

# Mapping Top Strategic E-commerce Technologies in the Digital Marketing Literature

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**Abstract:** The increasing use of e-commerce technologies has been studied in several fields and from different perspectives: technological, economic, organizational and social: hence, the need for a literature review that provides a map of top strategic e-commerce technologies from a managerial perspective and, more specifically, for digital marketing research. This paper aims to provide researchers with a comprehensive overview of the range of e-commerce technologies that have had a significant role in shaping digital marketing strategies. Based on a thematic analysis, e-commerce technologies were classified through eleven categories. The objective is to reveal how each set of technologies affected the different digital marketing strategies. Both descriptive and clustering analyses show that the most evoked technologies in the digital marketing literature are Information and Communication Technologies and platforms. Results outline the growing interest in artificial intelligence technologies. Moreover, this literature review reveals how digital marketing research has focused on technology-enabled segmentation and targeting strategies, along with the use of social platforms and the development of new products and services. The scarcity of marketing papers studying the impact of cloud technologies, IoT, blockchain and data analytics orient researchers towards exploring further the potential of these technologies for digital strategies.

**Keywords:** E-commerce Technologies, Marketing Strategies, Literature Review, Thematic Content Analysis, Clustering

## Introduction

E-commerce has been growing rapidly alongside Internet and information technology in recent years, providing enormous opportunities and challenges for both demand and supply sides. Several studies have analyzed the growth of e-commerce in the last decade, and its interplay with consumer marketing strategy (Rosário & Raimundo, 2021). The evolution of e-commerce research was analyzed in three phases, from ecommerce to mobile commerce and

social commerce, including the concepts of business models, service relationships and technology (Yoo & Jang, 2019). The results highlighted various issues raised by practitioners and solutions suggested by researchers at each phase, but did not cover technologies deployed, nor the marketing aspects.

On the other hand, several publications have studied a single technology as a driver for digital marketing strategies. For instance, Mustak *et al.* (2021) presented a bibliometric analysis of the deployment of AI in marketing. Furthermore, Benslama and Jallouli (2020, 2022) provided a literature review (LR) of Social Media technologies for marketing purposes and drew a map matching social media data analytics with the following marketing strategies: (1) Segmentation, targeting and positioning (STP), (2) Product, service and brand, (3) Pricing, (4) Channel and logistics, and (5) Communication and influence strategy.

Besides considering single technologies, managers should take into account a set of technologies to evaluate companies' technology portfolios and support decision-making in the context of mergers and acquisitions (Hofmann, Keller & Urbach, 2019).

Based on the studies presented above, we can conclude that previous research in both business and computer science fields has attempted to reveal how technologies enable marketing decisions, but usually focuses on a particular technology or a specific marketing strategy or tool. However, with the remarkable growth of e-commerce and the development of innovative business models based on emerging technologies, it becomes insightful for managers and researchers to have on hand a map illustrating the whole set of e-commerce technologies that drive the innovative digital marketing strategies.

This study aims to respond to this gap, and present a thematic content analysis of papers published in the last three years evoking innovative digital marketing strategies that were transformed and enabled with the implementation of technologies such as Artificial Intelligence (AI), blockchain and Internet of Things (IoT). The objective of this research is to answer the following questions: What are the most influential technologies in terms of digital marketing strategies? Which digital marketing strategies were driven by these technologies and how? What are the understudied areas in this field that could be considered as relevant orientation for future research?

To answer these questions, this paper proposes a LR of selected journal papers published from January 2018 to November 2021. Selected papers mention “e-commerce technologies” and “marketing” as author keywords. Then, a thematic content analysis focuses on keywords, titles and abstracts of selected papers. Finally, a descriptive analysis and clustering technique are applied to the corpus.

This paper is organized as follows: The first section presents an overview of e-commerce technologies and data analytics tools, and defines the main areas of digital marketing that will be retained in this research. The second section explains the methodology used. The third section describes and discusses the main results related to thematic analysis of e-commerce technologies, descriptive analysis, cross analysis, and the clustering analysis. The last section includes the conclusion and lists recommendations for future research.

## E-commerce Technologies and Digital Marketing Strategies

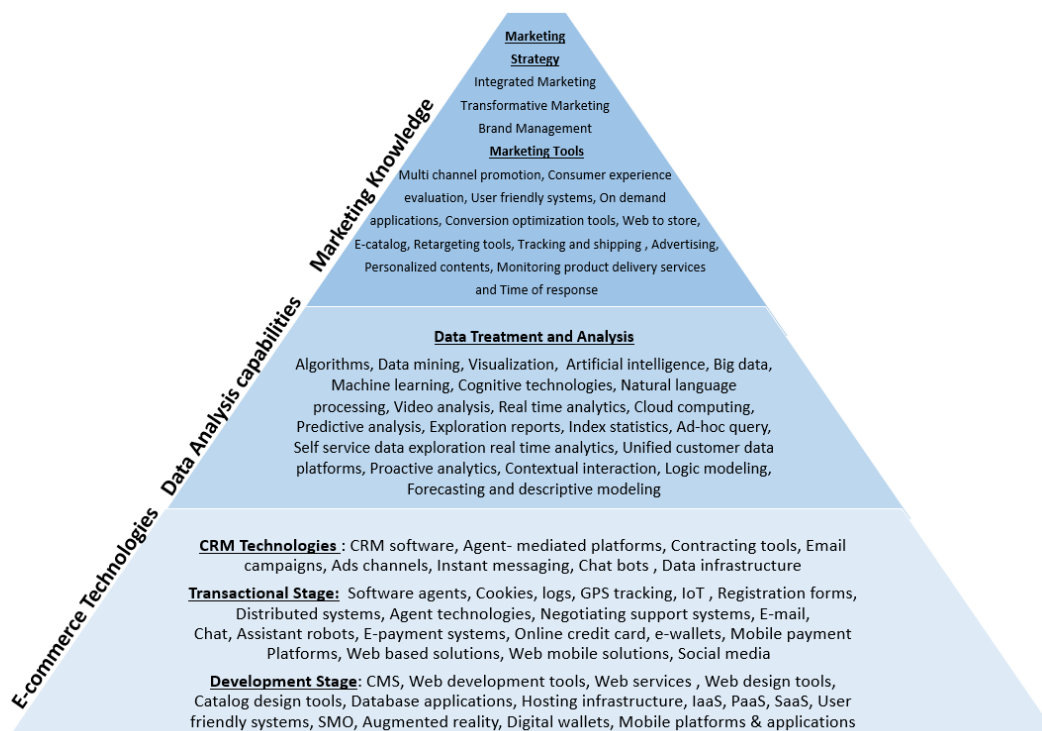
Adams et al. (2019) analyzed three types of strategic orientations – customer, technology, and combined customer/technology orientation – and studied their impact on innovation performance. According to Gartner (Nguyen, 2021), “Emerging technologies provide a strategic roadmap to firm differentiation over the next three to five years”. Several organizations such as Gartner and Forbes publish periodic reports on top impactful technologies to enlighten businesses regarding the opportunities for implementing these technologies at an early stage, and ensure strategic competitive advantage via innovative business models. According to Gartner (Nguyen, 2021), the top strategic impactful technologies in 2022 are AI, IoT, 5G, cloud technologies, quantum computing, augmented reality/virtual reality, data mining, visualization and blockchain technologies.

In addition to their impact on the effectiveness of e-commerce operations, emerging technologies, such as AI, IoT, and blockchain, are playing an insightful role in collecting relevant real-time data during the e-commerce process with the aim of well targeting, communicating and satisfying markets and communities of interest. Kaabi and Jallouli (2019) presented an overview of e-commerce technologies and data analysis techniques, and attempted to clarify the importance of the analytical phase for the extraction of marketing insights enabled with e-commerce technologies (Figure 1).

The following subsection attempts to structure the domains of digital marketing strategies and specifies for each strategy some examples of transformation driven by emerging technologies in the last years. Based on Campbell et al. (2020) and Kotler et al. (2017), marketing strategies are structured in five categories:

- (1) Targeting and positioning strategy (TPS), which includes analyzing the current situation, understanding markets and customers, customer/market selection, planning direction and objectives, and, finally, marketing investments. Emerging technologies such as mobile, cloud and Customer Relationship Management (CRM) technologies enable firms to understand customers’ requirements, develop marketing strategies of positioning and build relationships with customers, suppliers and other strategic partners. Identifying customers’ needs is the most important capability that

influences the positioning development process and digital strategies ([Butt & Ahmad, 2021](#)).



**Figure 1. Overview of e-commerce technologies, data analysis capabilities and marketing knowledge ([Kaabi & Jallouli, 2019](#))**

- (2) Product, service and brand strategy includes all decisions regarding product line, multi-product and portfolio strategies, new products' development, services and product quality, and brand management (Developing, positioning and managing brands). Collaborative platforms, IoT and CRM technologies are tools that help firms to co-create innovative products based on feedback from active virtual communities.
- (3) Pricing strategy (PS) includes technical, technological or market related processes that help define prices of products and services. AI, Recommender Systems (RS), visualization and modelling techniques are technologies that support decision making regarding the price strategy especially for digital businesses.
- (4) Channel and logistics strategy (CLS) includes channel management (strategy, design, and monitoring) and salesforce management (size, allocation, and compensation). IoT, AI, cloud and mobile technologies (MT) provide managers with valuable tools to allow the firm to manage several interconnected channels, including physical stores and online channels such as websites, CRM systems and platforms. The objective is to draw a total experience strategy based on the real-time data collected and analyzed with the aim to support intelligent decisions targeting customers.
- (5) Communication and influence strategy (CIS) includes promotion, advertisement management (Spending, planning and design) and Relationship management (Customer value assessment and maximization, acquisition and retention). Platform

technologies and privacy-enhancing computation are providing customers with the opportunity to play an active role and communicate intensively with the firm. Therefore, innovative digital content strategy and community management capabilities are becoming extremely important to collect relevant data and satisfy personalized needs of virtual communities ([Ayachi & Jallouli, 2022](#)).

These five areas of digital marketing will be adopted to map top strategic e-commerce technologies proposed in this LR.

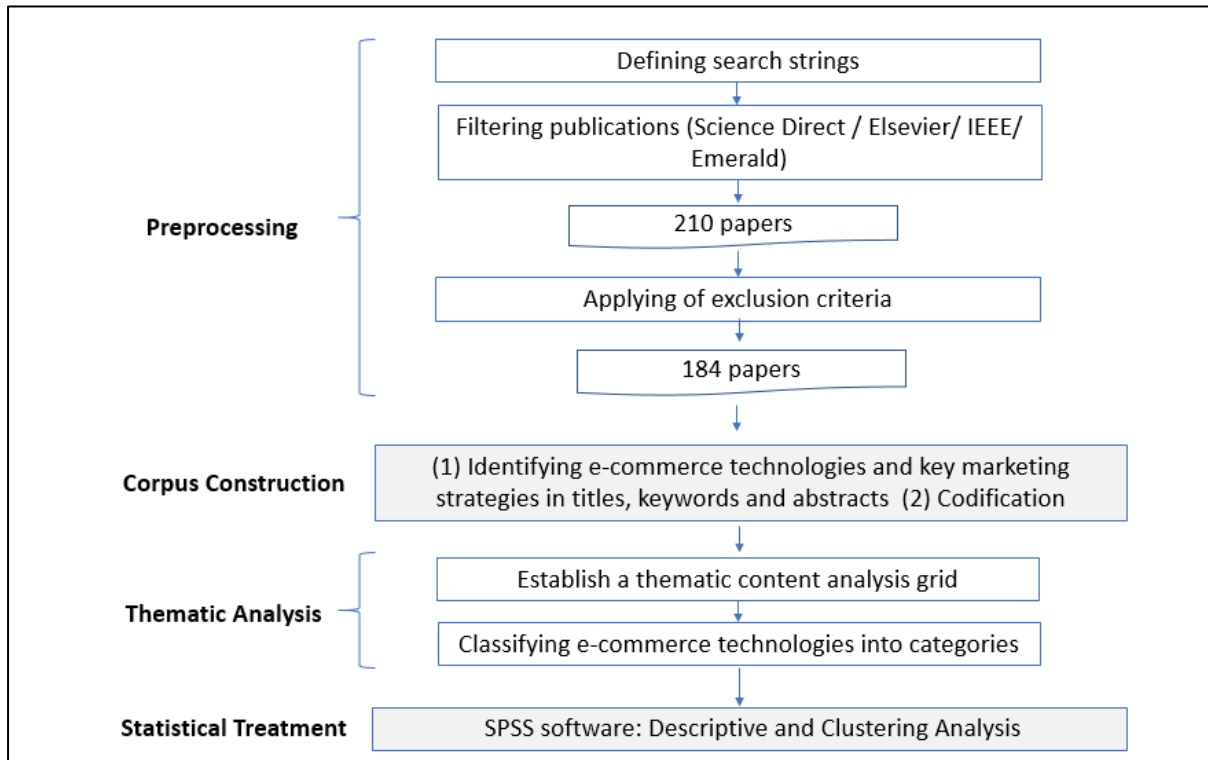
## Research Method

The aim of this study is to provide researchers with a map of top e-commerce technologies that have had a significant role in shaping digital marketing strategies, and to specify which digital strategies were mostly driven by these technologies and how. Indeed, the cycles of emerging technologies published by Gartner show that the ranking of top technologies changes in a significant way every 2 to 3 years. Hence, this study targets research papers published from January 2018 to November 2021. The data collection is based on a search of the terms “e-commerce technologies” and “Marketing” in search engines of, respectively, Springer, Elsevier, IEEE and Emerald. Springer and Elsevier are the top-ranked editors in terms of number of journals ([Pagliaro, 2020](#)). IEEE and Emerald were selected due to their focus and high number of publications, respectively, on technologies and business strategies. This LR does not pretend to be systematic, but, rather, is exploratory research that could be extended in future work with an exhaustive list of all editors that publish in this area.

Only papers in English language were retained. This stage enabled the selection of 210 papers. The second step consists of floating reading of titles, keywords and abstracts. Exclusion criteria are duplication, editorials, prefaces, proceedings, corrections or papers out of scope. Twenty-six results were eliminated for the following reasons: 2 duplications, 8 editorials, 6 prefaces, 1 proceedings, 1 correction and 8 papers out of scope. The third step consists of a content analysis focusing on titles, keywords and abstracts of the 184 papers retained ([Shim et al., 2019](#)).

After performing a floating reading and rereading that identifies e-commerce technologies along with the digital marketing strategies, the division of the corpus was carried out according to a thematic content analysis grid. The purpose of this step is to apply statistical treatments, using SPSS software, on the corpus of data. The coding was applied as follows: number one is assigned to the theme if the related term (e-commerce technology or marketing strategy) is present in the corpus (title, keywords and abstracts); and number zero is assigned if the theme is not cited in the corpus. The final step is the thematic content analysis where technologies

cited in the corpus were classified into categories. [Figure 2](#) illustrates the research method adopted.



**Figure 2. Process of corpus identification, construction and treatment**

The final grid includes 184 lines (papers) and 5 columns of marketing strategies, 11 columns of e-commerce technologies, and 3 additional columns mentioning the name of the Publisher, the year of publication, and the Impact factor of the journal.

## Research Findings and Discussion

This section is structured as follows: after a short description of the corpus, a first subsection is dedicated to the thematic analysis that aims to propose a categorization of e-commerce technologies. These categories will be useful to build the cross tables showing technology-enabled strategies in the studied corpus. The second subsection presents the results of the clustering technique that help to draw the map of top strategic e-commerce technologies linked with marketing studies.

The overall set of papers is composed as follows: 94 papers selected through Elsevier; 35 papers selected through IEEE; 29 papers selected through Emerald library; and 26 papers selected through Springer. Fifty-nine papers were published in 2018, 78 in 2019, 29 in 2020, and 18 in 2021. The Impact factors of the journals in which the papers were published have values between 0 and 9.50 ([Table 1](#)).

**Table1. Impact Factor (IF) of selected journals**

	N	Minimum	Maximum	Mean	Standard Deviation
<b>IF</b>	184	.00	9.50	2.83	2.14

## Thematic analysis and categorization of e-commerce technologies

E-commerce technologies refer to services, capabilities, practices and solutions used in the context of e-commerce. This section explains the thematic content analysis of revealed technologies in the studied corpus. The corpus included mention of many e-commerce technologies, such as IoT, blockchain, information and communication technologies (ICT), virtual reality (VR), big data, data mining, AI, workflow, resource sharing, Business intelligence (BI), platforms, decision-making, RS, algorithms, stochastic process, data visualization, payment, web programming, security, telecommunication, MT, algorithms and web-crawler technology.

Revealed terms related to e-commerce technologies are then sorted into the eleven categories shown in [Table 2](#). Related terms are gathered in the same category. For example, “mobile devices”, “mobile applications” and “mobile programming” are regrouped in the category MT. Classification was based on the occurrence in the abstract, title or keywords of the exact name of the category or terms that are related to the category. Technologies with rare occurrences were associated with other keywords to obtain categories with a minimum of five occurrences.

[Table 2](#) summarizes the content analysis of e-commerce technologies. The second column presents the total number of terms cited for each category. The third column presents all terms related to the same technology.

Results show that Platforms and ICT are the most evoked technologies in the corpus. These two categories are regrouping a large set of essential technologies and infrastructure related terms. The high number of their occurrences could be explained by the high common understanding of these technologies and their popular use in e-commerce projects. The two categories that are ranked in the third and fourth places in terms of occurrence are AI and DSS. This result confirms the increasing focus on AI technologies in the field of marketing.

**Table 2. Categorization of e-commerce technologies in the corpus of scientific papers**

<b>Categories of E-commerce technologies</b>	<b>Frequency</b>	<b>Related terms as cited in the corpus</b>
CLOUD	5	cloud
BLOCKCHAIN	5	blockchain, bitcoin, Ethereum
IOT	11	IoT



Categories of E-commerce technologies	Frequency	Related terms as cited in the corpus
MT	12	mobile computing, mobile commerce, mobile devices, mobile services, mobile applications, mobile payment, smartphone games
ICT	37	ICT, E-commerce, telecommunication, fiber channel, network optimisation, new generation networks, machine-to-machine communication, IT, information systems, fintech, virtual reality
IT SERVICES	16	workflow, resource sharing, self-service parcel delivery service, website ranking, web programming, web 2.0
SECURITY	13	electronic signature, trust, two-factor authentication, secure system, encryption, e-commerce vulnerability, computer security
PLATFORMS	39	social networks, e-commerce platform, third-party websites, multi-sided platform, third-party payment, social information systems, dual-purposed information systems
AI	32	mobile agent, agent system, deep learning and RS, neuronal networks, reinforcement learning, chatbot, AI, prediction algorithm, training, machine learning, deep learning
DATA ANALYTICS	16	machine learning, BI, big data analytics, big data and decision support systems, data visualization, data mining and RS, Big Data, data mining data
DECISION SUPPORT SYSTEMS (DSS)	25	RS, decision making, decision support systems, multiple-criteria decision-making, cluster analysis

Indeed, several special issues and conferences were dedicated to the deployment of AI in marketing strategies, such as in *Journal of the Academy of Marketing Science* and *International Marketing Review* (Davenport et al., 2020; Grewal et al., 2020; Turban et al., 2018). Companies need AI applications to process business data and to make the shopping experience more personalised. Dau and Salim (2019) for instance proposed a sentiment-aware deep RS based on the neural networks paradigm. Thanks to the power of AI, online retailers provide chatbot services and analyse customer comments. Multiple e-commerce platforms use multi-agent systems in various contexts, such as e-commerce logistics (Barenji et al., 2019).

## Strategic e-commerce technologies in marketing research

Regarding the frequencies of marketing strategies driven by e-commerce technologies, the evoked terms are sorted within five groups as detailed in [Table 3](#).

**Table 3. Occurrences of Marketing Strategies**

Marketing strategies	Frequency
Segmentation, Targeting and Positioning strategy (STP)	92
Product, service and Brand strategy	65
Pricing strategy	9
Communication and influence strategy	45
Channel and logistics strategy	120



[Table 3](#) shows that channel and logistics strategy occurs with 120 papers out of 184. This finding outlines a focus on improving the current solutions provided by ICT and platforms for marketers to exploit the full potential of e-commerce opportunities in terms of channels and logistics. Marketing research attempts to explain and study new ways of delivering products and services based on opportunities offered within an e-commerce context.

Moreover, results shows that 92 among 184 studied papers in this LR focus on STP strategies. This result highlights the role of emerging technologies in segmenting and targeting markets. Indeed, market segmentation is based on data collected and analyzed to better understand the needs and evolution of the market segments. ICT and platforms play an increasing role to help collect in real time a huge volume of data about the socio-demographic characteristics of clients and prospects, the consumer experiences, and the trends of consumption in the future. Based on collected data, decision support systems and data analytics help marketers to draw effective strategies of targeting and positioning.

Product, service and brand strategy occupies the third place in terms of occurrence, with 65 papers. This result indicates the role of ICT and platforms in the STP strategy, which affects in a significant way the product, service and brand strategy. AI technologies are helping to customize services delivered to each segment. Indeed, researchers and marketers are more and more focusing on branding strategy in response to customer needs and feedback.

[Table 3](#) indicates also that 45 papers out of 184 studied the communication and influence strategy. Indeed, platforms, MT and AI are technologies that support the communication strategy. More specifically, social networks, e-commerce platforms, data analytics, RS, chat bots and web services are tools that marketers are implementing to obtain effective communication decisions.

Finally, pricing strategy occurs rarely in papers studying e-commerce technologies. Data analytics and decision support systems are the main technologies involved in this area. Consequently, the low cost of network access and e-commerce transactions, and the development of cloud and AI technologies are future investigation areas about how the marketing pricing strategy takes advantage of these advances.

Results of cross analysis show the main associations between retained categories of technologies and marketing strategies in the corpus ([Table 4](#)).

Cloud technology contributes to orienting the product, service and brand strategy, mainly with the development of cloud micro-services and cloud service platforms that enhance business performance. The integration of cloud technologies and big data infrastructures contributes to performing logistic strategy based on real-time data and transforms the way e-commerce firms do business ([Barenji et al., 2019](#); [Li et al., 2019](#)).

Moreover, blockchain technology provides solutions to STP strategies especially in the data market. As an example, a blockchain-based fair data trading protocol provides data consumers with information that guarantee fairness and traceability of data providers (Liu *et al.*, 2019). Blockchain technology allows also automation of high-volume tasks, such as reconciliations, payments and settlements, and contributes to implementing end-to-end instrumented data-rich micro-segmented supply chains (Liu *et al.*, 2019; Narayanaswami *et al.*, 2019).

**Table 4. Cross analysis of 'Marketing strategies' and 'E-commerce technologies'**

<b>Technology</b>	<b>Cloud</b>	<b>Blockchain</b>	<b>IOT</b>	<b>MT</b>	<b>ICT</b>	<b>IT services</b>	<b>Platforms</b>	<b>AI</b>	<b>Data Analytics</b>	<b>DSS</b>	<b>Security</b>
<b>Strategy</b>											
<b>STP</b>	0	3	4	6	15	9	18	15	8	12	6
<b>Product, service &amp; brand</b>	3	5	7	5	14	10	12	14	7	8	2
<b>Pricing</b>	0	0	0	1	0	1	0	1	0	2	0
<b>Communication &amp; influence</b>	0	3	3	3	6	6	11	10	5	5	3
<b>Channel &amp; logistics</b>	3	2	8	8	25	12	24	19	9	16	10

Table 4 shows that IoT, MT, ICT, IT services, platforms, AI, data analytics, decision support systems and security are mostly studied in relation to the channel and logistics strategy. Indeed, new perspectives of e-commerce channels are raising in the literature, such as the theoretical and practical features of sustainability (Shukla, Mohanty & Kumar, 2018). Exploring and evaluating aspects and performance of e-commerce channels call up a set of related technologies such as IoT, MT and security (Liu *et al.*, 2019). In addition, data analytics techniques and decision support systems, like, for example, fuzzy cognitive maps, provides researchers and practitioners with tools that aid in strategizing decision situations related to evaluation and improvement of e-commerce channels (Shukla, Mohanty & Kumar, 2018).

Finally, the results highlight the rising number of papers associating AI with STP, product, and channel strategies, especially in the last two years. Indeed, an increasing number of researchers have implemented AI tools combined with big data, virtual reality and augmented reality to conceive new products and services that meet the consumers' need (Huang & Rust, 2021). Fashion and tourism sectors are among the most concerned with the implementation of this set of technologies, especially because of the high use of social platforms providing researchers and practitioners with contextualized data about the product, the brand and the preferences of consumers and prospects (Koubaa & Jallouli, 2019; Samara, Magnisalis & Peristeras, 2020; Silva & Bonetti, 2021).

## Clustering analysis

Clustering is the process of grouping a set of objects into classes of similar objects. There are two types of algorithms for clustering: flat, also called partition algorithm; and hierarchical algorithm (Ramasubbareddy *et al.*, 2020). Based on the cluster hypothesis, papers in the same cluster behave similarly regarding the presence of e-commerce technologies and key marketing decisions. In this study, there was not an *a priori* number of clusters; a hierarchical clustering was therefore adopted. This method produced a family of clustering options represented by a dendrogram from the set of 184 selected papers. There are many variants to define the closest pair of clusters: Single-link (Similarity of the most cosine-similar); Complete-link (Similarity of the “furthest” points, the least cosine-similar); Centroid Clusters whose centres of gravity are the most cosine-similar; Average-link, calculated based on the average cosine between pairs of elements.

In this study, we tried all these methods, and then we retain the results of the centroid variant, which has provided the better representation that maps how the eleven categories of e-commerce technologies have affected the five digital marketing strategies. A good clustering should produce high quality clusters in which the intra-class (intra-cluster) similarity is high, and the inter-class similarity is low. Figure 3 presents the dendrogram using a centroid linkage applied to the 184 papers published from 2018 to 2021.

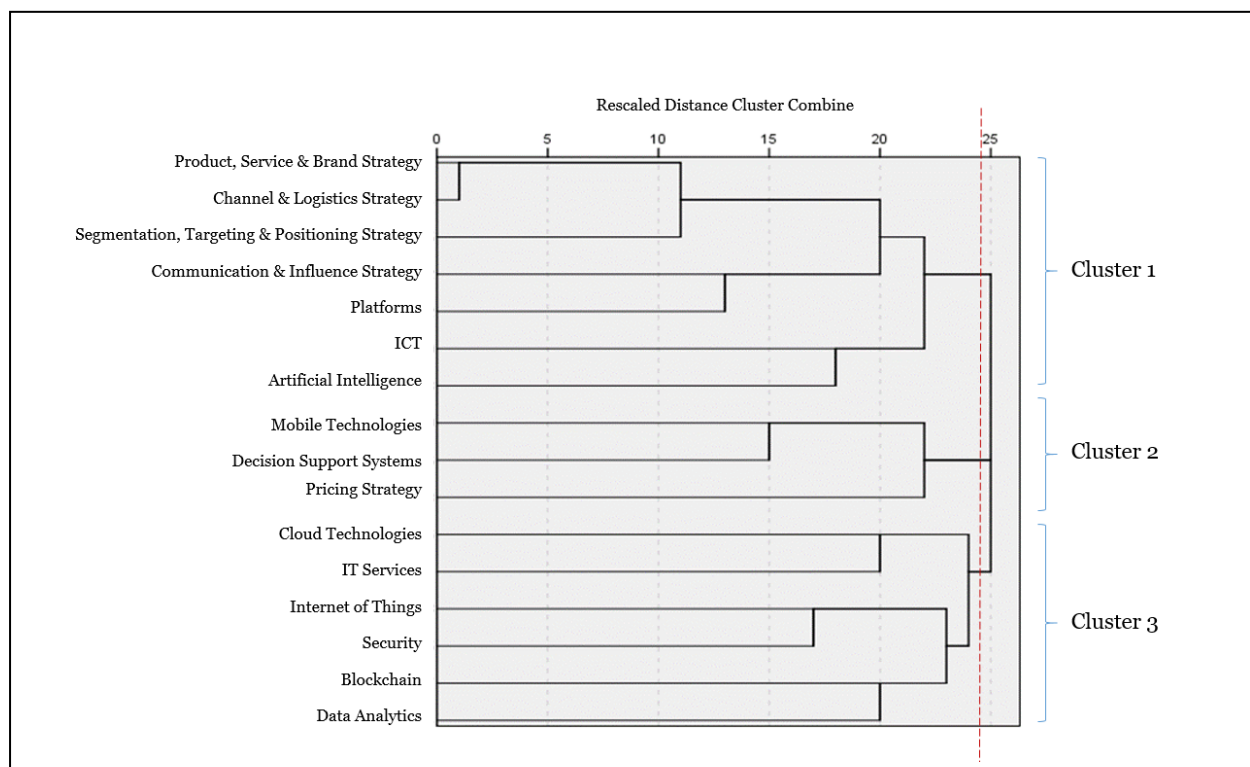


Figure 3. The dendrogram using a centroid linkage

Based on the hierarchical clustering method, studied papers mentioning “e-commerce technologies” and “marketing” are divided in three groups that behave differently.

The first cluster links all marketing strategies, excluding pricing, with AI, Platforms and ICT. [Table 4](#) indicates that these three technologies are widely studied by marketing researchers in the last four years. As explained earlier, ICT and Platforms are general terms and were largely evoked in marketing papers, especially in relation to communication and influence strategy.

More specifically, marketing researchers were highly interested in studying social media contents to meet virtual community’s needs. Indeed, marketing researchers are appealing to text-mining techniques, such as topic modelling, sentiment analysis and classification, to extract insightful marketing knowledge and guide marketing decisions ([Adams et al., 2019](#)).

Moreover, AI is gaining interest in the published papers, especially during 2021. The number of studies that link AI with product and brand strategy, channel and logistic strategy and STP strategy has risen at a remarkable rate. Consequently, several frameworks for strategic marketing planning incorporating AI benefits have been proposed ([Huang & Rust, 2021](#)).

The second cluster consists of papers that studied MT and decision support systems in relation to pricing strategy. Based on [Table 4](#), the number of papers in this cluster is relatively low. Future marketing research is expected to further explore how new technologies in general, and more specifically MT and decision support systems, enable managers to design profitable pricing strategies based on collected demographic and real-time contextualized information about prospects and customers.

The third cluster defines papers evoking cloud technologies, IT services, IoT strategy, security, blockchain and data analytics. This cluster concerns papers that focus more on technical aspects and show weak association with marketing strategies. [Table 4](#) illustrates the low number of papers studying specifically cloud and blockchain technologies in relation with marketing strategies. This area is indeed a recommended field for future studies, especially with the high performance that cloud computing is offering regarding the cost of IT services, and also the large set of mobile applications based on IoT technologies with high potential for meeting user needs.

The results of the hierarchical clustering highlight the relevance of initiating more research projects on e-commerce technologies and marketing strategies, involving researchers from the fields of computer science and marketing.

## Conclusion and Directions for Future Research

Recent advances in technologies have been widely integrated into the different phases of e-commerce process. Marketing literature has been deeply impacted by the transformation of

strategies and tools integrating emerging e-commerce technologies. This paper has described a LR of 184 papers published from January 2018 to November 2021, evoking a set of e-commerce technologies in association with marketing strategies, namely, STP strategy; product and brand strategy; pricing; channel and logistics; and, finally, communication and influence strategy.

This study followed a rigorous process of identification, construction and treatment of retained papers, using a thematic analysis and statistical treatments with SPSS software. Thematic analysis allowed sorting the revealed e-commerce technologies, and classifying them into eleven categories, namely: blockchain, MT, ICT, security, platforms, Internet services, AI, cloud computing, IoT, data analytics, and decision support systems. This categorization is insightful to guide future research in the area of e-commerce technologies and marketing, especially future LRs, since this classification provides essential keywords to adopt in the stage of corpus identification.

Moreover, results show that platforms, ICT and AI are the most studied categories in association with digital marketing strategies. This finding sheds light on the increasing focus in the marketing literature on new methods and tools, such as netnographic studies and text mining techniques applied by researchers and practitioners to explore social media contents and meet virtual communities' needs.

In addition, this research highlights the increasing number of papers studying the potential of AI in the marketing context, linked mainly with product and brand strategy, channel and logistic strategy and, finally, STP strategy. However, few papers linked MT and decision support systems with pricing strategy. This result defines, then, a relevant gap to study in the future, and invites marketing researchers to explore more technologies, such as cloud technologies, that provide opportunities to design profitable pricing strategies.

Finally, this LR outlines that few marketing papers have studied in depth the technical features of a range of technologies, such as IoT, big data and blockchain, and their contribution to shape effective digital strategies. Hence, there is relevance in future joint projects involving researchers from the fields of computer science and marketing management to focus more on understudied e-commerce technologies and reinvent digital marketing practice and research.

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