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Quantitative analysis of the development of digital marketing field: Bibliometric analysis and network mapping

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Introduction

In 1978, two computer fans, Ward Christensen and Randy Suess, decided to invent a digital system to inform their friends about meetings, make announcements, and share information (Glenn, 2012). The invention of this system was the beginning of a transformational era in the world of communication between customers and businesses and the development of interactive and engaging digital marketing systems (Paradkar, 2016). With many disruptive marketing technologies available, marketing research has entered into a new phase of its evolution (Walsh, 2004). The democratization of information and the increasing number of technologically savvy customers have also ignited novel research trends in the marketing literature. Digital transformation, in general, is a change where digital artifacts, systems and symbols are utilized both within and around an organization (Bonfour, 2016). Digital transformation, therefore, is different from digitalization, which means other areas of the enterprise that are generally reformed around digital technologies (Delgosha, Saheb & Hajiheydari, 2020; Soltani Delgosha, Haji Heydari & Saheb, 2020). As it is defined, digital marketing has emerged to employ "digital technologies to create an integrated, targeted and measurable communication which helps to acquire and retain customers while building deeper relationships with them" (Drennan, 2002; Petit, Velasco & Spence, 2019; P. K. Kannan & Li, 2017; Reibstein, 2002).

Digital marketing influences the effectiveness of all departments of an organization, from customer feedback, customer service, product enhancement, sales, and finance/payment to delivery, administration and marketing departments (Chaffey, Smith & Paul, 2013). Digital marketing responds to consumers' behavioural changes ubiquitously using digital platforms, such as social media and smartphones (Pinheiro et al., 2014). The changes mentioned above in the market have positioned digital marketing as a new discipline within marketing. Soon it will become inevitable to understand if marketing research is redesigned and evolved to be inconsistent with disruptive market needs (Wymbs, 2011;Royle & Laing, 2014;Watanabe, Naveed & Neittaanmäki, 2018).

The evolution of scientific progress in the field of digital marketing has been conducted narrowly, as most of the quantitative studies have a narrow research topic and focus either on one aspect or one tool of digital marketing (Ávila-Robinson & Wakabayashi, 2018; J. Kim & McMillan, 2008; Most, Conejo & Cunningham, 2018). Moreover, most of the previous studies are highly qualitative, relying mainly on the judgement and expertise of experts (Dehabreh, Chung, Kitsois GD & Et al, 2012; Garg, A. X., Hackam, & Tonelli, 2008; Mallett, Hagen-Zanker, Slater, & Duvendack, 2012). Therefore, there is a scholarly need to complement previous scholarly insights with a quantitative assessment of research of all digital tools and aspects of digital marketing. This study investigates the scientific evolution of "digital marketing" as a broad scientific term instead of narrowly defined terms, such as internet marketing. Our goal is to integrate and study all sub-disciplinary silos of digital marketing research.

This study is a bibliometric analysis and mapping of scientific research on digital marketing. Quantitative literature review methods enable researchers to use literature data to measure scientists' and researchers' performance and productivity and identify the emerging research fields (Daim, Oliver, & Kim, 2013). These quantitative methods as the measurement of literature and texts will "capture some of the information inherent in the content and patterning of the literature…[and] to measure and interpret technological [and scientific] advances" (Kahraman, Kerre, & Bozbura, 2012). Previous studies confirm that bibliometric analysis and mapping can be effective approaches in assessing various scientific fields' development has been expanded rapidly in recent years as the number of analytical tools with more significant computing power increases (Cobo et al., 2011). The analytical tools, such as VOSviewer, have enabled mapping bibliometric data through network and visualization approaches (Waltman, van Eck & Noyons, 2010). The major strength of combining bibliometric analysis with bibliometric mapping is uncovering the interrelations between scholarly research by using network approaches, main research areas (nodes), their size, and their level of interaction (edges). Bibliometric mapping quantifies details regarding a field's knowledge structures composed of clusters, topics, and direction (Cronin & Sugimoto, 2015; Verbeek et al., 2002).

This paper aims to uncover the knowledge structures and clusters of digital marketing and the dominant growth directions in the field to find research topic bursts and trajectories. It also seeks to identify the most influential contributors to the area. To this end, this paper incorporates various bibliometric techniques, including co-citation analysis,

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bibliographic coupling, and burst detection. We then map and visualize the findings in the form of social networks.

The main research question of this paper is: what are the scholarly trends in scientific research about digital marketing in journals published between 1900 and 2020? The secondary objectives of this research are:

1 What are the most elements within the scientific research on digital transformation of marketing?
2 What are the hot research clusters and keywords in the field of digital transformation in marketing? And how their development has evolved over time?

Theoretical contributions to this research are as follows: First, research on traditional marketing or a limited scope of digital marketing, such as internet marketing, does not provide a whole picture of research evolution on digital marketing. The findings of this research will provide a comprehensive map of research trends on digital marketing. The study will also shed light on traditional marketing literature that is changed by digital marketing strategies. Second, the findings of this study will shed light on the impact of digital technologies on the evolution of digital marketing research. Third, this study can answer concerns regarding the relevance of digital marketing as a discipline in the business world. It can increase understandings if scientific endeavours in digital marketing have kept up with the disruptive dynamics of the business world. Understanding the evolution of scientific research on digital marketing will help identify research gaps and future research needs. Fourth, there has been no scholarly effort to map the most influential contributors in the digital marketing field. This research is deemed necessary to provide a comprehensive view of the scholarly research on digital marketing and a guide for future research.

This study is beneficial for researchers and academia, but it will benefit managers and businesses. Practically, this study will better understand scientific research on digital marketing in the digital economy. Understanding the research trends and voids will assist in increasing the responsiveness of research on digital marketing to the needs of the business community and practitioners. This understanding will help the managers to better design and implement their digital marketing strategies. On the other hand, this research will assist researchers in understanding how technological development has influenced the research trends of digital marketing.

This article is composed of the following sections: We first review the previous studies that have examined the marketing literature. Then we describe in detail our research method, data collection procedure, and analytical mechanisms and tools that we employed. In the next section, we describe the findings and results of our analysis. We conclude the paper with our discussion of the paper's results, theoretical and practical contribution, limitations of our research, and possible future works.

Theoretical framework

As Table 1.0 shows, however, quantitative bibliographic methods have been applied to study marketing literature in general; almost all the reviews of digital marketing, to our knowledge, have qualitatively studied digital marketing to synthesize research evidence. The main difference between this study and previous studies is that it does not narrow the research topic or focus on a specific aspect or channel of digital marketing. The current study aims to overcome the above limitations and complement previous studies. Moreover, compared to previous studies, this study analyses a large amount of data over 50 years. Furthermore, this study integrates various bibliometric analysis and visualization techniques to portray the research trajectories of digital marketing more comprehensively.

Statistical analysis of the scientific literature started almost 50 years ago when the bibliometric analysis was introduced (Glänzel & Glänzel, 2003). Text mining and visualization methods have been used in various studies(Karami et al., 2021; Rawat et al., 2021). Moreover, quantitative review methods surpass the limitations of qualitative research methods. These methods " seemingly remove the element of qualitative and subjective assessment, with all its attendant problems of personality and politics and fallible human nature, found in peer and panel review models" (Goldfinch & Yamamoto, 2012). Bibliometric Analysis provides a quantitative analysis of academic literature (De Bellis, 2009). It is defined as applying mathematical and statistical methods to books and other media of communication by showing and describing tendencies in different areas of knowledge (Vargas-Quesada & Moya Anegón, 2007). Citation analysis was introduced to make the "communicative structure of science" visible (De Bellis, 2009) by mapping and visualizing the citation networks. Some scholars even argue that citation networks may contribute to more efficient science (Moed, 2005). With the advent of mapping and visualization tools, scholars have stepped toward visualizing bibliometric data into networks to depict social structures using network theory and graph theory (Meghanathan, 2018). These methods characterize network structures in terms of nodes and edges. Nodes can be individual actors, people, or things of a network, and edges are links and interactions of the nodes that connect them.

Marketing as a scientific discipline has also been studied by incorporating bibliometric techniques. As Table 1 shows, previous reviews of digital transformation in marketing are minimal and have studied internet marketing (Ngai, 2003), social media marketing (e.g. Alalwan et al., 2017; Misirlis & Vlachopoulou, 2018; Salo, 2017) and mobile marketing (e.g. Ström, Vendel & Bredican, 2014). Very few studies have reviewed digital marketing (P K P. K. Kannan & Li, 2017) as a general scientific term. Previous studies have explored digital marketing qualitatively and quantitatively, and all of them explored one tool or one aspect of digital marketing. Some qualitative studies have examined social media marketing (Alalwan et al., 2017; Misirlis & Vlachopoulou, 2018; Salo, 2017), mobile marketing (Ström et al., 2014), internet marketing (Ngai, 2003), and strategic marketing (Brown et al., 2018). These studies have a narrow scope and typically examine a limited number of publications from a handful of journals. The results are highly flexible based on the judgement of experts. One of the studies that have specifically focused on digital marketing proposes a framework for research on digital marketing. The authors address the critical touchpoints influenced by digital marketing (P.K. P. K. Kannan & Li, 2017). These areas are the environment, outcomes, market research, and marketing strategy.

In a study of internet advertising, the authors (Kim & McMillan, 2008) conducted a bibliometric analysis of the academic literature on internet advertising to explore the current status of scholarly research and how this research has shaped the internet advertising field. The authors focus on the influential cited works, the most cited authors, the most cited papers, the underlying themes amongst the most cited works, and the co-citation networks amongst significant cited works to show the key influences and influencers through implementing citation analysis. One of the critical findings of their research is that interactivity is an essential concept in scientific research on internet advertising. Another study (Valenzuela Fernandez et al., 2018) conducted a bibliometric analysis and mapping of the most influential universities and countries researching industrial marketing. Their analysis shows that British authors and institutions are the most productive authors.

In another study, the authors (Ávila-Robinson & Wakabayashi, 2018) combined evidence-based analytical methods, including bibliographic coupling networks, portfolio analysis charts, co-word relationships, and circular plots to study the knowledge structure of research on destination marketing; its interconnections, research fronts and research trajectories. They identified 10 clusters in research on destination marketing. Another study (Most et al., 2018) examined the topical structure of entrepreneurial marketing (EM) by integrating four methods of bibliometric analysis, including co-citation and bibliographic-coupling analyses, network analysis, factor analysis and correspondence analysis. They identified seven topical Meta clusters in their research. Table 1 compares this study with the previous studies that conducted a bibliometric analysis of marketing research.

Table 1
A comparison Study of previous studies conducting bibliometric analysis of scientific marketing research.

Source	*Theoretical Framework*	*Methodological Framework*	*Objectives of the research*	*Research Approach*
This study	*Statistical analysis of digital Marketing research*	*Integrated Bibliometric Analysis and mapping consists of Bibliographic coupling, Co-citation analysis, Burst detection analysis,*	*To assess the scientific evolution of digital marketing by incorporating integrated techniques of bibliometric analysis and mapping*	*Bibliometric Analysis and mapping of scientific papers from 1974 until 2020*
(Kim & McMillan, 2008)	Citation analysis of internet advertising	1-Citation and co-citation analysis	To explore the current status of the scholarly research on internet advertising and the ways academic research have shaped the internet advertising field	Citation analysis of 113 papers extracted in 10 years
(Ávila-Robinson & Wak-abayashi, 2018)	Statistical analysis of destination marketing	Integrated Bibliometric mapping consists of evidence-based analytical methods, including bibliographic coupling networks, portfolio analysis charts, co-word relationships, and circular plots.	To study the knowledge structure of research on destination marketing; its interconnections, research fronts and research trajectories	Bibliographic data of 49 tourism and hospitality management studies
(Most et al., 2018)	Statistical analysis of entrepreneurial Marketing	A four-phase bibliometric research design composed of co-citation and bibliographic-coupling analyses, network analysis, factor analysis and correspondence analysis	To examine the topical structure of EM's literature	Bibliographic data of 302 publications on EM
(Valenzuela Fer-nandez et al., 2018)	Statistical analysis of industrial marketing	Bibliometric Analysis and mapping of the most influential countries and universities	To determine the most influential countries and universities in the field of industrial marketing research.	Bibliometric Analysis of papers on industrial marketing

Regarding literature themes, the studies have identified various themes in literature. For instance, in a study of social media in marketing, the authors identified the following key themes: social media and advertising, electronic word of mouth, CRM, brand, customer behaviour ad perception, adoption and organizational culture (Alalwan et al., 2017). Another study (Misirlis & Vlachopoulou, 2018) identifies the following key themes: consumer behaviour research, engagement, awareness and branding, social capital, predictive marketing, relationship marketing and electronic word of mouth advertising and promotion. To one study by Salo, (2017), the main themes of social media in industrial marketing are advertising, buyer-seller relationship and business network domain, computers in business markets, decision support and management sciences, public relations and marketing, marketing communication and sales. In studying mobile marketing, one study (Ngai, 2003) limited its analysis of mobile marketing literature to mobile device value creation. In reviewing the fundamental concepts of digital marketing, one study (P K P. K. Kannan & Li, 2017) identified the following concepts: consumer behaviour, social media, platforms, two-sided markets, search engines, contextual interaction, marketing research and strategy, consumer behaviour, user-generated content, promotion, place and marketing outcomes. In their bibliographic study of internet advertising, the authors (Kim & McMillan, 2008) identified five themes: interactivity, electronic commerce, advertising and persuasion, effectiveness and traditional media.

From this analysis, we can conclude that these studies have identified a limited number of themes; without identifying their timeline and burst period of keywords and terms. In these qualitative review studies, the keywords and concepts are drawn from the literature based on the expertise and knowledge of researchers. It is also unclear what words form a theme (or a cluster or a community) and what links exist between the words of a theme. It is also unclear how strong the themes are linked together. These studies do not assess the semantic similarity as well. The similarity analysis measures that the keywords or the themes in close proximity or location to each other tend to be more strongly linked.

Research method

This section describes the research methods we employed to conduct bibliometric analysis and visualization of the digital marketing field. This part describes the data collection procedure, the text preprocessing processes, and the bibliometric analysis and visualization methods that we incorporated in this study. These methods are bibliographic coupling, co-citation analysis, and burst detection analysis.

Data collection

We collected data from the Web of Science (WOS) database. We searched for the following keywords as the "topic" of papers from 1900 to 2020 on the WOS Core Collection Database. We searched for the following keywords: digital marketing, social media marketing or Bluetooth marketing, or mobile marketing, or email marketing, or SMS marketing, or proximity marketing, or beacon marketing. The timespan was all years. In total, 29,123 documents were extracted. In sum, the research population is all documents that have the keywords above as their "topic," and was published from 1900 till 2020 and was indexed in the WOS core collection database.

Text preprocessing

We applied some preprocessing procedures to maximize the value of texts (i.e. tokenization, stemming, and stop-word removal). The first step of preprocessing our text data was tokenization, which takes raw data as an input and cleansed tokens as an output (Anandarajan, Hill & Nolan, 2019; Delgosha, Hajiheydari & Talafidaryani, 2021). Then, words with special characters or numerical values were removed, and a list of tokens became the input of the stemming or the stop-word removal procedure (Taeho, 2019). Stemming maps each token into its root forms, such as plural nouns converted into their singular forms. For instance, "better" and "best" will be converted into their root form, which is "good." The next step was removing stop words from the list of tokens or stemmed words. Stop words are words that are extremely common, like articles and prepositions (Abraham et al., 2018; Taeho, 2019). This procedure cleans the data and is ready for reliable text analysis (Hajiheydari et al., 2019).

Table 2
Connection of research methods to the research objectives of the research.

Objectives of the research	Techniques were used
What are the most influential cited works and sources in the field of digital marketing? Who are the most cited authors?	Co-citation analysis of references Co-citation network of sources Co-citation analysis of authors
What are the major knowledge structures, research themes, and clusters in digital marketing research? Their interconnections, topic and research bursts and trajectories	Bibliographic Coupling Burst detection

Bibliometric analysis and mapping

Bibliometrics is the quantitative analysis of bibliographic data of unstructured texts, like scientific literature (Eom, 2009). In recent years, many studies have been conducted to analyse the trend of scientific research by using bibliographic Analysis (Cobo et al., 2011; Saheb & Izadi, 2019; Saheb & Saheb, 2019, 2020). As the complexity and volume of bibliometric data increases, a new wave of scholarly needs has emerged to visualize bibliometric data in the form of networks (van Eck & Waltman, 2014). Powerful bibliographic analytical and visualization tools, such as Cite Space and VOSviewer, were developed to map and visualize bibliographic data in terms of networks.

Bibliometric Analysis can be conducted through several techniques. The most common bibliometric analytical methods are bibliographic coupling and co-citation analysis. The most popular bibliometric visualization approaches are distance-based, graph-based and timeline-based (van Eck & Waltman, 2014). Table 2 illustrates various bibliometric techniques used in this paper and their connection with the research objectives. In this part of the paper, we describe each of the bibliometric methods we employed in this research. Table 2 summarizes how each technique is associated with the objectives of the study.

Bibliographic coupling, introduced by Kessler in the 1960s, connects papers that cite the same articles. The more papers they both cite, their similarity is stronger (Liu, 2008). Studies show that this method can identify " hot" research topics depicted by " core documents" selected through appropriate thresholds (Glänzel & Czerwon, 1996). Co-citation analysis, on the other hand, measures the relatedness of papers based on their co-citation frequency. The major strength of bibliographic coupling compared with co-citation analysis is that bibliographic coupling can capture the early-stage evolution of a scientific field (Jarneving, 2007). However, some studies challenge the bibliographic coupling method concluding that integrated approaches, such as combining text analysis with bibliographic coupling, can yield better results (Janssens & Quoc, 2006).

Co-citation analysis is also defined as the frequency or the number of times that two documents are cited (Vargas-Quesada and Moya Anegón, 2007). The greater the value of co-citation, the stronger the relationships (Maimon & Rokach, 2010; Roger-Maurice Bonnet, Vincent Bontems, Thijs de Graauw, Matt Griffin, 2017). Co-citation analysis provides a forward-looking assessment of the similarity of documents (Chen, 2006a; Adam, 2002). However, as the academic fields evolve, frequencies of co-citations also change (Culnan, 1986). The major limitation of co-citation analysis is that it is "inconsistent in their coverage over time, were subject to errors in citations, under-represented experimental work and were found to contain a significant subjective element" (Hicks, 1987).

Kleinberg first coined detection of burstiness of words in 2003 (Kleinberg, 2003). 'Word bursts' are defined as " having arrival rates defined by the number of messages containing a particular word" (He & Parker, 2010). So a burst of a word is a sharp increase in the frequency of a word (Pan, Chen & Nguyen, 2012) which shows the timing of a hot topic (Chen, 2006a). The burst shows the " start time and the end time " of burst words and periods (Vasant, Zelinka & Weber, 2018). In this study, we used the CiteSpace software to detect the burstiness of keywords.

Table 3
Bibliometric analysis techniques used in the paper, their strengths and limitations.

Bibliometric Technique	Strengths	Limitations
Co-Citation Analysis;	It assesses the intellectual development and structure of scientific disciplines; They cluster papers tending to share some common theme and research areas; (Surwase et al., 2011)	Co-citation analysis is "inconsistent in their coverage over time, were subject to errors in citations, under-represented experimental work and were found to contain a significant subjective element." (Hicks, 1987)
Burst Detection	It analyses " the rate of increase of word frequencies and identifies the most rapidly growing words... it can handle multiple levels of bursts"(Chen, 2006b);	It is not a threshold-based detection (Chen, 2006b)
Bibliographic Coupling	It can identify "hot" research topics depicted by " core documents" selected through appropriate thresholds (Glänzel & Czerwon, 1996).	Its integration with other methods such as text analysis can yield better results (Janssens & Quoc, 2006)

In addition to bibliometric analysis, we also visualized the results in the shape of networks. A bibliometric network is composed of nodes and edges in which the nodes can be publications, journals, keywords, or researchers. The edges also depict relations between pairs of nodes, and these relations can be citation relations, keyword-co-occurrence relations or co-authorship relations (van Eck & Waltman, 2010). In the distant-based approach like multidimensional scaling, the position of the nodes in a bibliometric network shows the relatedness of the nodes. The smaller distance means that the nodes are more related (Borg, Groenen & J, 2005). VOSViewer mainly focuses on the distant-based visualization of bibliometric networks (van Eck & Waltman, 2014). In this study, we used the VOSViewer to visualize the networks. The graph-based approach functions like the distance-based approach. However, in the graph-based method, edges are also displayed to indicate the relatedness of nodes. The Fruchterman and Reingold algorithm is mainly used in this approach (Fruchterman & Reingold, 1991). The third approach is the timeline-based approach linking each node to a specific point in time (Chen, 2006a).

Despite the popularity of bibliometric analysis, some scholars challenge the suitability of bibliometric data in databases, such as the WOS for evaluating science (Adam, 2002). Some studies also challenge the quality of bibliometric data and their capability to cope with multiple data dimensions (Ferrara & Salini, 2012). Table 3 summarizes some strengths and limitations of each bibliometric technique we implemented in this paper.

Results

Identifying the knowledge clusters of digital marketing research through bibliographic coupling

To analyse and visualize the knowledge clusters of research on digital marketing, we employed the bibliographic coupling of documents by using the VOSViewer software. We set the minimum number of citations of a document at 10, and 4705 documents met the threshold to visualize

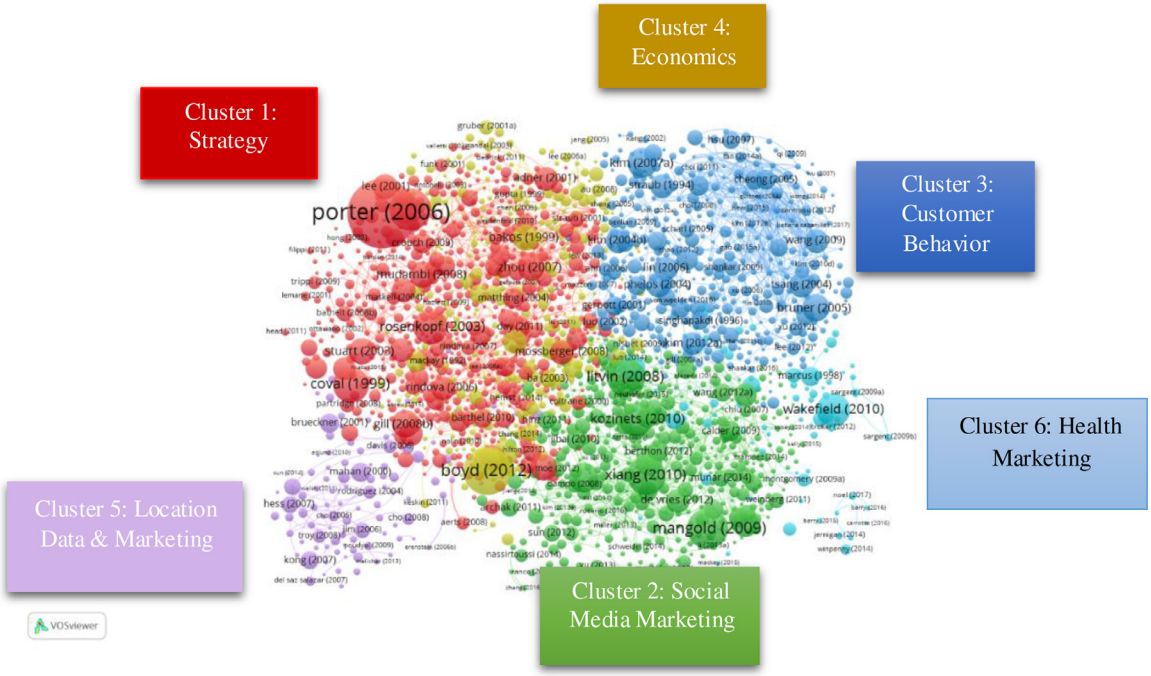

Fig. 1. Knowledge clusters of research on digital marketing.

Table 4
Knowledge clusters of research on the digital transformation of marketing, their sizes, and some of the documents with the greatest total link strength.

No	Cluster Name	Size	Some of the representative papers with the greatest total link strength
1	Marketing Strategy	643	(Adner & Levinthal, 2001; Buckley et al., 2007; Porter & Kramer, 2006)
2	Social media	449	(Litvin et al., 2008a; Mangold & Faulds, 2009; Xiang & Gretzel, 2010)
3	Customer behaviour	407	(Bruner & Kumar, 2005; Kim, Chan & Gupta, 2007a; Wang et al., 2009)
4	Economics	312	(Aker & Mbiti, 2010; Bakos & Brynjolfsson, 1999; boyd & Crawford, 2012)
5	Location Data and Marketing	102	(Carroll & Green, 1997; Cho et al., 2008; Zhuo Chen et al., 2009)
6	Health marketing	83	(Boulos et al., 2011; Marcus et al., 1998; Wakefield et al., 2010)

the network. We only chose the top 2000 documents with the greatest total link strength to be visualized in the next phase. The normalization method was modularity. The modularity algorithm measures the strength of a network and explains how easily a graph can be classified into clusters or communities (Khokhar, 2015). The size of each frame is a representation of the total link strength of each item. As a result, six research clusters and the top documents with the greatest total link strength were identified) Fig. 1 and Table 4). These clusters are strategy, social media marketing, customer behaviour, economics, location data and marketing and health marketing.

Cluster 1: Strategy- The major cluster of digital marketing is "strategy." Undoubtedly, digital marketing requires new strategy frameworks; whose principles may alter based on factors, such as demand heterogeneity and the emergence of consumers with different needs. One study (Adner & Levinthal, 2001) shows the significant impact of these conditions on a firm's innovation choices. Another hot aspect of research on digital marketing strategy is regarding the social responsibility of companies. By deeming this phenomenon an opportunity for firms, one study (Porter & Kramer, 2006) proposes a framework to achieve objectives, such as identifying the social consequences of their behaviours, discovering beneficial opportunities, and strengthening their competitive power in the market. Another hot topic of this cluster is regard to the institution-based view of strategy. In a study (Buckley et al., 2007), the authors aim to examine how a country, specifically an emerging country like China, with distinctive home country institutions fits with institution-based views of strategy, and to do so; the authors analyse a series of primary and control variables of foreign direct investment, such as market size, policy liberalization, cultural proximity.

Cluster 2: Social media marketing- The second-largest research cluster of digital marketing literature is social media marketing. Social media is utilized for better relationships with customers, and many sectors are deploying it. One of the significant use cases of social media marketing is tourism and hospitality (Mangold & Faulds, 2009; Xiang & Gretzel, 2010). Despite the promising benefits of social media, the literature alerts the marketers of the detrimental impacts of customer's comments on a firms' performance and the significant effect of online comments on customers' decision-making process. For instance, one of the essential components of social media is eWOM or electronic word of mouth. However, authors (Litvin, Goldsmith & Pan, 2008a) alert the marketers to pay close attention to the ethical and technological issues of eWOM. These authors encourage marketers to design strategies to control eWOM (Litvin, Goldsmith & Pan, 2008b). Another study also (Mangold & Faulds, 2009) argue that the content, timing, and frequency of social media-based conversations are out of the control of managers. So they encourage the managers to organize social media discussions that are inconsistent with the company's mission and goals.

Cluster 3: Customer behaviour- Although developing a solid and comprehensive strategy is necessary for a successful marketing campaign, understanding customers' behaviour is essential. The third central cluster of digital marketing literature addresses customer behaviour by incorporating theories like the technology acceptance model or consumer

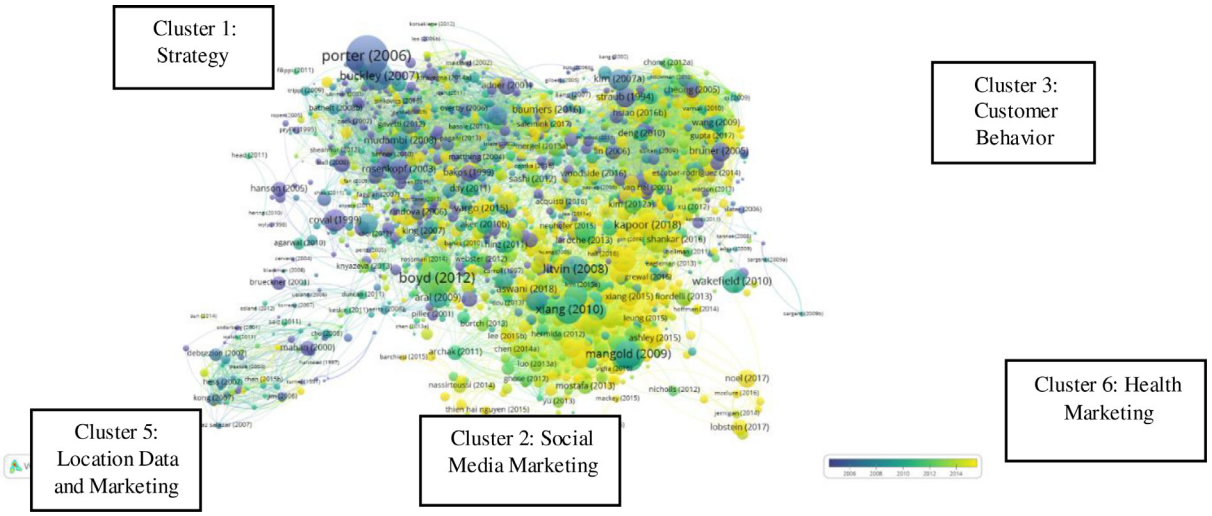

Fig. 2. Overlay Visualization of Research Clusters.

choice and decision-making. These studies highlight factors that influence the behaviour of a customer. These factors can be utilitarian and hedonic aspects of a technology (Bruner & Kumar, 2005), the values derived from adopting a technology (Kim, Chan & Gupta, 2007b), or the age and gender differences (Wang, Wu & Wang, 2009). In sum, this cluster explores the impact of a wide range of determinants on the adoption behaviour of customers.

Cluster 4: Economics- The fourth research cluster of digital marketing literature is concerned with economics. One of the major topics in this cluster is mobile phone adoption and its economic outcomes, such as producing welfare for consumers (Aker & Mbiti, 2010). In another study, the authors focus on facilitating the process of predicting customers' valuations by bundling very large numbers of unrelated information goods (Bakos & Brynjolfsson, 1999). As their study shows, if different market segments of consumers vary in terms of their valuations of goods, simple bundling is not an optimal mechanism. Another hot topic of this cluster is big data technology and its consequences in creating a new digital divide and other wide-ranging implications (boyd & Crawford, 2012).

Cluster 5: Location data and marketing - The fifth knowledge structure of digital marketing literature is location data and its utilization in marketing. For instance, the literature investigates the role of multidimensional scaling and the impact of proximity data on marketing (Carroll & Green, 1997), the spatial analysis of the amenity value of green open spaces and the importance of variables such as size, proximity, the spatial configuration of open spaces (Cho, Poudyal & Roberts, 2008), or using housing sales data to forecast sub-market segmentation strategies (Zhuo Chen et al., 2009).

Cluster 6: Health Marketing- The last cluster of research on digital marketing is regarding health marketing. One of the research trends of this cluster is healthcare technologies, their emerging trends, and market uptake (Boulos et al., 2011). The other scholarly concern of this cluster is reviewing specific use cases of employing health technologies for health interventions (Wakefield, Loken & Hornik, 2010), such as for physical activity (Marcus et al., 1998). These studies confirm the positive role of employing technology-based health interventions to reduce health risks (Wakefield et al., 2010).

As Fig.1 indicates, the most robust linkage of the strategy cluster is with the economics cluster regarding the linkage of clusters. This analysis also shows that the consumer behaviour cluster links with the strategy, health marketing, and economics clusters. Social media marketing has some relatively average linkages with health marketing and customer behaviour. The location data and marketing cluster has the lowest citation linkage with the other clusters.

Since 2013, the major upfront research topics have been social media marketing, followed by customer behaviour, as shown in the overlay visualization of the clusters. As Fig. 2 shows, the strategy cluster was the primary research upfront between 2006 and 2008. The location data and marketing cluster was also upfront research in 2008. The social media marketing cluster is a prominent research theme since 2007 to this date. As Fig. 3 shows, the number of papers on this topic has grown from 2014 onward. During this period, health marketing became a scholarly concern as well. The customer behaviour cluster is a prominent topic since 2006 to this date. This topic is still scholarly and has experienced growth since 2010. The economics of marketing is also a scholarly topic since 2006.

Regarding the growth rate in scientific publications on digital marketing, as Fig. 3 shows, although the strategy cluster was a hot research topic between 2000 and 2002, it experienced a downward trend. Between 2015 and 2017, the number of publications on strategy in the digital marketing literature had a very dramatic drop. Unlike the strategy cluster, the social media cluster was fast-growing from 2006. The most significant number of papers on social media in the digital marketing literature was published between 2018 and 2019. The health marketing cluster has grown steadily since 2000, and its development is mainly similar to the growth of research on location data and marketing. Though research on customer behaviour declined slightly between 2000 and 2002, it had an abrupt growth between 2003 and 2005. With a steady increase from 2005 until 2017, research on customer behaviour was considered one of the research subjects in the digital marketing literature. However, the number of publications on this topic once again experienced a sudden increase between 2018 and 2019. As one of the other clusters, the economics cluster is a scholarly topic with relatively steady growth from 2000 until 2017. However, the percentage of publications on this topic dropped between 2018 and 2019. In this part of the paper, we explore the burst keywords from 1992 to 2017 explained in detail in Table 5.

As shown in Table 5, the burst of keywords in the literature is strongly related to social and technological changes in the real world. For example, in 1997, the World Wide Web was one of the most popular keywords, which coincided with the real-world development of the WWW. Alongside this keyword, other burst keywords are electronic commerce and power. For instance, this year, James Ho, in his paper "evaluating the World Wide Web: a global study of Commercial Sites," evaluated websites from customers' perspective of value-added (Ho, 1997). One of the highly cited papers in this year on electronic commerce is a paper published by Bakos, J.Y; titled " reducing buyer search costs: implications for the electronic marketplace" (Bakos, 1997),

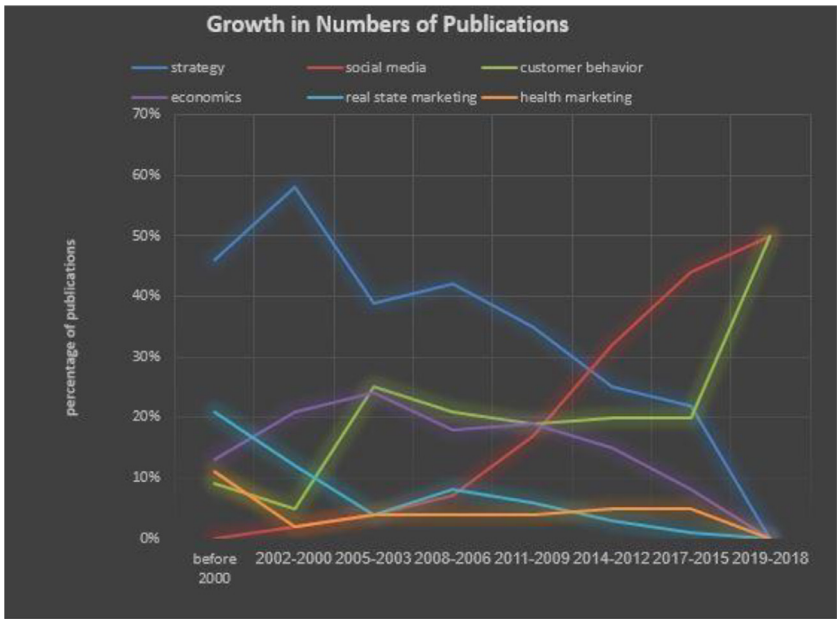

Fig. 3. Growth in the number of publications in each cluster.

Table 5
The highly burst keywords from 1992 to 2017.

Begin	Entity & Strength	Begin	Entity & Strength	Begin	Entity & Strength
1992	Location (7.8013)	2000	dynamics (5.0266)	2005	a developing country(9.607)
1993	geography (7.1444)	2001	diffusion(55.3326)	2006	mobile phone(42.2124)
1994	migration (7.1444)		commerce(13.7423)		demand(26.2228)
	city (6.7325)		bluetooth(12.7527)		acceptance(15.0956)
	International trade (5.2741)		agent(12.1145)	2007	united states(26.7357)
1995	access(5.7521)		labour market(10.3039)		advertising(16.6793)
	mass media (5.5117)		internet(9.6292)		user acceptance(14.645)
1996	growth(35.3287)		e-business(8.4771)	2008	firm(7.2192)
	mobility(17.8662)		wireless(6.0842)	2009	knowledge(10.3714)
	security(12.1914)		web(5.4463)		design(6.4105)
	fuel cell(5.1193)		law(5.2155)	2010	policy(18.0279)
1997	electronic commerce(28.2264)		Africa(4.5633)		attitude(8.9332)
	mobile agent(14.5117)	2002	telecommunication(58.7523)	2011	mobile(29.445)
	power(11.9653)		cost(15.4177)		organization(25.2701)
	reliability(6.9365)		competitive advantage(13.5826)		proximity(22.271)
	politics(5.3758)		regulation(11.6263)		determinant(6.094)
	worldwide web(4.7036)		wireless network(4.6251)	2012	android(45.4395)
	research and development(4.4977)		software(4.6251)	2013	smartphone(43.5134)
1998	mobile communication(37.7356)	2003	mobile commerce(35.289)		privacy(24.6763)
	globalization(24.3838)		externality(14.5387)	2014	education(19.7296)
	electronic market(7.1092)		digital divide(14.1605)	2015	social media marketing(37.0682)
	pattern(6.8152)		business(13.4191)		brand(24.3129)
	gsm(6.4626)		evolution(7.0763)		loyalty(23.6333)
	digital camera(4.729)		m-commerce(5.2375)		big data(16.9924)
	pricing(4.3362)	2004	price(18.5176)		Facebook(10.4179)
1999	choice(16.7679)		network externality(13.7073)	2016	experience(42.9116)
	simulation(8.5867)		competition(7.6116)		intention(25.163)
	hplc(6.7084)		architecture(6.6675)		perception(20.1408)
2000	e-	2005	mobile telecommunication(17.5011)		online(14.8263)
	commerce(17.7703)		standard(16.1129)		framework(8.937)
	culture(8.4588)		economics(14.7384)	2017	engagement(35.5659)
	state(7.6997)		business model(10.9282)		twitter(14.5802)
	umt(7.3385)		mobile service(9.8219)		perspective(7.9985)

or a paper titled " power and trust: critical factors in the adoption and use of electronic data interchange" in electronic commerce by Hart, P. and Saunders, C. (Hart & Saunders, 1997). The other highly cited paper on this keyword burst was a paper published by Hoffman D.L and Noval, T.P. called " A new marketing paradigm for electronic commerce" (Donna L., Hoffman Thomas P., Novak, 1997).

In 1998, mobile communication was one of the burst keywords. As history shows, by the late-1990s, mobile devices rapidly developed. In 1997, the first handset mobiles- i.e. Nokia 6110 and Motorola StarTAC were introduced (StellaDoradus, 2018). In 2000, e-commerce was a keyword burst. This year, many companies in the US and Western Europe delivered their services through the WWW (Ma'aruf & Abdulkadir, 2012). For instance, in 2000, Google launched AdWords, which is an advertising service. Also, StubHub, which was a popular online marketplace for event tickets, was launched. Walmart also launched its website in 2000. In 1998 and 1999, Ali Baba, Amazon 1-Click Service, Tradera, PayPal, and Zappos were launched. The highly cited paper on e-commerce in 2000 highlighted the role of familiarity and trust in e-

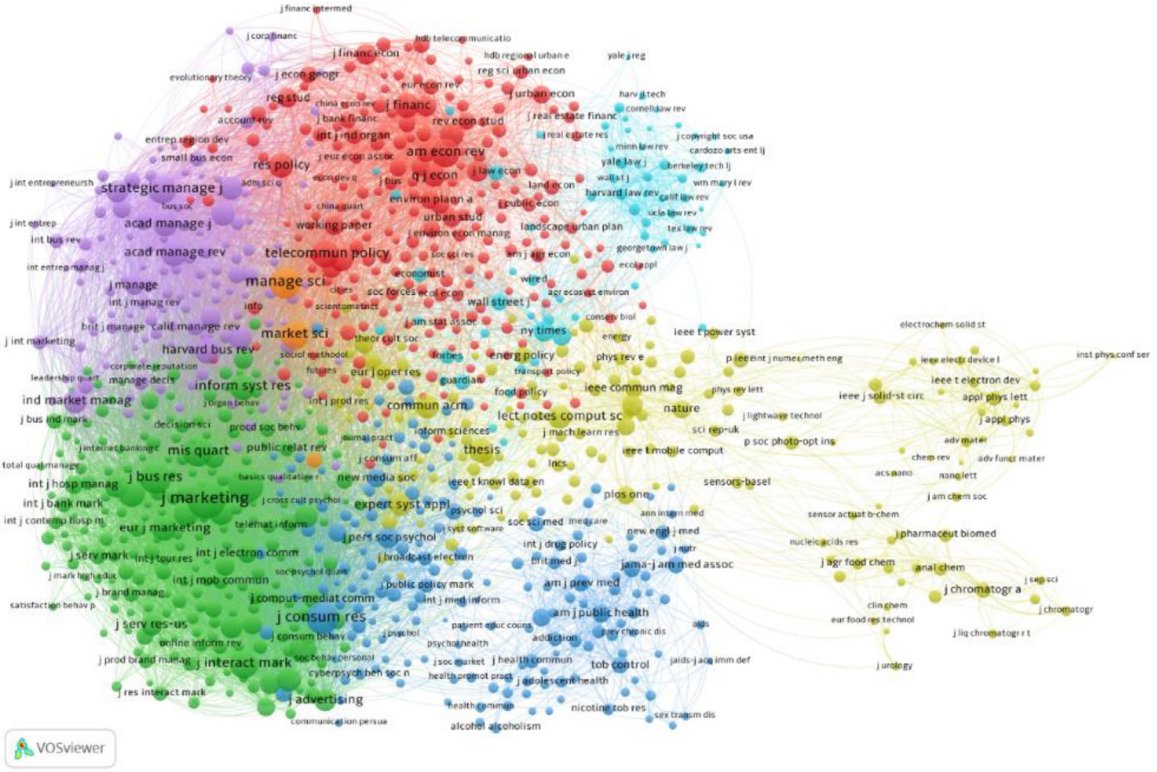

Fig. 4. Co-citation Analysis of Sources.

commerce (Gefen, 2000). Other highly cited articles on e-commerce this year addressed issues of e-loyalty (Reichheld & Schefter, 2000), business models (Mahadevan, 2000), acceptance of e-commerce services (Bhattacherjee, 2000), and privacy and security (Miyazaki & Fernandez, 2000).

Before 2015, mobile technology was a prominent keyword for several years, and each year, a specific aspect of mobile technology is highlighted. For instance, in 2011, mobile and proximity were keyword bursts, implying the privacy controversy over GPS- based location marketing this year. The first commercial location-based service was launched in 2001 by a Japanese mobile Carrier called KDDI. However, in 2011, Facebook's plan to make users' information to third-party developers and external websites arose a new wave of concerns over user's privacy, and US legislators also addressed location privacy (Greer, 2012). One of the highly cited papers regarding privacy and mobile location-based or proximity marketing is titled " the personalization privacy paradox: an exploratory study of the decision-making process for location-aware marketing" (Xu et al., 2011). Privacy in smartphones was still a hot scholarly topic in 2013. With the growth of disruptive technologies, we observe that after 2015, social media marketing, big data, Facebook, brand and loyalty; and in 2017, Twitter and engagement became hot scholarly topics.

Identifying the most influential sources, authors and references through co-citation analysis

In this part of the paper, we conducted a co-citation analysis of references, sources and authors to identify the most influential contributors of the scientific research on digital marketing. To visualize the co-citation of sources, we set the minimum number of citations of a source to 20, and 4218 sources met the threshold. We selected the top 500 sources to be visualized (Fig 4). The co-citation analysis of sources shows (Table 6) that the top five sources with the greatest total link strength are, respectively, journal of marketing, journal of marketing research, journal of consumer research, journal of business research, and strategic management journal.

Table 6
The most influential sources in digital marketing scientific research.

Source	Citations	Total Link Strength
J marketing	9217	454,322
J marketing res	6571	322,735
J consum res	5333	252,961
J bus res	4690	219,418
Strategic manage j	3957	211,572
Manage sci	4952	201,103
Mis quart	4110	174,693
J acad market sci	3172	173,851
J interact mark	3618	163,453
Market sci	3700	157,311

Table 7
Documents with the greatest total link strength.

Related Cluster	Documents
Social Media Marketing	(Kaplan & Haenlein, 2010)
Location Data and Marketing	(Barwise & Strong, 2002)
Research Method	(Fornell & Larcker, 1981)
Customer behaviour	(Tsang, Ho & Liang, 2004)
Customer behaviour	(Bauer et al., 2005)
Social Media Marketing	(Mangold & Faulds, 2009)
Customer behaviour	(Davis, 1989)
Customer behaviour	(Zhang & Mao, 2008)
Social Media Marketing	(Peters et al., 2013)
Customer behaviour	(Hennig-Thurau et al., 2010)

Table 7

The second co-citation analysis we conducted is the author-co-citation analysis. We set the minimum of citations at 20. Out of 323,951 authors, 5436 authors met the threshold. We set the network to visual-

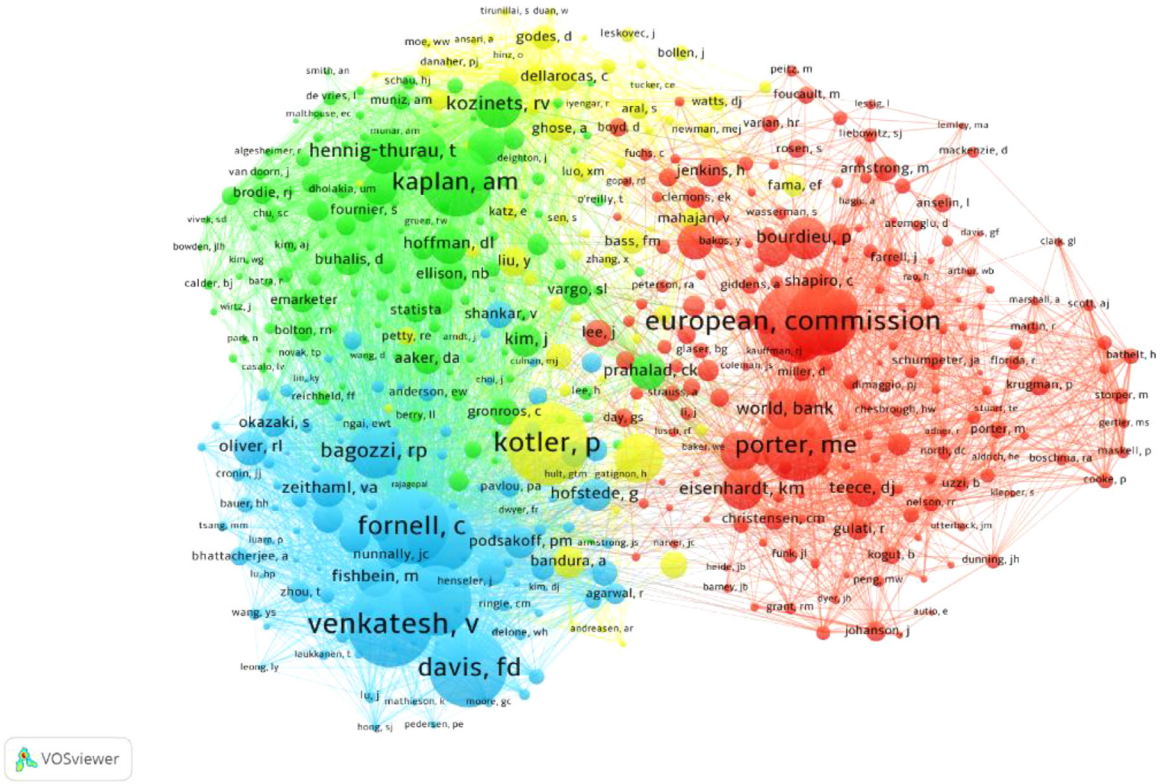

Fig. 5. Visualization of Author Co-Citation Analysis.

ize only the 500 authors with the greatest total link strength (Fig. 5). The five top authors with the greatest total link strength are Venkatesh, V (17,364), Fornell, C (16,171), Davis, fd (14,566), Hair, jf (12,838), Bagozzi, rp (12,193), Ajzen, I (12,151), hennin-thurau, t (8670), Kaplan am (8551) porter, me (8174) and oliver, rl (7723) Fig 6.

This analysis shows that the most influential authors in digital marketing literature are concerned with customer behaviour, satisfaction, and adoption. On the second level, the influential authors are also concerned with social media in marketing. The first influential author is Venkatesh Shankar. His-highly cited paper is " customer value, satisfaction, loyalty, and switching costs: An illustration from a business-to-business service context." His-work is mainly related to the clusters of strategy, economics, and customer behaviour. The second influential person is Claes Fornell, chairman and founder of the American Customer Satisfaction Index. His-work is also mainly within the realm of customer behaviour cluster. Fred Davis, the third influential author, is also associated with customer behaviour, with his influential model of technology acceptance being a prominent model. The fourth influential researcher in digital marketing is Joseph Hair Jr, whose main contribution is in the domain of research methods in marketing. As the fifth influential person, Bagozzi is the colleague of Davis who presented the most significant model of technology acceptance. The work of Ajzen is also focused on customer behaviour, which is verified in his theory of planned behaviour. The work of Horsten Hennig-Thurau is linked with social media marketing and consumer behaviour clusters. The work of Andreas M. Kaplan is also social media marketing. As the ninth most influential person, Porter has published papers on strategy and competitive advantage in the market. The work of Oliver rl is also mainly associated with customer behaviour and satisfaction.

In this part of the paper, we analysed and visualized a co-citation network of cited references. We set the minimum at 20, and out of 651,097 cited references, 1604 references met the threshold. However, we selected the top 500 references with the greatest total link strength to be visualized. As this analysis shows, the most influential references in digital marketing are related to customer behaviour and social media marketing.

Discussion

This paper provided a systematic and integrated bibliometric analysis of scientific research development trends on digital transformation in marketing by reviewing scientific works indexed in the WOS from 1900 until 2020. The primary objectives of this research were identifying the most influential actors (sources, authors, and references) and distinguishing the major knowledge clusters and research themes. We incorporated evidence-based analytical methods, including bibliometric analysis and mapping methods, including bibliographic coupling, co-citation analysis, and burst detection. The bibliographic coupling method discovered the knowledge structures and clusters, and the co-citation analysis method identified the most influential actors. The burst detection analysis also uncovered the burst keywords in different periods.

This research proposed two major inquires. The first enquiry was concerning the most influential elements, including sources, authors and references, within digital transformation in marketing. Through co-citation analysis, we uncovered that the journal of marketing is the most influential source in the area, while the most effective author is Vankatesh Shankar. Our second enquiry was regarding the hot research themes in the field. Our bibliometric review revealed six major hot research themes: marketing strategy, social media, customer behaviour, economics, location data and marketing and health marketing.

Theoretical contributions and implications for practice

Earlier in this paper, we described that previous bibliometric studies of marketing research have focused on traditional marketing solely or on a limited scope of digital marketing, such as internet marketing. Theoretically, this study fills this gap and contributes to the marketing liter-

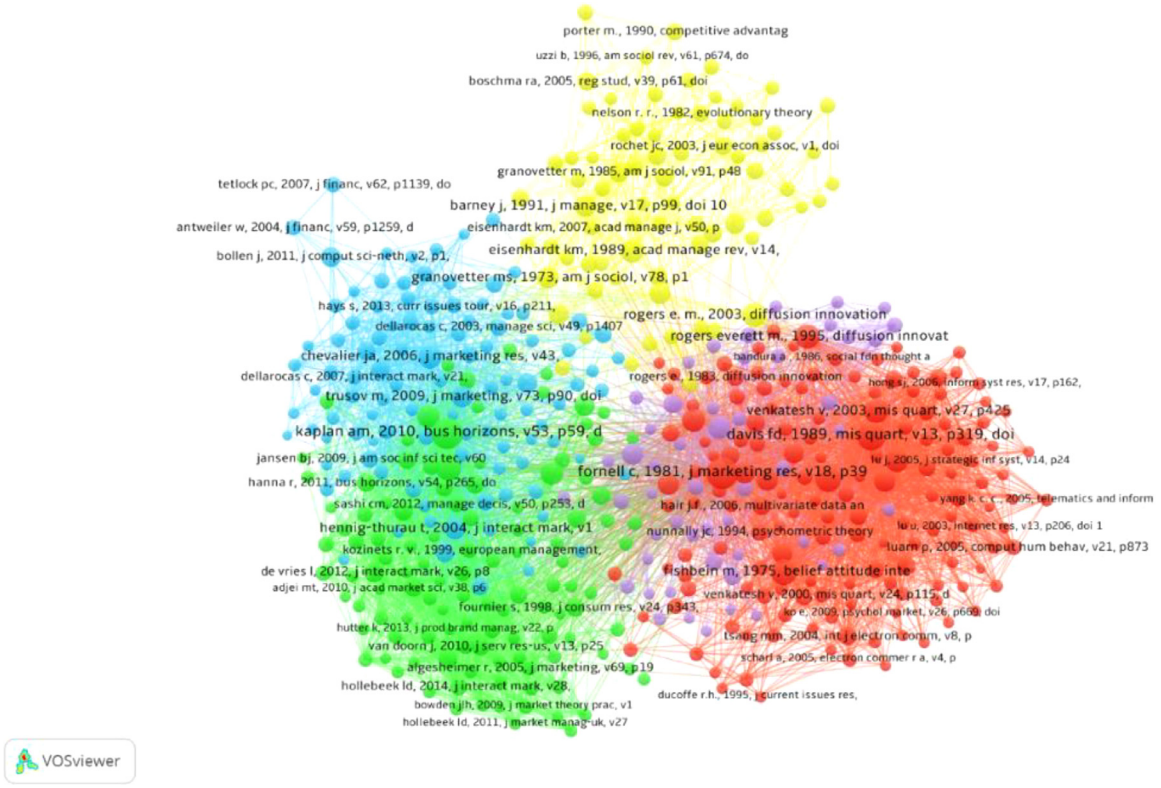

Fig. 6. Visualization of References Co-Citation Analysis.

ature by illustrating a whole picture of research evolution in this field. Theoretically, this paper contributes to digital marketing by identifying the major research themes and influential elements of research on digital marketing. The results of this study suggest six major research clusters within the domain of digital marketing scientific research: strategy, social media, customer behaviour, economics, location data and marketing, and health marketing. This finding confirms the study by (P.K. P. K. Kannan & Li, 2017), arguing that the critical touchpoints impacted by digital marketing are the environment (such as customer behaviour), market research (such as location marketing or health marketing), outcomes (such as values), and marketing strategy. As this study shows, at the beginning of scientific endeavours on digital marketing, research on strategy was the hot scholarly topic; later in 2015, its growth declined. On the other hand, research on social media has a fast-growing trend from 2006 onward. This scientific trend is incompatible with the popularity of social media and the ubiquitous engagement of citizens and users in social networking platforms. Concurrently, research on customer behaviour turned into a hot scholarly topic. This study shows that the most influential references in the field address issues related to customer behaviour. Research on customer behaviour experienced tremendous growth after 2015 compared to the other research clusters, which experienced a downfall trend since 2015. This growth is in accordance with the market trends in which social media transformed into an influential tool for marketing and business disruptions. Customers' comments and behaviours impacted business tremendously.

The burst detection analysis also shows that the burst keywords are highly associated with the social and technological changes in the real world. For instance, concurrent with the development of Nokia in 1997, research on mobile communication turned into a burst keyword; or in 2000, concurrent with the growth of e-commerce in the US and Western Europe, e-commerce became a burst keyword. In 2015, social media marketing, big data, Facebook, brand and loyalty; and in 2017, Twitter and citizen engagement became the hot scholarly topics. All of these scientific incidences were concurrent with technological trends in the market. This analysis demonstrated that research on digital marketing was highly in accordance with technical and social disruptions in the real world. Based on the results of this study, we can highlight several trends that may influence research on digital marketing in the future: 1) the need to deepen knowledge regard to customer behaviour, 2) shifting toward research on disruptive technologies in marketing to be compatible with the real-world, 3) investigating both the positive and negative consequences of social media in marketing campaigns, and 4) the ubiquitous use of location data for marketing purposes and concerns regarding the ethics of private data.

Practically, this study offers new insights for marketers and businesses on their marketing endeavours using digital technologies. Marketers and businesses can incorporate digital technologies to facilitate their engagement with their customers and decrease their marketing costs. Each digital technology has its unique capabilities, and developing a stack of digital technologies in marketing will benefit their customers and their businesses in detecting customers' preferences and their needs in real-time and via the customers' voices.

Limitations and future agenda

In this analysis, we included all scientific disciplines that worked on the digital transformation of marketing; and analysed theories and models developed in various fields such as marketing and consumer psychology. This approach was an answer to the call by (P.K. P. K. Kannan & Li, 2017) inquired scholars to conduct a more comprehensive analysis of the digital marketing field. Future research can focus only on bibliometric and visualization analysis of only marketing journals. Moreover, of the various quantitative methods, we incorporated only bibliometric analysis. Future research can utilize other text mining methods such as topic modelling by using Python and its text mining libraries such as the Gensim library.

Moreover, new digital marketing tools and techniques are emerging rapidly, and various scientific fields are assessing their impact on mar-

keting practices. In this study, we used broad terms in our analysis, while future research agenda can narrow down their scope of review and focus on more advanced and detailed methods and techniques. The other future strands of research can be conducted a cluster-based content analysis. While we identified six clusters of hot research topics, cluster-based content analysis can complement the findings of quantitative analysis by uncovering detailed research themes in the field. In this analysis, we did not identify how digital marketing influences customers, marketers, and businesses. More research is required to analyse how digital transformation of marketing has impacted various stakeholders at various individual and organizational levels.

Conclusion

The primary purpose of this paper is to set an agenda for scientific research in the digital transformation of marketing. We considered digital marketing at its broadest level. We uncovered the most influential elements in digital marketing research, including hot research topics, authors, references, and sources through co-citation analysis and burst analysis. In the end, we proposed a series of possible research strands for further analysis.

Declaration of competing interest

None.

References

Abraham, A., et al. (2018). *Emerging technologies in data mining and Information security : Proceedings of IEMIS 2018: Volume 2*. Springer.

Adam, D. (2002). The counting house. *Nature, 415*(6873), 726–729. 10.1038/415726a.

Adner, R., & Levinthal, D. (2001). Demand Heterogeneity and Technology Evolution: Implications for Product and Process Innovation. *Management Science, 47*(5), 611–628. 10.1287/mnsc.47.5.611.10482.

Aker, J. C., & Mbiti, I. M. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives, 24*(3), 207–232. 10.1257/jep.24.3.207.

Alalwan, A. A., et al. (2017). Social media in marketing: A review and analysis of the existing literature. *Telematics and Informatics, 34*(7), 1177–1190. 10.1016/J.TELE.2017.05.008.

Anandarajan, M., Hill, C., & Nolan, T. (2019). *Practical text analytics : Maximizing the value of text data*.

Ávila-Robinson, A., & Wakabayashi, N. (2018). Changes in the structures and directions of destination management and marketing research: A bibliometric mapping study, 2005–2016'. *Journal of Destination Marketing & Management, 10*, 101–111. 10.1016/j.jdmm.2018.06.005.

Bakos, J. Y. (1997). Reducing Buyer Search Costs: Implications for Electronic Marketplaces. *Management Science, 43*(12), 1676–1692. 10.1287/mnsc.43.12.1676.

Bakos, Y., & Brynjolfsson, E. (1999). Bundling Information Goods: Pricing, Profits, and Efficiency. *Management Science, 45*(12), 1613–1630. 10.1287/mnsc.45.12.1613.

Barwise, P., & Strong, C. (2002). Permission-based mobile advertising. *Journal of Interactive Marketing, 16*(1), 14–24. 10.1002/dir.10000.

Bauer, H. H., et al. (2005). Driving consumer acceptance of mobile marketing: a theoretical framework and empirical study. *Journal of Electronic Commerce Research*. Available at Https://search.proquest.com/openview/9f82a69f0d8428d058e77be85990f529/1?pq-origsite=gscholar&cbl=44515 . Accessed: 11 May 2019.

Bhattacherjee, A. (2000). Acceptance of e-commerce services: The case of electronic brokerages. *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans, 30*(4), 411–420. 10.1109/3468.852435.

Bonfour, A. (2016). 'Digital futures, digital transformation from lean production to acceluction'. Available at: Https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=bonfour+2016+digital+transformation&btnG= (Accessed: 3 May 2021).

Bonne, Roger-Mauricte, Bontems, Vincent, Thijs de Graauw, Matt, & Griffin, F. H. (2017). Amazon.com: Inventing a space mission: The story of the herschel space observatory (ISSI scientific report series book 14) eBook: Vincent Minier, Roger-Maurice Bonnet. *Vincent bontems, thijs de graauw, matt griffin, frank helmich*. Göran Pilbratt Sergio V'.

Borg, I., Groenen, P., & J, F. (2005). The four purposes of multidimensional scaling. In *Modern multidimensional scaling* (pp. 3–18). New York: NY: Springer New York. 10.1007/0-387-28981-X_1.

Boulos, M., et al. (2011). How smartphones are changing the face of mobile and participatory healthcare: An overview, with example from eCAALYX. *BioMedical Engineering OnLine, 10*(1), 24. 10.1186/1475-925X-10-24.

boyd, danah and Crawford, K.. (2012). Critical questions for big data. *Information, Communication & Society, 15*(5), 662–679. 10.1080/1369118X.2012.678878.

Brown, T., et al. (2018). Twenty-five years and counting: An analysis of the journal of strategic marketing. *Journal of Strategic Marketing, 26*(2), 125–139. 10.1080/0965254X.2017.1411388.

Bruner, G. C., & Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research, 58*(5), 553–558. 10.1016/J.JBUSRES.2003.08.002.

Buckley, P. J., et al. (2007). The determinants of Chinese outward foreign direct investment. *Journal of International Business Studies, 38*(4), 499–518. 10.1057/palgrave.jibs.8400277.

Carroll, J. D., & Green, P. E. (1997). Psychometric methods in marketing research: Part II, multidimensional scaling. *Journal of Marketing Research, 34*(2), 193. 10.2307/3151858.

Chaffey, D., Smith, P. R., & Paul, R. (2013). *Emarketing excellence : Planning and optimizing your digital marketing* Routledge.

Chen, C. (2006a). CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology, 57*(3), 359–377. 10.1002/asi.20317.

Chen, C. (2006b). *Information visualization : Beyond the horizon*. Springer.

Cho, S.-. H., Poudyal, N. C., & Roberts, R. K. (2008). Spatial analysis of the amenity value of green open space. *Ecological Economics, 66*(2–3), 403–416. 10.1016/J.ECOLECON.2007.10.012.

Cobo, M. J., et al. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology, 62*(7), 1382–1402. 10.1002/asi.21525.

Cronin, B., & Sugimoto, C. R. (2015). *Beyond bibliometrics : Harnessing multidimensional indicators of scholarly impact*. The MIT Press.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319. 10.2307/249008.

Dehabreh, I., et al. (2012). Comprehensive overview of methods and reporting of meta-analyses of test accuracy. *Agency for Healthcare Research and Quality*. Https://www.ncbi.nlm.nih.gov/books/NBK92424/.

Delgosha, M. S., Hajiheydari, N., & Talafidaryani, M. (2021). Discovering IoT implications in business and management: A computational thematic analysis. *Technovation*, Article 102236. 10.1016/j.technovation.2021.102236.

Delgosha, M. S., Saheb, T., & Hajiheydari, N. (2020). Modelling the asymmetrical relationships between digitalisation and sustainable competitiveness: A cross-country configurational analysis. *Information Systems Frontiers*. 10.1007/s10796-020-10029-0.

DONNA L. HOFFMAN THOMAS P. NOVAK. (1997). A new marketing paradigm for electronic commerce. *The Information Society, 13*(1), 43–54. 10.1080/019722497129278.

Mort, G.S., Drennan, J. (2002). Mobile digital technology: Emerging issue for marketing. Journal of Database Marketing & Customer Strategy Management, 10(1), 9–23.

Eom, S. B. (2009). Author cocitation analysis: Quantitative methods for mapping the intellectual structure of an academic discipline. *Information Science Reference*.

Ferrara, A., & Salini, S. (2012). Ten challenges in modeling bibliographic data for bibliometric analysis. *Scientometrics, 93*(3), 765–785.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. 10.1177/002224378101800104.

Fruchterman, T. M. J., & Reingold, E. M. (1991). Graph drawing by force-directed placement. *Software: Practice and Experience, 21*(11), 1129–1164. 10.1002/spe.4380211102.

Garg, A. X., Hackam, D., & Tonelli, M. (2008). Systematic review and meta-analysis: When one study is just not enough. *Clinical Journal of the American Society of Nephrology, 3*(1), 253–260. 10.2215/CJN.01430307.

Gefen, D. (2000). E-commerce: The role of familiarity and trust. *Omega, 28*(6), 725–737. 10.1016/S0305-0483(00)00021-9.

Glänzel, W., & Czerwon, H. J. (1996). A new methodological approach to bibliographic coupling and its application to the national, regional and institutional level. *Scientometrics, 37*(2), 195–221. 10.1007/BF02093621.

Glänzel, W., & Glänzel, W. (2003). 'Bibliometrics as a research field – A course on theory and application of bibliometric indicators'. Available at: http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.606.6339 (Accessed: 9 April 2019).

Glenn, D. (2012). The History of Social Media from 1978 –2012 [Infographic] – Adweek. *Adweek*. Available at Https://www.adweek.com/digital/the-history-of-social-media-from-1978-2012 . -infographic/(Accessed: 29 November 2018).

Greer, T. (2012). *The worldwide mobile location-based learning market: 2011-2016 forecast and analysis. available at: Www.ambientinsight.com* (Accessed: 13 December 2018).

Hajiheydari, N., et al. (2019). Business model analytics: Technically review business model research domain. *Foresight (Los Angeles, Calif.), 21*(6), 654–679. 10.1108/FS-01-2019-0002.

Hart, P., & Saunders, C. (1997). Power and trust: Critical factors in the adoption and use of electronic data interchange. *Organization Science, 8*(1), 23–42. 10.1287/orsc.8.1.23.

He, D., & Parker, D. S. (2010). Topic dynamics. In *Proceedings of the 16th ACM SIGKDD international conference on Knowledge discovery and data mining - KDD '10* (p. 443). New York, New York, USA: ACM Press. 10.1145/1835804.1835862.

Hennig-Thurau, T., et al. (2010). The Impact of New Media on Customer Relationships. *Journal of Service Research, 13*(3), 311–330. 10.1177/1094670510375460.

Hicks, D. (1987). Limitations of co-citation analysis as a tool for science policy. *Social Studies of Science, 17*(2), 295–316. 10.1177/030631287017002004.

Ho, J. (1997). Evaluating the world wide web: a global study of commercial sites. *Journal of Computer-Mediated Communication, 3*(1), 0. 10.1111/j.1083-6101.1997.tb00066.x.

Janssens, F., & Quoc, V. T. (2006). Integration of textual content and link information for accurate clustering of science fields. In *SCit2006, current research in information sciences and technologies: Multidisciplinary approaches to global information systems: I* (pp. 615–619). Open Institute of Knowledge. Available at. Https://lirias.kuleuven.be/1691734?limo=0 .

Jarneving, B. (2007). Bibliographic coupling and its application to research-front and other core documents. *Journal of Informetrics, 1*(4), 287–307. 10.1016/J.JOI.2007.07.004.

Kannan, P. K., & Li, H. (2017a). Digital marketing: A framework, review and research agenda. *International Journal of Research in Marketing, 34*(1), 22–45. 10.1016/J.IJRESMAR.2016.11.006.

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons, 53*(1), 59–68. 10.1016/J.BUSHOR.2009.09.003.

Karami, A., et al. (2021). Investigating diseases and chemicals in COVID-19 literature with text mining. *International Journal of Information Management Data Insights, 1*(2), Article 100016. 10.1016/j.jjimei.2021.100016.

Khokhar, D. (2015). *Gephi cookbook : Over 90 hands-on recipes to master the art of network analysis and visualization with Gephi*.

Kim, H.-. W., Chan, H. C., & Gupta, S. (2007a). Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems, 43*(1), 111–126. 10.1016/J.DSS.2005.05.009.

Kim, H.-. W., Chan, H. C., & Gupta, S. (2007b). Value-based adoption of mobile internet: An empirical investigation. *Decision Support Systems, 43*(1), 111–126. 10.1016/J.DSS.2005.05.009.

Kim, J., & McMillan, S. J. (2008). Evaluation of internet advertising research: A bibliometric analysis of citations from key sources. *Journal of Advertising, 37*(1), 99–112. 10.2753/JOA0091-3367370108.

Kleinberg, J. (2003). Bursty and hierarchical structure in streams. *Data Mining and Knowledge Discovery*. Available at https://link.springer.com/article/10.1023/A:1024940629314 . (Accessed: 5 December 2018).

Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008a). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management, 29*(3), 458–468. 10.1016/J.TOURMAN.2007.05.011.

Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008b). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management, 29*(3), 458–468. 10.1016/j.tourman.2007.05.011.

Liu, B. (2008). *Web data mining: Exploring hyperlinks, contents, and usage data*. Springer Available at: Https://books.google.com/books?id=6Mh50Uaq6AIC&pg=PA245&dq=bibliographic+coupling&hl=en&sa=X&ved=0ahUKEwiFxcuooOPhAhUT4KYKHV9LBKUQ6AEINDAD#v=onep.&q=bibliographic coupling&f=false (Accessed: 22 April 2019).

Ma'aruf, L.M., .& Abdulkadir, K. (2012). 'An overview of e-commerce implementation in developed and developing country ; A case study of United State and Nigeria'. Available at: Https://www.semanticscholar.org/paper/An-overview-of-e-commerce-implementation-in-and-%3B-A-Ma'aruf-Abdulkadir/8cbee095bc21271016510276e1a3a483239ba853 (Accessed: 13 December 2018).

Mahadevan, B. (2000). Business models for internet-based E-commerce: An anatomy. *California Management Review, 42*(4), 55–69. 10.2307/41166053.

Maimon, O., & Rokach, L. (2010). *Data mining and knowledge discovery handbook*. Springer.

Mallett, R., et al. (2012). The benefits and challenges of using systematic reviews in international development research. *Journal of Development Effectiveness, 4*(3), 445–455. 10.1080/19439342.2012.711342.

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons, 52*(4), 357–365. 10.1016/J.BUSHOR.2009.03.002.

Marcus, B., et al. (1998). Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventive Medicine, 15*(4), 362–378. 10.1016/S0749-3797(98)00079-8.

Misirlis, N., & Vlachopoulou, M. (2018). Social media metrics and analytics in marketing – S3M: A mapping literature review. *International Journal of Information Management, 38*(1), 270–276. 10.1016/J.IJINFOMGT.2017.10.005.

Miyazaki, A. D., & Fernandez, A. (2000). Internet privacy and security: An examination of online retailer disclosures. *Journal of Public Policy & Marketing, 19*(1), 54–61. 10.1509/jppm.19.1.54.16942.

Most, F., Conejo, F. J., & Cunningham, L. F. (2018). Bridging past and present entrepreneurial marketing research. *Journal of Research in Marketing and Entrepreneurship, 20*(2), 229–251. 10.1108/JRME-11-2017-0049.

Ngai, E. W. T. (2003). 'Internet marketing research (1987-2000): A literature review and classification'. *European Journal of Marketing, 37*(1/2), 24–49. 10.1108/03090560310453894.

Pan, J.-.S., Chen, S.-.M., & Nguyen, N.T. (.2012). (Computer scientist) Intelligent information and database systems : 4th Asian conference, ACIIDS 2012, Kaohsiung, Taiwan, March 19-21, 2012, Proceedings. Part II. Springer.

Paradkar, S. (2016). *Cracking the it architect interview : The ultimate guide to successful interviews for enterprise, business, domain, solution, and technical architect roles as well as it advisory consultant and software designer roles*.

Peters, K., et al. (2013). Social media metrics — A framework and guidelines for managing social media. *Journal of Interactive Marketing, 27*(4), 281–298. 10.1016/j.intmar.2013.09.007.

Petit, O., Velasco, C., & Spence, C. (2019). ScienceDirect digital sensory marketing : Integrating new technologies into multisensory online experience. *Journal of Interactive Marketing, 45*, 42–61. 10.1016/j.intmar.2018.07.004.

Pinheiro, M.T. et al.' (2014).Digital marketing and social media: Why bother?' doi: 10.1016/j.bushor.2014.07.002

Porter, M., & Kramer, M. (2006). Strategy and society: The link between competitive advantage and corporate social responsibility. *Harvard Business Review*. Available at Https://hbr.org/2006/12/strategy-and-society-the-link-between-competitive-advantage-and-corporate-social-responsibility . (Accessed: 17 April 2019).

Rawat, S., et al. (2021). Application of machine learning and data visualization techniques for decision support in the insurance sector. *International Journal of Information Management Data Insights, 1*(2), Article 100012. 10.1016/j.jjimei.2021.100012.

Reibstein, D.J. (.2002). 'What attracts customers to online stores, and what keeps them coming back ?', Journal of the Academy of Marketing Science, 30(4), pp. 465–473. doi: 10.1177/009207002236918.

Reichheld, F., & Schefter, P. (2000). E-loyalty- Your secret weapon on the web. *Harvard Business Review, 78*(4), 105.

Royle, J., & Laing, A. (2014). International Journal of Information Management The digital marketing skills gap : Developing a Digital Marketer Model for the communication industries. *International Journal of Information Management, 34*(2), 65–73. 10.1016/j.ijinfomgt.2013.11.008.

Saheb, T., & Izadi, L. (2019). 'Paradigm of IoT big data analytics in the healthcare industry: A review of scientific literature and mapping of research trends', *Telematics and Informatics*. Elsevier Ltd, pp. 70–85. doi: 10.1016/j.tele.2019.03.005

Saheb, T., & Saheb, M. (2019). 'Analyzing and visualizing knowledge structures of health informatics from 1974 to 2018: A bibliometric and social network analysis', *Healthcare Informatics Research*. Korean Society of Medical Informatics, pp. 61–72. doi: 10.4258/hir.2019.25.2.61

Saheb, Tahereh, & Saheb, Tayebeh (2020). Understanding the development trends of big data technologies : An analysis of patents and the cited scholarly works. *Journal of Big Data*. 10.1186/s40537-020-00287-9.

Salo, J. (2017). Social media research in the industrial marketing field: Review of literature and future research directions. *Industrial Marketing Management, 66*, 115–129. 10.1016/J.INDMARMAN.2017.07.013.

Soltani Delgosha, M., Haji Heydari, N., & Saheb, T. (2020). 'The configurational impact of digital transformation on sustainability : A country-level perspective'. Available at: Https://aisel.aisnet.org/ecis2020_rp/33/ (Accessed: 3 May 2021).

StellaDoradus. (2018). History of Mobile Phones. *Stella Doradus*. Available at Https://www.stelladoradus.com/history-mobile-phones/ . (Accessed: 13 December 2018).

Ström, R., Vendel, M., & Bredican, J. (2014). Mobile marketing: A literature review on its value for consumers and retailers. *Journal of Retailing and Consumer Services, 21*(6), 1001–1012. 10.1016/J.JRETCONSER.2013.12.003.

Surwase, G., et al. (2011). Co-citation analysis: An overview. In *in Bosla National Conference Proceedings. Available at* Https://core.ac.uk/download/pdf/11889658.pdf (Accessed: 13 April 2019).

Taeho, J. (2019). *Text mining: Concepts, implementation, and big data challenge*. Springer Available at Https://www.amazon.com/Text-Mining-Concepts-Implementation-Challenge/dp/303006302X/ref=sr_1_fkmrnull_1?keywords=Text+Mining%3A+Concepts%2C+Implementation%2C+and+Big+Data+Challenge&qid=1555159622&s=gateway&sr=8-1-fkmrnull (Accessed: 13 April 2019).

Tsang, M. M., Ho, S.-. C., & Liang, T.-. P. (2004). Consumer attitudes toward mobile advertising: An empirical study. *International Journal of Electronic Commerce, 8*(3), 65–78. 10.1080/10864415.2004.11044301.

Valenzuela Fernandez, L. M., et al. (2018). Industrial marketing research. A bibliometric analysis (1990-2015). *Journal of Business & Industrial Marketing* p. JBIM–07–2017–0167. 10.1108/JBIM-07-2017-0167.

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics, 84*(2), 523–538. 10.1007/s11192-009-0146-3.

van Eck, N. J., & Waltman, L. (2014). Visualizing Bibliometric Networks. In *Measuring scholarly impact* (pp. 285–320). Cham: Springer International Publishing. 10.1007/978-3-319-10377-8_13.

Vasant, P., Zelinka, I., & Weber, G.-.W. (2018). Intelligent computing & optimization.

Verbeek, A., et al. (2002). Measuring progress and evolution in science and technology – I: The multiple uses of bibliometric indicators. *International Journal of Management Reviews, 4*(2), 179–211. 10.1111/1468-2370.00083.

Wakefield, M. A., Loken, B., & Hornik, R. C. (2010). Use of mass media campaigns to change health behaviour. *The Lancet, 376*(9748), 1261–1271. 10.1016/S0140-6736(10)60809-4.

Linton, J.D., Walsh, S.T. (2004). Roadmapping: from sustaining to disruptive technologies. Technological Forecasting & Social Change, 1(71), 1–3.

Waltman, L., van Eck, N. J., & Noyons, E. C. M. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics, 4*(4), 629–635. 10.1016/J.JOI.2010.07.002.

Wang, Y.-. S., Wu, M.-. C., & Wang, H.-. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology, 40*(1), 92–118. 10.1111/j.1467-8535.2007.00809.x.

Watanabe, C., Naveed, N., & Neittaanmäki, P. (2018). Technology in Society Digital solutions transform the forest-based bioeconomy into a digital platform industry - A suggestion for a disruptive business model in the digital economy. *Technology in Society, 54*(May), 168–188. 10.1016/j.techsoc.2018.05.002.

Wymbs, C. (2011). 'Digital marketing : The time for a new " academic major " has arrived'. doi: 10.1177/0273475310392544

Xiang, Z., & Gretzel, U. (2010). Role of social media in online travel information search. *Tourism Management, 31*(2), 179–188. 10.1016/J.TOURMAN.2009.02.016.

Xu, H., et al. (2011). The personalization privacy paradox: An exploratory study of decision making process for location-aware marketing. *Decision Support Systems, 51*(1), 42–52. 10.1016/J.DSS.2010.11.017.

Zhang, J., & Mao, E. (2008). Understanding the acceptance of mobile SMS advertising among young Chinese consumers. *Psychology and Marketing, 25*(8), 787–805. 10.1002/mar.20239.

Zhuo Chen, Z., et al. (2009). Forecasting housing prices under different market segmentation assumptions. *Urban Studies, 46*(1), 167–187. 10.1177/0042098008098641.