying situations in the e-marketplace using the dimensions of risk importance and risk probability. Sharma and Mehrotra (2007) provide a framework for understanding how channel mix operates optimally in multichannel environments. Researchers also provide additional frameworks using the Internet as the medium to facilitate better relationships with customers (Garau Vadell & Orfila-Sintes, 2007), create awareness and information about the firms and their products (Wilson & Abel, 2002), manage effective channel strategy (Berthon, Ewing, Pitt, & Naudé, 2003), and enhance communication (Perry & Bodkin, 2002).

Other researchers examine a framework for CRM data mining in a business-to-business relationship (Stein et al., 2013) and a sales-funnel framework using automation in business-to-business marketing firms (Järvinen & Taiminen, 2016). Researchers also develop frameworks for the use of the Internet in creating a web-based auction model (Sashi & O'Leary, 2002) and examining readability of text on business-to-business websites (Leong, Ewing, & Pitt, 2002).

Difference between Methods: Differences appeared among the classifications by the three methods. HCA has 14 articles in this cluster, MDS 12, and EFA 22 articles. The difference between the hierarchical cluster analysis and multidimensional scaling was research on mechanism and process for implementation of business-to-business marketing frameworks (Clarke & Flaherty, 2003; Sharma & Mehrotra, 2007); business-to-business websites effectiveness and role of Internet (Avlonitis & Karayanni, 2000; Chakraborty, Lala, & Warren, 2002); and importance of digital content marketing (Holliman & Rowley, 2014). The difference between the hierarchical cluster analysis and exploratory factor analysis is research on auxiliary tools, such as apps and web analytics, to support digital business-to-business marketing frameworks (Järvinen & Karjaluoto, 2015; Wang, Hsiao, Yang, & Hajli, 2016) and strategic deployment of frameworks such as e-exchange for network management and market intelligence (Samiee, 2008).

6.4.2. Cluster 2: Digital business-to-business marketplace

This second cluster from the hierarchical cluster analysis contains five articles that focus on the role of digital technologies in developing the business-to-business marketplace. Marketplaces are the locations (physical or virtual) where buyers and sellers meet and exchange information and goods and services. The commonality of the articles in this cluster is the utilization of different digital technologies in enhancing business-to-business transaction and performance (Sharma, 2002; Trainor, Rapp, Beitelspacher, & Schillewaert, 2011). The emphasis of articles in this cluster is on the role of digital technologies in business-to-business exchanges and their relevance for those businesses (Kaplan & Sawhney, 2000); transaction-level effectiveness (Sharma, 2002); client-level effectiveness (e.g., loyalty) (Janita & Miranda, 2013); and dimensions of digital exchanges (Dou & Chou, 2002). Another focus area is the integration between information technology and marketing capabilities and its implications for performance (Trainor et al., 2011).

Difference between Methods: Differences arose among the classifications by the three methods. HCA has 5 articles in this cluster, MDS 15, and EFA 4 articles. The difference between the hierarchical cluster analysis and multidimensional scaling was research on implications of Internet innovation (Garau Vadell & Orfila-Sintes, 2007), communication with stakeholders (Swani, Brown, & Milne, 2014; Swani, Milne, & Brown, 2013) and Internet as a communication tool (Deeter-Schmelz & Kennedy, 2002) in business-to-business marketing. The difference between hierarchical cluster analysis and exploratory factor analysis is research on the Internet as a communication tool (Deeter-Schmelz & Kennedy, 2002).

Table 6
A comparison of structure based on mixed-method (HCA, MDS & EFA).

HCA (base model)	Difference between base model and MDS	Difference between base model and EFA
Cluster-1	Quadrant-1 Addition	Factor-1 Addition
• Framework for digitally mediated business-to-business marketing • Framework for optimal channel mix in digitally mediated business-to-business marketing • Classification framework of business-to-business e-marketplace • Specific frameworks in business-to-business marketing (e.g., meant for CRM data mining and sales-funnel based on automation)	• Business-to-business websites effectiveness and role of the Internet • Mechanism and process for implementation of business-to-business marketing frameworks • Importance of digital content marketing Removal • Classification framework of business-to-business e-marketplace • Specific frameworks in business-to-business marketing (e.g., meant for CRM data mining and sales-funnel based on automation)	• Auxiliary tools such as apps and web analytics to support digital business-to-business marketing frameworks • Strategic deployment of frameworks such as e-exchange for network management and market intelligence
Cluster-2	Quadrant-2 Addition	Factor-2 Addition
• Digital business-to-business marketplace • Impact of digital business-to-business marketplace on performance effectiveness	• Internet innovation • Communication with stakeholders • Internet as a communication tool	• Internet as a communication tool Removal • Impact of digital business-to-business marketplace on performance effectiveness
Cluster-3	Quadrant-3 Addition	Factor-3 Addition
• Value creation through digital marketing • Digital strategies in business-to-business marketing • Traditional versus digitally mediated communication for value creation	• Benefits and challenges of value creation in business-to-business marketing due to digital mediation of Internet and e-commerce Removal • Traditional versus digitally mediated communication for value creation	• Benefits and challenges of value creation due to digital mediation of e-commerce, websites, and Internet Removal • Traditional versus digitally mediated communication for value creation
Cluster-4	Quadrant-4 Addition	Factor-4 Addition
• Social Media tools for business-to-business marketing • Drivers of social media adoption in business-to-business marketing firms • The consequence of social media usage • Social media as a value creator	• Research on the role of social media apps, digital channels, and marketing automation Removal • Drivers of social media adoption in business-to-business marketing firms	• Integration of information technology and marketing • E-marketing strategies in an international context.

6.4.3. Cluster 3: Value creation through digital marketing

The third cluster from hierarchical cluster analysis focuses on how the digitization of marketing activities results in value creation for customers and other stakeholders. This cluster contains 17 articles, and their commonality lies in the use of digital technologies to create value. Exemplars are value creation through digitally mediated communication (Boyd & Spekman, 2004; Karjaluoto, Mustonen, & Ulkuniemi, 2015; Sheth & Sharma, 2005; Thomas, 2013); and, value creation through new technologies, such as web analytics and automation (Järvinen & Karjaluoto, 2015). The articles also discuss comparisons between traditional networks and digitally mediated communication for value creation (Sheth & Sharma, 2005), and enhanced value through reduced customer-service cost and improved customer-firm relationships (Day & Bens, 2005). Some of the articles in this cluster discuss emerging tools and techniques for value creation, e.g., web analytics, automation, and apps (Järvinen & Karjaluoto, 2015; Nguyen, Yu, Melewar, & Chen, 2015). The tools refer to emerging technologies in that time period. Other articles address brand innovation and better communication (Agnihotri et al., 2012; Järvinen, Tollinen, Karjaluoto, & Jayawardhena, 2012); market mechanisms for value creation, such as aggregation and matching (Lichtenthal & Eliaz, 2003); and critical success factors for the creation of relational values (Clarke & Flaherty, 2003; Claycomb, Iyer, & Germain, 2005; Lancastre & Lages, 2006; Samiee, 2008).

Difference between Methods: Differences arose in the classifications by the three methods. HCA has 17 articles in this cluster, MDS 10, and EFA 7 articles. The difference between the hierarchical cluster analysis and multidimensional scaling is research on benefits and challenges of value creation in business-to-business marketing, as an additional insight due to digital mediation of Internet and e-commerce (Kaplan & Sawhney, 2000; Sharma, 2002; Wilson & Abel, 2002). The difference between the hierarchical cluster analysis and exploratory factor analysis is research on benefits and challenges of value creation due to digital mediation of e-commerce, websites, and Internet (Chakraborty et al., 2002; Evans & King, 1999; Kaplan & Sawhney, 2000).

6.4.4. Cluster 4: Social media for business-to-business marketing

The fourth cluster from hierarchical cluster analysis focuses on social media and discusses the use of social media to facilitate business-to-business marketing activities, such as customer interaction, customer engagement, and selling processes. This cluster has 14 articles that mostly discuss social media. Although the Internet provided the initial impetus, social media has started gaining relevance in various business-to-business marketing processes.

With the proliferation of social media, business-to-business marketers started shifting focus from the Internet to social media. Studies on social media in this cluster broadly describe the barriers to the adoption of social media and the consequences of social-media adoption. Researchers highlight major barriers in the adoption of social media by business-to-business marketers, i.e., lack of perceived

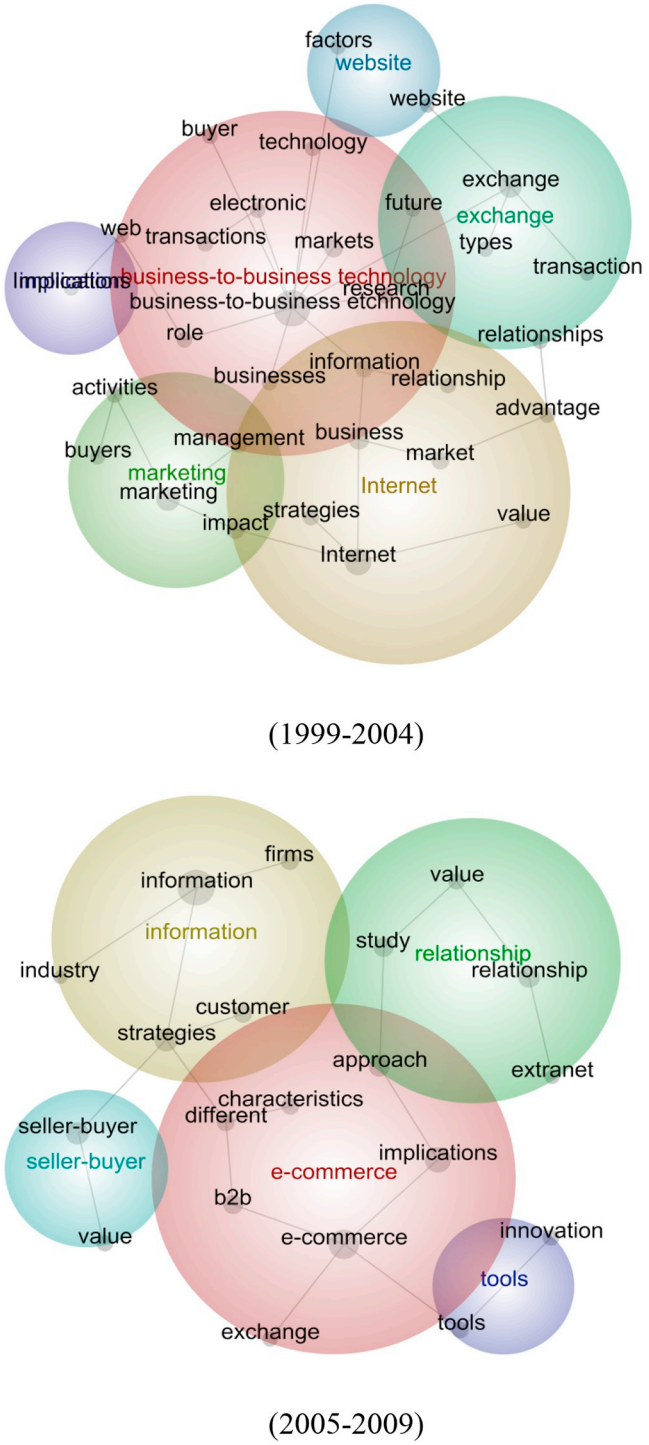


Fig. 4. Content analysis and visualization (Leximancer output).

relevance to a particular industry, non-usage of appropriate metrics, lack of organizational innovativeness, lack of firm-level commitment, information-security risks, and intellectual-property rights (Guesalaga, 2016; Jussila, Kärkkäinen, & Aramo-Immonen, 2014; Michaelidou et al., 2011; Siamagka, Christodoulides, Michaelidou, & Valvi, 2015). Researchers found that social-media adoption led to sales evolution, better communication, and a focused approach to customer-centric management (Andzulis et al., 2012; Jussila et al., 2014; Trainor et al., 2014). Researchers also concluded that social media help in overall branding; hence, business-to-business marketers may gain better brand performance, resulting in customer loyalty (e.g., Holliman & Rowley, 2014; Rapp et al., 2013).

Difference between Methods: Differences arose in the classifications by the three methods. HCA has 14 articles in this cluster, MDS 13, and EFA 17 articles. The difference between the hierarchical cluster analysis and multidimensional scaling was research on the role of social-media apps, digital channels, and marketing automation (Järvinen & Taiminen, 2016; Karjaluoto et al., 2015; Wang, Pauleen, & Zhang, 2016). The difference between the hierarchical cluster analysis and exploratory factor analysis is the discussion on integration of information technology and marketing (Lichtenthal & Eliaz, 2003; Trainor et al., 2011) and e-marketing strategies in an international context (Sheth & Sharma, 2005).

In summary, although different numbers of articles were clustered in four groups by different methodologies, there is consensus around the four clusters defining the main area of research in each cluster. Some concepts within a subdomain, which are central and common across the three methods, we define with the subdomain label. However, there are peripheral differences within a subdomain that we identify and summarize in Table 6.

7. Content analysis and visualization

The study's third objective is content analysis and visualization of the digitally mediated business-to-business literature. We used text mining for automated content analysis. The reason to use automated content analysis rather than manual content analysis by a knowledgeable researcher is twofold. First, it takes an enormous amount of time to do a content analysis manually. Second, manual analysis requires multiple researchers to provide convergence, and automatic content analysis is likely less biased.

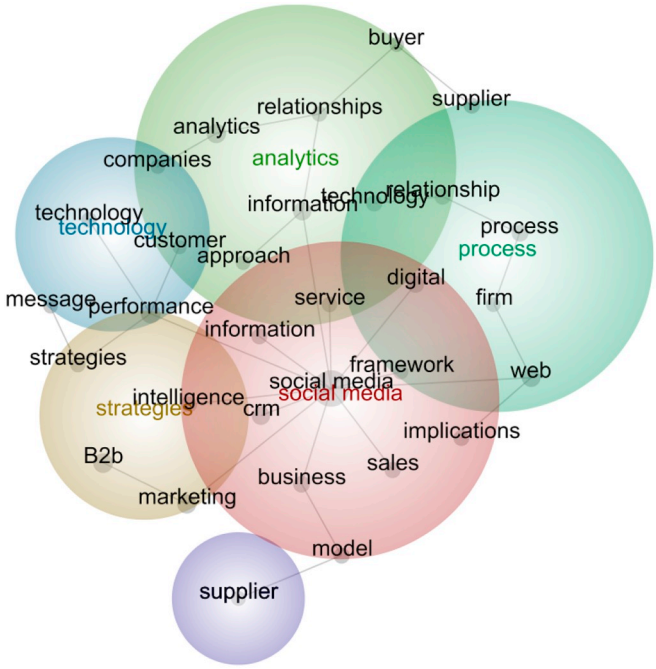
Text mining was applied to the abstracts of 119 articles to understand the changes in the literature over four time-periods: 1999–2004, 2005–2009, 2010–2014, and 2015–2019. Research describes the five-year time period as appropriate for understanding changes taking place in the literature (Kumaret al., 2019; Kumar & Polonsky, 2017: Kumar, 2016). Text mining helps in the discovery of unstructured ontology and conceptual insights, using words in the selected set of articles (Biesenthal & Wilden, 2014).

The analysis was conducted by text-mining software called Leximancer. It uses a Bayesian learning algorithm to read the proximity values between textual data to provide themes and concepts as output. Leximancer counts word frequency and analyses co-occurrence of data to arrive at families of terms (Smith & Humphreys, 2006). The concepts are then analyzed for inherent relationships that provide the basis for aggregating them into themes, represented by circles (Campbell, Pitt, Parent, & Berthon, 2011; Randhawa et al., 2016). Both the colors and the sizes show the importance of a theme—brighter and larger circles are more important (Randhawa et al., 2016); most important themes are highlighted in hot colors, such as red and orange, while less important themes are highlighted in cool colors such as blue and green. Brighter and bigger circles in the output indicate more important themes, and the overlap of circles shows the degree to which two topics are studied together. This approach is used in the literature by Kumar et al. (2019) and Randhawa et al. (2016).

7.1. Results

Leximancer software used abstracts of the articles from the selected time periods as input, and the output of the analysis is the creation of maps depicting key concepts and linkages between them (see Fig. 4). Data were divided into four time periods: 1999–2004 (26 articles), 2005–2009 (15 articles), 2010–2014 (28 articles) and 2015–March 2019 (50 articles).

This text analysis helps in arriving at four trends in digitally mediated business-to-business marketing, discussed next.



(2010-2014)

(2015-2019)

Fig. 4. (*continued*)

7.1.1. 1999–2004: Emergence of research on the Internet and business-to-business technology

This period coincided with the emergence of the Internet. The two biggest circles describing this time period are business-to-business technology (e.g., Boyd & Spekman, 2004; Grewal, Iyer, Krishnan, & Sharma, 2003; Leong et al., 2002; Pillai & Sharma, 2004; Pires & Aisbett, 2003) and the Internet (e.g., Sharma, 2002; Sharma & Krishnan, 2002; Sharma & Tzokas, 2002). Other areas of research, with less salience (smaller circles), include exchanges (e.g., Kaplan & Sawhney, 2000), websites (e.g., Evans & King, 1999), implications (e.g., Dou & Chou, 2002), and digital marketing (e.g., Wilson & Abel, 2002). Interestingly, the hot color would suggest that business-to-business technology was the more important or salient topic of research. The reason is that business-to-business technology includes the Internet (please see overlap in Fig. 4). Also, business-to-business technology overlaps with research on exchanges, websites, implementation, and marketing. Therefore, the research in this time period focuses on technologies used in business-to-business marketing, including the Internet.

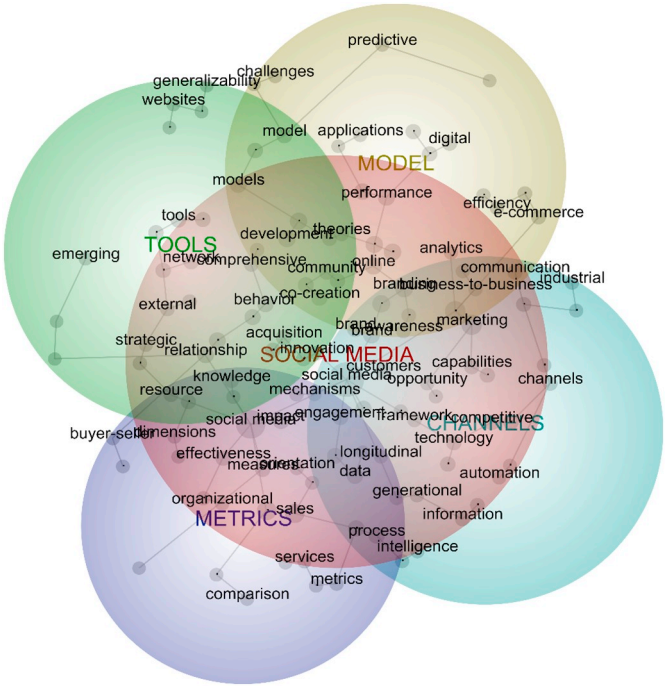


Fig. 5. Future research directions (Leximancer output).

7.1.2. 2005–2009: Evolution of e-commerce

E-commerce had the largest circle in a hot color, and the research moved away from business-to-business technology to the exchange process between buyers and sellers (e.g., Ng, 2005; Sheth & Sharma, 2006). The two larger circles with cool colors highlighted research on information exchange (e.g., Sharma & Mehrotra, 2007; Sheth & Sharma, 2005) and relationships (e.g., Lancastre & Lages, 2006). Finally, the smaller circles were tools (e.g., Day & Bens, 2005) and seller-buyer value creation (e.g., Klanac, 2008). Therefore, the research in this time period moved away from the focus on technologies in the previous periods to examining buyer-seller exchange processes.

7.1.3. 2010–2014: Focus on social media

As the use of social media moved from consumer markets to business-to-business markets, this area of research became most salient (e.g., Michaelidou et al., 2011; Rapp et al., 2013), as seen by the size of the circle and its hot color. Analytics also emerged as an area of research salience, reflected in the size of the circle (e.g., Stein et al., 2013; ⁎Dale Wilson, 2010), but the articles were few. Finally, the firm-level processes (e.g., Palmer, Ellinger, Allaway, & D'Souza, 2011) became more salient in this time period. Smaller circles, suggesting less salience, represent areas such as digital strategy (e.g., Balocco, Perego, & Perotti, 2010), technology (e.g., Sharma & Sheth, 2010), and supplier issues (e.g., Obal & Lancioni, 2013). In summary, this time period was dominated by research on social media.

7.1.4. 2015–2019: The broadening of research

In this time period, the research on digital mediation broadened to

Table 7
Directions for future research.

Areas	Exemplar questions
The intersection of social media and tools, channels, models and metrics	• What is the impact of social media on each stage of the business-to-business selling process? • What are the cost-benefit models for utilizing social media in business-to-business marketing? • What are the models of the size of firm and social-media strategies? • How can artificial intelligence and machine learning be utilized in social media strategies? • What framework can be used to understand the role of social media, resource integration, and value co-creation? • What are the metrics to evaluate the ROI (return on investment) of social media implementation in business-to-business organizations?
The intersection of tools and models and metric.	• What frameworks can explain the differential effects of social media, websites, and email campaigns? • What are the metrics to evaluate the ROI (return on investment) of digital tools in business-to-business marketing? • What frameworks can be developed to allow the selection of digital tools based on strategy?
The intersection of channels and models and metrics.	• How do machine learning and artificial intelligence affect business-to-business sales-service link, sales frontlines, and supply chain process? • What frameworks can help understand how online versus offline channels enhance performance in different business-to-business marketing contexts? • What models can be used to examine the efficacy of digital channels in business-to-business customers' journey?
Models	• What models can be used to understand intra- and inter-organizational digital communications? • What models can be used to understand the effect of demographic and cultural factors on digital communications in business-to-business markets? • What model can help define the success of digital platforms in business-to-business marketing?
Metrics	• What metrics can be used to understand the differential effects of social media, websites, and email campaigns? • What metrics can be used to evaluate the effectiveness of artificial intelligence and machine learning in digital contexts? • What metrics can be used to assess the effectiveness of inter-organizational digital communications?

include a more holistic view of the area. Social media remained the dominant area of focus (e.g., Huotari, Ulkuniemi, Saraniemi, & Mäläskä, 2015; Mehmet & Clarke, 2016), as seen by the hot color and the size of the circle. The next largest circle depicts sales and the increase in research examining digital mediation in the sales processes (e.g., Bocconcelli, Cioppi, & Pagano, 2017). The next two areas are brand (e.g., Lipiäinen & Karjaluoto, 2015) and business processes (e.g., Siamagka et al., 2015). The last two areas of research are performance implications of digital mediation (e.g., *Gregory, Ngo, & Karavdic, 2017) and emerging concepts and technologies, such as big data, Internet of Things, and machine learning (e.g., Syam & Sharma, 2018). In summary, this time period demonstrates maturity in the topic area, dominated by a focus on the broader implications of digital mediation in business-to-business marketing.

8. Directions for future research

One of the key objectives of this study was to develop directions for future research. We examined the content analysis of the section on future areas of research, the 50 articles published during the time period from 2015 to 2019, for two reasons. First, the articles reflect the current research on digital mediation in business-to-business marketing; they can be expected to outline the more relevant future research directions. Additionally, some of the areas of future research outlined in previous time periods may already have been addressed. Second, the 50 articles published in this time period, compared to 69 articles in the first three time periods, suggests a broader perspective. We used Leximancer software for text mining the 50 articles we examined for data in areas of future research.

8.1. Results

Fig. 5 presents the very interesting results. The five major research areas in terms of salience are social media, tools, channels, models, and metrics. However, all research areas overlap and are tightly packed, suggesting that researchers have in mind an integrated examination of research topics on digital mediation in business-to-business marketing. The identified areas are discussed next.

The most important area the research articles identified was social media. However, researchers suggested that future inquiry should not focus only on social-media topics, but also on the intersection of social media and tools, channels, models, and metrics. In the area of tools used in digital mediation (e.g., websites, email), the recommendation is to look at the intersection of tools and social media, models, and metrics. The area of channels focuses on topics like automation, artificial intelligence, and information collection. The recommendation for channels is to look at the intersection of channels and social media, models, and metrics. The models area is self-explanatory, and the recommendation is to look at models and the intersection of models and social media, tools, and channels. Finally, metrics focus on measurement, and the recommendation is to look at metrics and the intersection of metrics and social media, tools, and channels. We have developed some future research questions based on the analysis, presented in Table 7.

9. Conclusion

The purpose of this study was to examine research in digitally mediated business-to-business marketing. This is the first study to provide an extensive and holistic review of literature on this subject. We reviewed the relevant literature published from 1999 to March 2019, using citation analysis, document co-citation analysis, and text mining. This study makes four major contributions.

First, it outlines the impact of authors, journals, institutions, and articles in the domain of digital mediation in business-to-business marketing. This literature profile provides a comprehensive introduction of digital mediation in business-to-business marketing literature to researchers in the domain of business-to-business marketing, introducing them in turn to publication resources.

Second, this study identifies four key subdomains of digitally mediated business-to-business marketing, using co-citation analysis and three different methods—hierarchical cluster analysis, multidimensional scaling, and exploratory factor analysis. The subdomains are a framework for digitally mediated business-to-business marketing, the digital business-to-business marketplace, value creation through digital marketing, and social media for business-to-business marketing.

This categorization provides a more granular view of the literature on the subject.

Third, this study uses text mining to delineate the development of digitally mediated business-to-business marketing literature in various areas over four different time periods—the emergence of research on the Internet and business-to-business technology; evolution of e-commerce; focus on social media; and the broadening of research.

Literature published in the first time period discusses the emergence of the Internet and business technologies. Most of the research in this time period centers on the role of the Internet and technologies in business-to-business marketing, exchanges, and transactions. The second period focuses on the evolution of e-commerce, on digital tools for the development of the buyer-seller relationship, and commercial transactions between buyers and sellers under the aegis of digital platforms. The subsequent time period's literature delineates the use of social media and emerging technologies in business-to-business marketing. Some prominent research areas include barriers to the adoption of social media by business-to-business marketers and the role of social media in strategic decision making. This time period also provided research on emerging technological trends like analytics and clickstream data. The last time period broadens the research on digital mediation in business-to-business markets with the examination of social media, sales, branding, processes, performance, and machine learning.

Finally, future research directions were identified using text mining of the future research directions of 50 articles published during the time period from 2015 to 2019. The analysis suggest a focus on the integration of social media and other areas such as tools, channels, models, and metrics. The authors hope that the paper serves as an impetus for future research in this area.

Appendix A

Formulae to calculate impact of articles, impact of authors and impact of Institutions

Table 3 - Impact of Articles Based on Citations per Year

- Citations per Year $= \frac{\text{Total Citations}}{\text{BY} - \text{PY}}$
  Where BY = Base Year i.e. 2019 and PY = Publication Year

Table 4 - Impact of Authors

- Author-wise weighted number of articles $= \sum_{k=1}^{n} \left(\frac{1}{\text{Number of authors}}\right)$
  Where k = number of articles by an author under consideration
- Author-wise weighted total citation $= \sum_{k=1}^{n} \left(\frac{\text{Citation of the article}}{\text{Number of authors}}\right)$
  Where k = number of articles by an author under consideration
- Author-wise weighted citation per year $= \sum_{k=1}^{n} \left[\left(\frac{\text{Citation of the article}}{\text{Number of authors}}\right) \text{X} \left(\frac{1}{\text{BY} - \text{PY}}\right)\right]$
  Where k = number of articles by an author under consideration
  Where BY = Base Year i.e. 2019 and PY = Publication Year

Table 4 - Impact of Institutions

- Institution-wise weighted number of articles $= \sum_{k=1}^{n} \left(\frac{\text{Number of authors from the Institution under consideration}}{\text{Total number of authors in the article}}\right)$

Where k = number of articles from the institution under consideration

- Institution-wise weighted citations $= \sum_{k=1}^{n} \left(\frac{\text{Citation of the article X Number of authors from the institution under consideration}}{\text{Total number of authors in the article}}\right)$
  Where k = number of articles from the institution under consideration

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