A broad overview of interactive digital marketing: A bibliometric network analysis

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Abstract

The widespread adoption of digital technologies and online social networks has revolutionized the way marketers engage with consumers. By deploying various digital platforms and information and communication technology (ICT) tools (e.g., smartphones, social media, mobile apps, electronic billboards, etc.), organizations can compete with more objective, relational, and interactive marketing techniques. The adoption of innovative devices and data-driven marketing, specifically in digital advertising, provides both a wide and efficient reach. Consequently, digital marketing (DM) triggered the creation of more informed, empowered, and connected groups of customers in both the real and virtual worlds. This paper tracks research dynamics in interactive digital marketing by identifying the stages of evolution of major topics, articles, citation and co-citation networks, using various computational techniques, including growth curve analysis and citation network analysis of bibliometric information. Finally, the study offers contributions to the field of interactive digital marketing as an international and interdisciplinary field of research.

1. Introduction

Digital marketing (DM) conceptualizes marketing on electronic platforms through the use of any type of technological device (American Marketing Association, 2021). Over the past two decades, DM has transformed global marketing through the deployment of the following electronic media and tools to implement metrics-based, objective, relational, and interactive marketing: social media, television, radio channels, SMS, email, search engines, websites, mobile apps, electronic billboards, and social networks. The adoption of innovative devices and techniques in digital advertising and marketing has provided more convenience, a wider reach, cost-effectiveness, and the ability to cross boundaries of distance and time. Digital marketing utilizes all forms of technology, including artificial intelligence (AI) and the Internet of Things (IoT),for the purpose of fulfilling marketing objectives in both consumer-to-consumer and business-to-consumer environments (Buhalis & Volchek, 2021; Chaffey & Chadwick, 2019; Dwivedi et al., 2020; Herhausena, Miočevićb, Morganc, & Kleijnene, 2020; Petrescu, Krishen, & Bui, 2020). DM sites based on retail platforms (e.g., Alibaba, Amazon Marketplace, iTunes, eBay, Flipkart, Booking.com, Expedia) and social media marketing communities (e.g., Twitter, Facebook, LinkedIn, etc.) both augment and replace conventional marketing methods (Dwivedi et al., 2015; Gensler et al., 2012, 2013; Kapoor et al., 2018). Thus, DM is an ever-evolving, multi-disciplinary domain, not confined to a simple application of electronic technology to marketing, but also able to advance with nascent developments in information and communication technology (ICT) tools and platforms (e.g., Das et al., 2019). Therefore, a definition including all of the following applied to the current research: the perspectives of customer-focused marketing (Yang et al., 2017), decision making and customer relationship management (CRM) (Lewis et al., 2015; Zahay, Peltier & Krishen, 2012),

social interactions and media (Berezan et al., 2018; Krishen et al., 2016), enterprise event marketing, destination marketing, digital content marketing, electronic word of mouth (eWOM), digital marketing analytics (Iacobucci et al., 2019), online sentiment analysis (Cvijikj & Michahelles, 2011) and virtual marketing communities (Jansen et al., 2009). Hence a broad and all-encompassing definition of digital marketing could be: *the application of data, ICT-based technology (e.g., artificial intelligence), platforms (e.g. social networks), media and devices to extend the scope of marketing within both physical and virtual spaces, for the purpose of improving customer relationships by empowering, informing, influencing, and engaging consumers.*

Therefore, the main objective of this study is to investigate research and development dynamics in the domain of digital marketing from a multi-disciplinary perspective by analyzing the corpus of relevant research articles using social network analysis (SNA). With DM research as a frame of reference, we aim to: (1) analyze the growth pattern of substantive areas, (2) identify authors, research institutions, and journals contributing a large volume of publications, (3) investigate research and development dynamics and propose a topic evolution model to show trends, (4) provide a holistic view of the research domain by identifying the evolution of productive research collaborations and networks, and (6) synthesize interesting findings and trends in the broad area of interactive digital marketing. This study proposes a model of the evolution of research topics by first identifying major clusters of them, mapping them into five stages, providing citation and co-citation network information, and finally by offering contributions to the field of interactive digital marketing as an international and interdisciplinary field of research.

2. Background

Since the DM research domain is quickly advancing, major areas of interest, their evolution, emerging trends of research, and core research collaborating groups, are valuable information to DM research scholars. Some of the major actors in DM include globally-recognized international organizations dealing with the marketing of branded products. From a broad and inclusionary perspective, this paper investigates research and the core researchers by analyzing the bibliographic data of related research articles using the citation network, the co-citation network, and co-author network analysis.

Globalization efforts in the 20th century introduced tight competition into the field of marketing that improved the quality of products and services. The marketing field also demanded worldwide distribution and product and service promotions through global advertisements. The concept of online advertising was introduced in 1994 with HotWired, a web magazine selling a banner advertisement (ad) to AT&T and displaying the ad on its web page (Hoffman et al., 1999). The grass-roots implementation of the Internet after the 1990s, the reduction in the cost of online communication, the introduction of smartphones, and the extensive popularity of online social networks such as Facebook and Twitter are the major milestones related to ICT that promoted the rapid development of interactive digital marketing. The decline of the newspaper industry, with newspaper circulations in 2018 falling to their lowest level since 1940, also increased the customer affinity for online advertisement and marketing (Grieco, 2020).

After 2005, there was a remarkable hike in the use of online social forums in digital media with the expansion of offerings including YouTube (Lips, 2018). Social networks represented a cost-effective solution to increase the scope of digital marketing and thus led to the emergence of the social media marketing (SMM) paradigm and

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associated marketing analytics. SMM is an integrative process aimed at promoting goods and services on social media platforms that has the potential to target a far wider consumer base than traditional forms of marketing (Dwivedi et al., 2015). Wang, Want, and Yao (2005) indicate that from the first decade of the 20th century, research works were anticipating the prospects of digital marketing, destination marketing, and opinion mining, to seek customer satisfaction and search needs. Consequently, DM research expanded with additional perspectives such as social marketing, online banking, optimization of models and networks, and opinion mining to anticipate future demand. Relative advancement in the field of ICT introduced an abundance of innovative research topics in digital marketing, making the detection of underdeveloped research areas a difficult task. Hence, the conceptualization of major research areas and the evolution of research topics will be beneficial for both research scholars and marketing practitioners working in the digital marketing domain. A literature review can therefore help identify main areas of interest related to digital marketing (Webster & Watson, 2002).

There are currently several literature reviews related to digital marketing. For example, Lamberton and Stephen, (2016), Luo, Wang, and Han (2013), and Mangold and Faulds (2009) offer elaborated reviews of social media literature in marketing. There are also reviews exclusively related to eWOM (Babić Rosario, de Valck, & Sotgiu, 2020; Ismagilova et al., 2020abc; 2017), affiliate marketing (Dwivedi et al., 2017), Pay-per-click (Kapoor et al., 2016), and the impact of social media (Tamilmani et al., 2018). Goldfarb (2014) delineates the difference between conventional marketing and digital marketing. The Ngai (2003) review classifies journals published between 1987 and 2000 in five distinct categories: Internet Marketing (IM) environment, IM functions, special IM applications, IM research, and other topics. Schibrowsky, Peltier, and Nill (2007) identify

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the essential trends in IM research to provide future directions, particularly in terms of research gaps and expected topical areas of interest. Overall, the literature reviews provided by Goldfarb (2014), Ngai (2003), and Schibrowsky, Peltier, and Nill (2007) give a broad classification of research areas, emphasize a particular discipline, or focus on a focused time period. Recent literature reviews investigate more specific aspects of digital and interactive marketing such as its use in business-to-business strategy (B2B) (Pandey, Nayal, & Rathore, 2020), its application and relevance to marketing analytics (Iacobucci et al., 2019), how it relates to digital marketing communication (Kim, Kang, & Lee, 2019), and a deeper, more specific review of a limited number of journals or search terms (Kannan & Li, 2017; Ribeiro, Fernandes, & Lopes, 2020).

Thus, the current paper uniquely provides an overview of the breadth of DM research articles from a multi-disciplinary perspective to broadly classify prominent research topics. In addition to viewing digital marketing as a strategic orientation, our review also augments the aforementioned studies by including a content creation perspective and including various types of advertising and social media marketing. This bibliometric analysis is extended to identify core research collaborations, their evolution, and related research topics by analyzing the bibliometric information of research articles written on DM. Since manually processing the literature review might be cumbersome, this work adopts a methodology of computational techniques applied to bibliometric information of DM research articles. The bibliometric information of the research literature is used to construct the citation, co-citation, and co-author networks that are analyzed by adopting the tools of Social Network Analysis (SNA). The use of SNA tools in co-author networks has emerged as a powerful methodology for analyzing the structure of complex relations among actors in a research discipline (e.g., Bindu et al., 2019). Co-

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authorships are social networks defined as a collection of individuals, each of whom is tied to one another through collaborative research (e.g., Newman & Girvan, 2004). Citation network analysis (CNA) is a technology forecasting tool that acts as an alternative to an expert-based approach. In the present work, we constructed the citation network of the corpus of research articles on interactive digital marketing. The evolutionary trajectory is traced by analyzing the main path of the giant component of the citation network. Citation networks are crafted such that nodes represent articles, and edges represent the citations that can be traversed for the major paths of knowledge flow by identifying prior literature, scholars, and models that can reveal the evolution of research topics (e.g., Merigó et al., 2015).

3. Methodology

Bibliometric-based citation analysis tools provide a visual representation of scholarship networks to identify knowledge flow in various substantive research domains (Van Eck & Waltman, 2014). The bibliometric information from the selected research is used to construct the evolutionary trajectory, citation, co-citation, and co-author networks that are analyzed using tools of social network analysis (SNA), such as Gephi and VOSviewer packages (Bastian, Heymann, & Jacomy, 2009). To trace the dynamic evolution of research themes in DM, main path analysis is carried out as a next step. Co-citations measure the frequency with which two research articles are cited together by other articles to identify exemplary referenced articles and substantive topics in clusters. An exploration of co-authorship networks can uncover substantive and methodological research trends (e.g., Donthu, Kumar, & Pattnaik, 2020). More recently, citation network analysis (CNA) is evolving as a technology forecasting tool that provides an alternative to the expert-based approach. Figure 1 provides a detailed schema for our interrogation. In this work, we

conduct temporal analysis of the bibliographic data on DM from the Scopus database and analyze the networks by applying computational algorithms and tools of SNA such as clustering and main path algorithms. Using main path analysis, we then trace the evolution of the subject domain and identify five stages in the growth curve of maturity model of DM. The observations are further corroborated with the knowledge burst detection algorithm. The content analysis of the leaf nodes of the main path identify the current topics that have future research scope. The modularity based clustering algorithm (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008; Newman & Girvan, 2004) identifies the main themes of research. The algorithm computes the difference between the fraction of links that fall within the cluster and the expected value of the same quantity if the links are distributed randomly without considering cluster structures.

<Figure 1 here>

3.1. Analytic Technique

In this work, we analyzed the bibliometric information of DM research from 1990-2019 using citation networks, co-author networks, and co-citation networks of research articles. We began by collecting bibliographic data from the of Scopus repository using the following Boolean search:

> "Digital Marketing" OR "Digital Advertising" OR "Online Marketing" OR "Online Advertising" OR "Interactive Marketing" OR "Internet Marketing" OR "Internet Advertising" OR "Social Media Marketing" OR "Social Media Advertising" OR "Affiliate Marketing" OR "Search Engine Optimization" OR "Search Engine Optimization" OR "Email Marketing" OR "E-mail Marketing" OR "Mobile Marketing" OR "Mobile Advertising" OR "S.M.S Marketing" OR "SMS Advertising" OR "Search Engine Marketing" OR "Search Engine Advertising" OR "Pay-Per-Click Advertising" OR "Pay Per Click Advertising" OR "Online Public Relations" OR "Electronic Marketing" OR "E-Marketing" OR "e Marketing" OR "Blogs Marketing" OR "Twitter Marketing" OR "Facebook Marketing" OR "LinkedIn Marketing" OR "Instagram Marketing" OR "Twitter Advertising" OR "Facebook Advertising" OR "LinkedIn Advertising" OR "Instagram Advertising" OR "Social Media Analytics" OR "Digital Marketing Analytics" OR "Display Advertising" OR "Display Marketing" OR "Video Marketing" OR "Video Advertising" OR "Pinterest Marketing" OR "Pinterest Advertising" OR "YouTube Marketing" OR "YouTube Advertising" OR "Google Ad Words" OR "Re marketing" OR "Re targeting Advertising" OR "Behavioral Retargeting" OR "Display ads" OR "eWOM."

The citation network contains 45,260 nodes representing research articles in journals and conference proceedings, and their associated references. The largest node, known as the

giant component, was extracted from the networks and analyzed further. The growth curve is constructed to identify the stages of evolution. The major topics in each stage are given by: (1) temporal content analysis and iterative content coding and (2) identifying words frequently present in titles, abstracts, and author-provided keywords in the 50 most highly cited articles retrieved from Scopus during each stage of development of the DM growth curve using the program R (https://www.r-project.org/). Main path analysis (using the global main path algorithm) reveals the stages of evolution of DM. By cross-checking the results from Scopus with Web of Science (WoS), a topic evolution model is proposed. Main path analysis of the citation network was first proposed in Hummon and Dereian (1989) to identify the main path of evolution of a domain using search path link count (SPLC). Various approaches are attempted in the literature to compute the traversal count such as local search, which includes the links with highest SPLC as the outgoing link, and global search, which considers the largest overall SPLC. In this work, we follow the global search approach to trace the main path of evolution.

3.2. General patterns

The preliminary analysis identifies the general pattern of research dynamics in DM. The major interdisciplinary subjects contributing to the dataset, authors, resources of the articles, and institutions related to the authors and their associated country affiliations are identified. The content analysis of the highly cited articles arranged in chronological order provides the overall information of the major research topics and stages of evolution over time. We constructed a growth curve to trace the maturity status of research and the scope of future advancement in research related to DM. The stages of development of the

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research domain can be approximated with the evolution of the growth curve depicted in Figure 2.

<Figure 2 here>

4. Findings

4.1. Countries and journals

The dataset extracted from the data repository of Scopus and WoS using the previously mentioned keywords includes 45,260 records after pre-processing. The institutions with the highest number of publications are presented in Table 1. The major substantive areas are business, management, and accounting (25%), computer science (23%), social sciences (15%), engineering (7%), decision sciences (6%), economics, econometrics and finance (5%), psychology (3%), and others (16%). The country affiliations show that the US, China, and the UK have the highest number of publications, with 14,300, 4,796, and 3,866, respectively. Australia, Taiwan, India, Germany, South Korea, Spain, and Canada have publication contributions nearing 2,200. The list of journals with the highest number of publications in DM is given in Table. 2. The three journals with the highest number of research articles published in DM are *Computers in Human Behavior*, *Journal of Business Research,* and *Journal of Interactive Marketing*.

<Tables 1 and 2 here>

4.2. Topic evolution model

The content analysis of major topics discussed in highly cited articles analyzed in chronological order gives an overview of the evolution of research topics in the domain. The increase in the number of articles published over the past two decades shows that DM is still in the growth and diffusion phase and has not yet reached maturity, as seen in Figure 2. The period preceding the year 2000 shows fewer publications, suggesting that it

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represents the starting stage of evolution. The second stage up to the year 2005 depicts a slow rise in the volume of literature, and the phase from 2005 to 2010 portrays a gradual rise representing the third stage of evolution. The fourth stage spans from the year 2010 to 2015 and represents rapid evolution. The fifth stage starts from the year 2016 and shows a transformational stage which is predicted to attain a stage of maturity during the period between 2025 and 2030.

Substantive information about the innovative topics introduced to the domain in the recent past will be helpful for research scholars, practitioners, and other stakeholders related to DM. During the initial stage, the major topics of research related to DM include customer trust, Internet marketing, telemarketing, Internet advertisement, Internet forums, and reviews. The adaptability of the Internet as a medium for advertising and shopping, and the associated fields of trust and privacy of personal information were related research topics up to the year 2000. The relatively slow pace of research output in the domain continued up to the year 2000 as shown in the growth curve; the slow growth can be considered the first stage of evolution, namely *Stage 1: Startup stage- Up to the year 2000*. In this stage of development, factors related to customer satisfaction and customer retention were the core topics. Optimization of customer trust, quality, privacy, and the formation of internet forums and brand communities were other major developments during the period following 2000. This pattern of development, focusing on customer satisfaction perspectives, continued until the year 2005 with the emerging topics including electronic CRM (eCRM), e-risk, and interactive advertising. The evolution in the second stage during the period 2001-2005 can be termed *Stage 2: Customer satisfaction and analysis stage of the topic evolution model.*

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The third stage during the period from 2006 to 2010, shows rapid development on the growth curve. The major papers focused on: (1) developing online social network groups, (2) developing customer trust, (3) mining opinions by searching through blogs and messages in social forums for extracting customer intention, (4) demand prediction for decision support, and (5) e-tourism, eWOM, m-commerce, eCRM, customer co-creation, online advertisement, and sentiment analysis through social networks. Hence this stage can be named *Stage 3, Social network stage (2006-2010).* The subsequent years witnessed revolutionary growth in DM as shown in the growth curve. The period 2011 to 2015 included research about virtual communities and generation of co-creative content in social media marketing. The promotion of branded products in social media and the establishment of virtual brand communities were the newly introduced research themes in this stage. Customer satisfaction, user engagement, customer trust, and the influence of eWOM continued to be major research topics.

In the year 2014, personalized advertising and the prediction of future demand and customer behavior using data mining tools achieved prominence. Big data analytics gained efficiency and effectiveness as a powerful tool for opinion mining and prediction of the future since the year 2015. This next phase can be considered the fourth stage of development, entitled *Stage 4: Customer engagement Stage (2011-2015).* Customer-generated content for marketing and advertising was a major development in the year 2016. Video advertising and the use of big data analytics were characteristic research topics in the year 2017. The deployment of the Internet of Things (IoT) was the new theme introduced during the period between 2017 and 2018. Mobile banking, shared economy, and the application of virtual reality, especially in e-tourism and e-learning are new major topics added to the domain of DM research around the year 2019. In

combination, Table 3 depicts the five topic development stages that are identified by this study.

<center><Table 3 here></center>

The fitted growth curve predicts the growth pattern up to the year 2035. The ongoing developing stage during the period 2016-2035 can be named the *Machine Intelligence and IoT-based Virtual Reality Stage.* By superimposing these stages over the growth curve, this study proposes a topic evolution model, as illustrated in Table. 4. The topic evolution model is corroborated with stages of development of research topics revealed by the main path analysis of the citation network.

<center><Table 4 here></center>

4.3. Main path analysis

The evolution trajectory traced by the main path analysis of the citation network is introduced with the work of Cook and Coupey (1998), which focused on several theoretical issues related to consumer behavior. Their work also illustrated the potential effects of interactive media on decision-making and problems regarding regulations for marketers and policymakers. Bush et al. (2000) analyze perceptions of societal, industrial, and corporate concerns related to marketing on the Internet. The changeover to the new paradigm of e-commerce posed several ethical issues for marketing managers and organizations, particularly privacy concerns. As shown in the growth curve, the first stage of evolution takes place up to the year 2000, when conversion policies and theoretical issues were prominent research themes. During this period, the Internet was adopted at the grass-roots level.

Implementation perspectives gained prominence in the second phase of development, after the year 2000. Another major subject of research included challenges

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and the future scope of e-commerce. Several articles review the massive growth of e-commerce and related security issues such as spamming and cyber-squatters (Stead & Gilbert, 2001). The use of online transactions increased risk and subsequently, research began to investigate security issues related to customer adoption of e-commerce (Palmer, 2005). Hence the second stage in the growth curve up to the year 2006 relates to customer satisfaction and security in terms of digital privacy (e.g. Ashworth & Free, 2006). During the third stage beginning with the year 2006, research about multi-channel marketing using mobile marketing and social network marketing began to rise. Neslin and Shankar (2009) investigate the key issues with multichannel customer management. The topic of multichannel delivery of service develops in the third stage up to the year 2010.

The fourth stage of development in digital marketing occurred after the year 2010 as per the growth curve. Bacile et al. (2014) investigate customer-controlled co-production initiatives. The fourth stage is more related to customer-oriented approaches, customer engagement, and co-content generation. The evolution in the fourth phase traces a unique path of development leading up to the year 2013. A diversification of research streams occurred thereafter. The trends of the research streams show that the introduction of smartphones and the wide adoption of social media for digital advertising and marketing were the major triggering attributes for the divergence of topics. During the period after the year 2015, the fifth phase in this study, the surge of ICT innovations related to web technology and smart phones induced a paradigm shift from the mainstream, thus initiating three divergent streams of research. Malthouse and Hofacker (2010) review the developments and provide insightful forecasting of future research trends. The first sub-branch was triggered with an empirical study of non-profit organizations identifying the

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potential of telepresence, social presence, and involvement on consumer brand

engagement and eWOM (Algharabat et al., 2018).

The second branch of study in the same stream is initiated with the findings of

Peltier, Zahay and Lehmann (2013) on organizational learning and the success of CRM.

This work tests an organizational learning framework of the relationship between

organizational processes, customer data quality, and firm performance (e.g., Peltier,

Zahay, & Krishen, 2013; Zahay et al., 2014). Findings from this stream of research show

that high-quality customer data impacts both customer and firm performance. The third

major branch of the paradigm shift is related to online marketing communications,

beginning with Shankar and Balasubramanian (2009). Similarly, Hofacker et al. (2016)

focus on the effectiveness, challenges, and opportunities of gamification in mobile

marketing. The end nodes in the main path provide implications of related emerging

topics. Figure 3 depicts these branches of research and Table 5 provides a core list of

research topics to summarize the findings of all of the reviewed studies.

<Figure 3 and Table 5 here>

The major stream of research topics related to the main path include uses of

gamification and mobile applications to improve CRM based on consumer-brand

relationships. Augmented reality and gamification are some of the top emerging research

trends. The idea of sub-topic security is also identified by main path analysis in the second

stage. In the fourth stage, main path analysis identifies m-banking perspectives in addition

to mobile advertising and customer engagement. Research trends in the leaf nodes of the

main path show that gamification, virtual reality, virtual and digital sensory markets, AI

and big data mobile marketing, and AI-based mobile banking are emerging research

topics.

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4.4. Cluster analysis of the citation network

The large component of the citation network is visualized in Figure 4. The thirty most highly cited articles of the clusters of the citation network and related topics revealed by the content analysis of articles are listed in Table 6. The results show the prominence of research topics related to e-CRM, e-WOM, analysis of product mix and customer satisfaction, and branding. The most recent articles published during the year 2020 (as provided in Table 3) focus on (1) branding and advertisement, (2) video-based advertisements, (3) analysis of social media content (e.g., blogs) using AI techniques, social media marketing, augmented reality, and video advertising, and (4) digital branding, celebrity or influencer endorsements in advertising, and mobile payment services.

<Figure 4 and Table 6 here>

4.5 Co-citation networks of articles and journals

For our analysis, co-citation networks of articles and journals are constructed with bibliometrics of research with more than 20 co-citations. The co-citation networks of articles and journals visualized in Figure 5 provides a visual graphic of these articles showing the four major clusters of co-cited articles and related topics, in red, green, yellow, and blue. The top 30 most highly co-cited articles are listed in Table 7. The major substantive topics in the red cluster are related to social media marketing; others in the cluster are related to the method of inquiry used such as structural equation modeling. The green cluster substantive topics are related to social media and brand community. The yellow cluster depicted in Figure 5 is related to social networking sites and user-generated content (UGC), and lastly the blue cluster is related mainly to e-WOM. Figure 6 shows the seven major clusters of journals in the co-citation network of journals. The highly co-cited top 25 journals are listed in Table. 8. In Figure 6, the major topics corresponding to the red

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cluster are related to information systems and marketing, and the orange cluster is related to business and marketing. The violet cluster is related to tourism, management and hospitality, the pink cluster to consumer culture and marketing, the blue cluster to interactive marketing, and the green cluster represents psychology and medical-related journals. Because many of the consumer behavior and interactive marketing studies refer to the psychological aspects of medical journals, the journals in the green cluster are also relevant in DM research, especially since the nature of our inquiry is highly interdisciplinary.

<Figures 5 and 6 and Tables 7 and 8 here>

5. Conclusions and Contribution

Our research analyzes the evolution of research trends and the current research dynamics from different perspectives and contributes in multiple ways. First, the study makes a preliminary analysis to trace the growth of research publications in digital marketing and identifies the major authors, co-authors, and research subjects related to interactive digital marketing. The fitted growth curve identifies five stages of development related to research topics in DM. Second, the study identifies highly cited articles in chronological order and groups the major research topics in different stages of evolution indicated by the growth curve. The observations are conceptualized using a topic evolution maturity model with the growth curve, divided into five stages. Third, the main path analysis of the citation network (shown in Figure 3) created with data from Scopus and WoS fits the evolution of research topics to five main stages and conceptualizes them using a topic evolution model. The stages identified are in congruence with the topic development model described earlier. The main path reveals that IoT applications, AI supported mobile banking, mobile applications, machine learning, and AI techniques have

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future research scope in DM. Fourth, the identification of existing and emerging research agendas is helpful for future research in this field. Understanding core research collaborations, leading research trends and the conceptualization of research topic evolution models will be helpful to understand the history of DM. The conceptualization of the topic model and major research agendas will aid scholars in generating creative research collaborations in interactive and digital marketing. Finally, our study further uncovers the major research works in the DM domain from the dual perspectives of citation strength and co-citation strength. The results from the collaborations using different centrality measures in the networks of authors and research institutions identify leading researchers and institutions. The most recently published works are related to sensory devices and IoT markets, search engine marketing, channel choice sale of alcoholic products, and prescription drugs and e-cigarettes.

Our bibliometric analysis offers insights through a big picture view of the interdisciplinary and globally relevant interactive digital marketing scholarship. An initial contribution of our analysis finds that interactive and digital marketing is a cross-cultural and internationally researched and recognized substantive area of inquiry. As such, Table 1 shows that universities with a high number of publications are located throughout the world in locations ranging from China, to the US, and Singapore. Secondly, our study emphasizes the importance of a multi-disciplinary view of digital and interactive marketing. Inherent in any study regarding DM is the content itself (information/data) and the connectivity tools (ICT); both of these involve multiple disciplines, such as engineering research on smart systems standardization (e.g., Folmer & Jakobs, 2021), computer science and information systems studies on the use of digital technologies in smart circular economies (e.g., Kristoffersen, Blomsma, Mikalef, & Li, 2020), and

consumption-related experiential studies on new technologies (e.g. Hoyer, Kroschke, Schmitt, Kraume, & Shankar, 2020). The presence of multiple disciplines as critical to the study of DM is best demonstrated in Tables 2 and 8. Table 2 shows that the highest number of publications within our topic of interest are present in computer science, interactive marketing, information management, advertising, and tourism journals, among others. Table 8 further indicates that articles with high levels of citations also span multiple fields including interactive marketing, business research, tourism, marketing, and advertising.

A third contribution of our review is the finding that across all decades of research, the customer-technology interaction is an important concept. Our study confirms this notion, especially related to the main path core research articles in Tables 4 and 5. Interestingly, whereas the research prior to 2000 related to customer trust and ethics, as time passed, customer satisfaction and ultimately customer co-creation and engagement surfaced as key areas. Additionally, the immersive experience of technology over time is becoming a more prominent area of research. This can be seen in Table 4, stages 3, 4, and 5, wherein prominent research topics include consumer co-creation of content (such as online reviews and videos), artificial intelligence, and virtual reality.

A final contribution and finding of our study is that researchers in the area of digital and interactive marketing utilize multiple methods of inquiry; this effect is especially evident in the most highly cited articles. As illustrated in Tables 6 and 7, qualitative (e.g. netnography in Kozinets, 2002), quantitative consumer behavior (e.g. structural equation modeling in Fornell & Larcker, 1981; Bagozzi & Yi, 1988; Hoffman & Novak, 1996), and quantitative modeling (e.g. Godes and Mayzlin, 2004) research are all present in highly cited and co-cited networks.

6. Limitations and Future Research

The present research lays the groundwork for future research directions and has limitations. One such limitation centers on the large number of articles utilized in the bibliometric analysis. This large set of literature, while providing a wide array of research and topics, also creates a knowledge and information overload. Future meta-analyses on this topic can limit the breadth of substantive areas and focus on fewer disciplines and topic areas to delve deeper and more specifically. Whereas our review provides substantive topic areas over time and delves into author and citation information, an inherent limitation of bibliometric reviews is that they tend to focus more on affiliations and countries and less on theories and frameworks (Paul & Criado, 2020). Another potential limitation of our research is that we did not identify moderators and mediators, relationships, and deeper connections between the topic areas uncovered. Therefore, future research can interrogate deeper substantive connections, co-authorships, and topics as they interconnect. We were also limited by excluding weighted average citations in Table 7, so future research should incorporate that metric (Hao et al., 2019). Our analysis was also limited by a reliance on the Scopus database for our initial information. A final limitation of the present work is a heavier focus on the process of the bibliometric analysis we conducted than on the identification of future research trends. In focusing on presenting an inclusive historical perspective, we limited our ability to dedicate space to proposing an emergent conceptual framework.

The topic evolution model indicates that the upcoming phase of DM will include artificial intelligence (AI), the Internet of Things (IoT), and smart environments that ensure seamless interaction between consumers. Future research should interrogate the interplay between smart environments, artificial intelligence, and consumer trust and

privacy (Bandara, Fernando, & Akter, 2020; Dwivedi et al., 2020; Nayal, Pandey, & Paul, 2021). A second area of potential future research is the role of business and marketing analytics and CRM tools in developing personalized yet permission-based marketing strategies. Future research should also delve further into topics including the interplay between physical and virtual space to (1) enable consumer well-being such as reducing loneliness (e.g., Berezan et al., 2020), (2) produce multisensory experiences (e.g., Petit, Velasco, & Spence, 2019), (3) serve various generational cohorts (e.g., Dash, Kiefer, & Paul, 2021), (4) facilitate all forms of community-building such as consumer-to-consumer (C2C) and B2B (e.g., Kachen et al., 2021), and (5) reduce consumer financial and privacy-based vulnerability (e.g., O'Connor et al., 2019).

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Figure 1. Schema of the study

Figure 2. The maturity model and topic evolution model of research topics in digital marketing.

Stage 1   Stage2 Stage3 Stage4   Stage5

Stage 1: Startup stage
Stage 2: Customer satisfaction and analysis stage
Stage 3: Social network & Review stage
Stage 4: Co-creation & Customer engagement stage
Stage 5: Machine intelligence & IoT based Virtual reality stage

Figure 3. Main paths in citation network

Figure 4: Large component of the citation network

Figure 5: Co-citation network of articles

Figure 6: Co-citation network of journals.

Table 1: Universities with a high number of publications contributing to the dataset

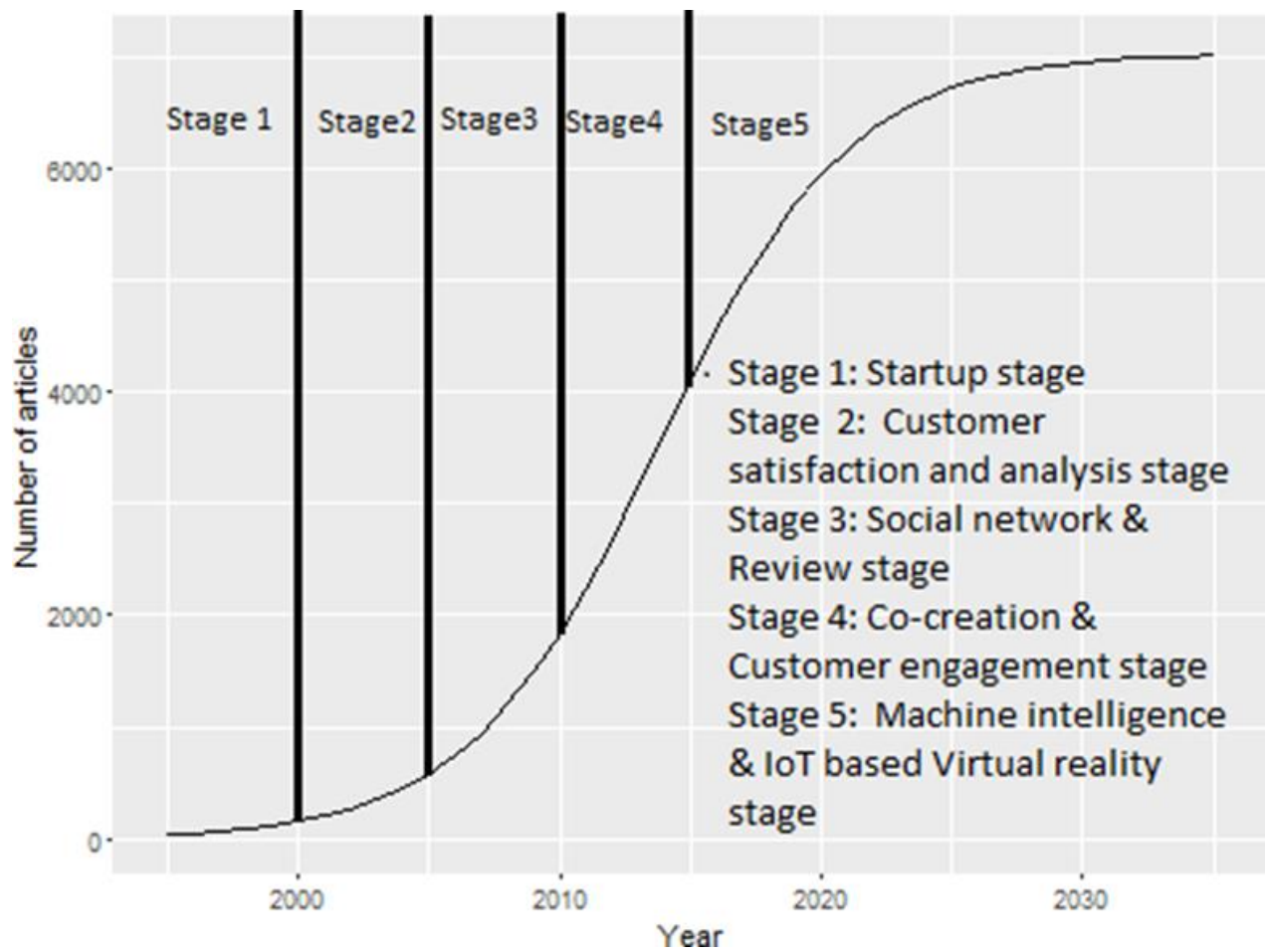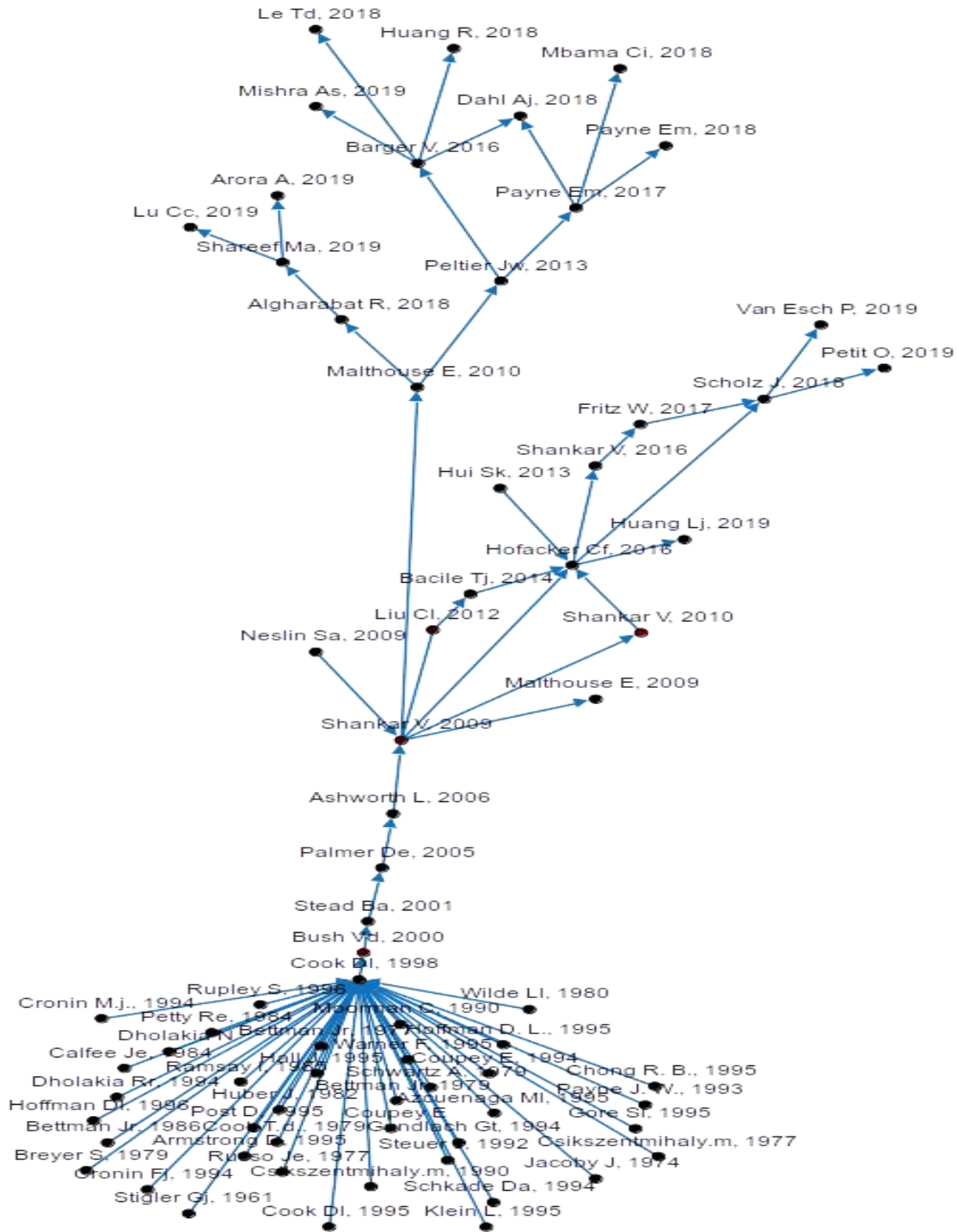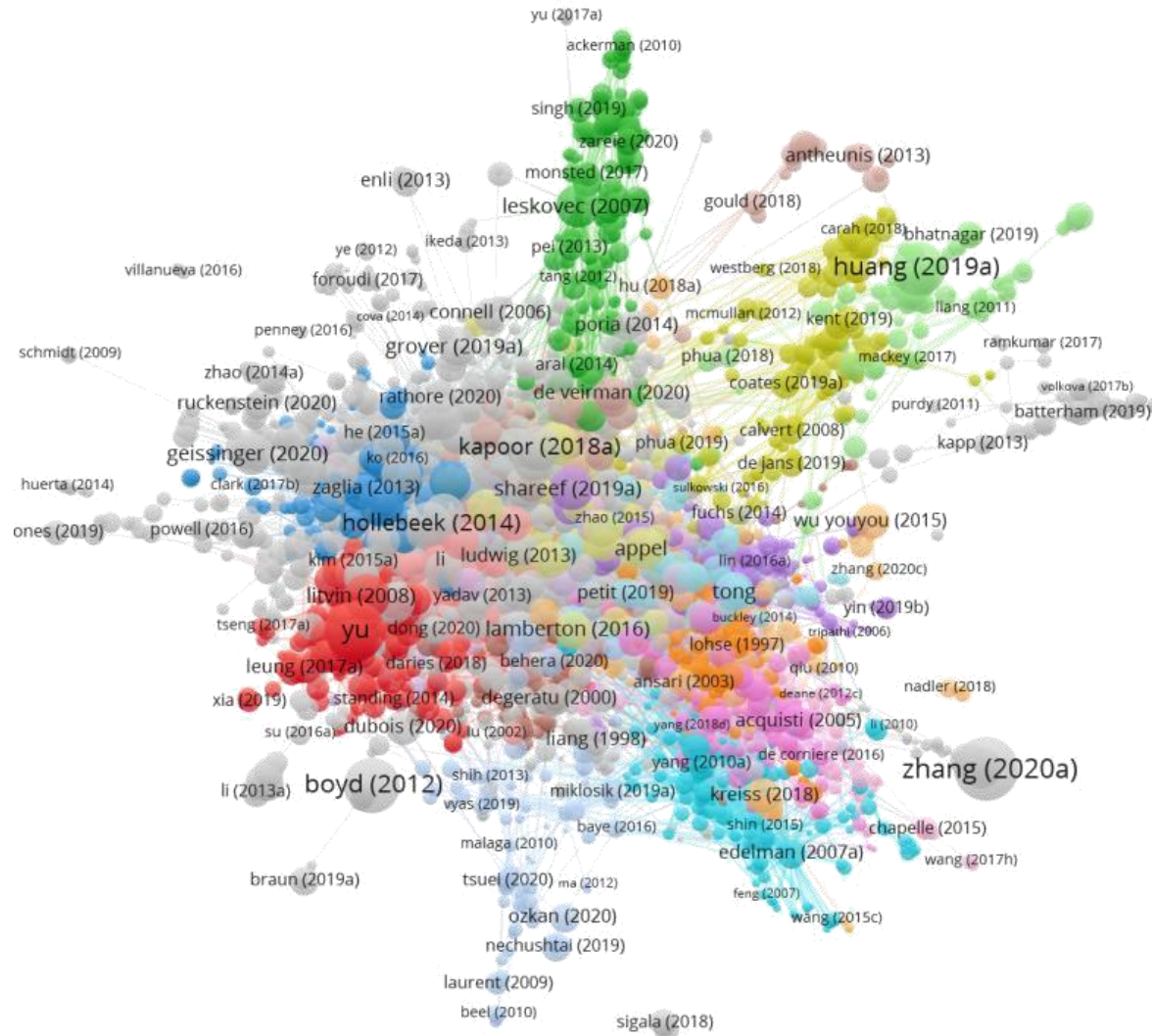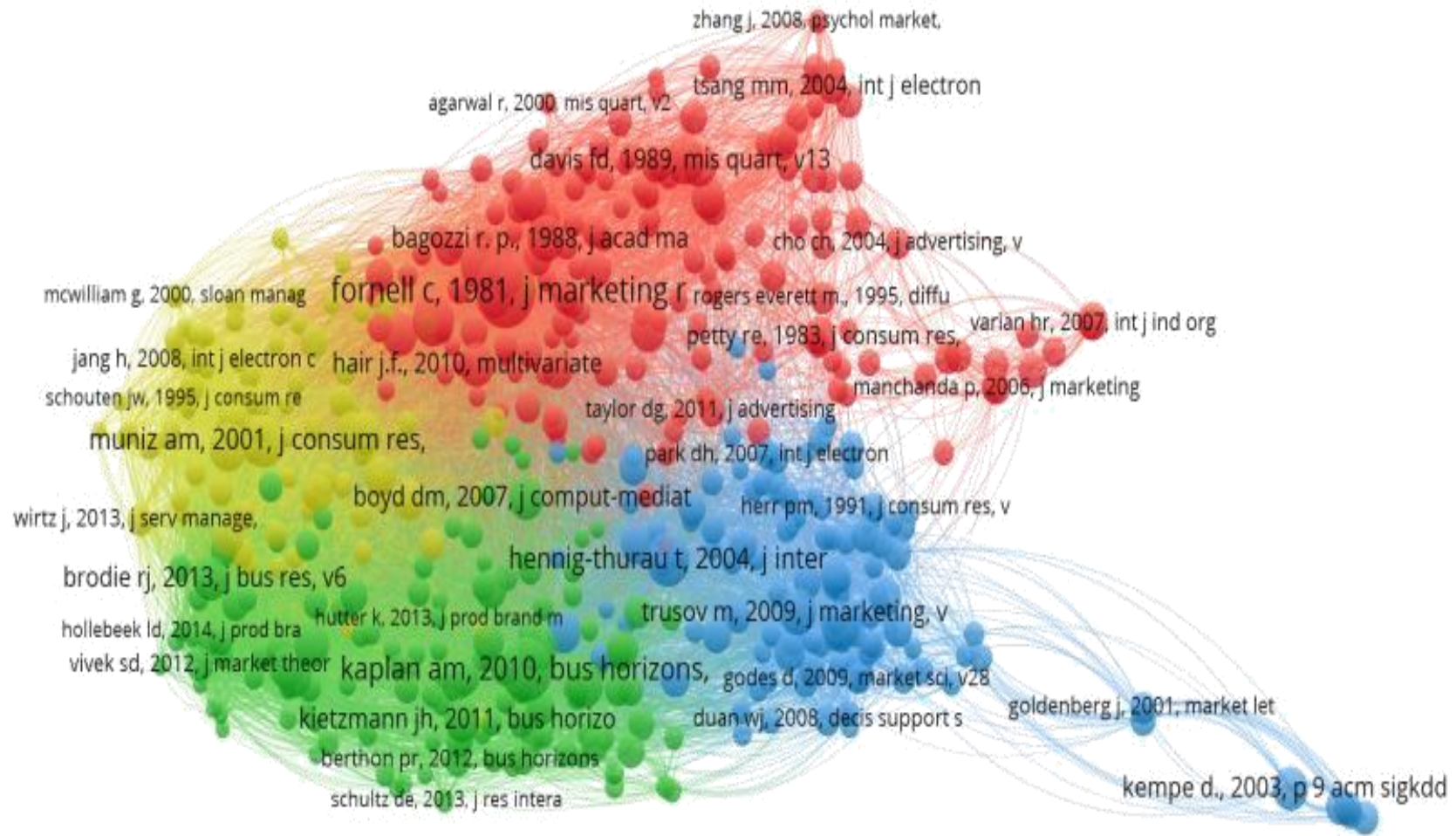| No.	University	Publications
1.	City University of Hong Kong	376
2.	Hong Kong Polytechnic University	370
3.	Pennsylvania State University	308
4.	National University of Singapore	268
5.	University of Texas at Austin	253
6.	Tsinghua University	251
7.	Michigan State University	248
8.	University of Maryland	239
9.	Purdue University	238
10.	Carnegie Mellon University	232

Table 2: Journals with the highest number of publications in the dataset

No.	Subject	Publications
1.	Computers in Human Behavior	585
2.	Journal of Business Research	544
3.	Journal of Interactive Marketing	506
4.	ACM International Conference Proceeding Series	504
5.	Journal of Retailing and Consumer Services	401
6.	Internet Research	279
7.	Decision Support Systems	252
8.	International Journal of Information Management	249
9.	Journal of Direct Data and Digital Marketing Practice (Discontinued in 2016)	230
9.	Sustainability	225
10.	Expert Systems With Applications	224
11.	International Journal of Internet Marketing and Advertising	219
12.	European Journal of Marketing	211
13.	Tourism Management	211
14.	International Journal of Advertising	204
15.	Information and Management	196

Table 3: Major research topics related to Stages 1 through 5 of the maturity model of digital marketing

Year	Major topics	Mostly cited related articles in the dataset
1990-1999	customer trust, internet marketing, telemarketing, online advertisement, internet forums, reviews	Drenth et al.(1991); Salomon and Koppelman(1992); Clemons and Weber (1994); Berthon (1996); Murphy et al. (1996); Hoffman and Novak (1996); Alba et al.(1997); Hamill and Gregory(1997); Hamill(1997); Grönroos(1997); Brodie et al. (1997); Culnan and Armstrong (1999)
2000-2002	Success factors, web mining, electronic data interchange (EDI) adoption model, brand community in internet, e- WOM, trust models, privacy, cost and quality optimization	Novak et al. (2000); Liu and Arnett (2000); Mobasher et al. (2000); Phelps et al.(2000); LynchJr and Ariely(2000); Childers et al.(2001); McKnight and Chervany(2001); Harrison-Walker(2001); Shim et al.(2001); Koufaris(2002); Kozinets (2002); McAlexander et al. (2002); Srinivasan et al. (2002)
2003-2005	Customer satisfaction and loyalty, trust, e-risk, success factors, CRM, interactive advertising, business models	Vander Heijden et al. (2003); Gefen et al. (2003); Anderson and Srinivasan(2003); Pavlou(2003); Vander Heijden(2003); Shankar et al.(2003); Corritore et al.(2003); Forsythe and Shi(2003); Grabner-Kräuter and Kaluscha(2003); Chen and Dubinsky(2003); Rust et al.(2004); Morris et al.(2005); Bart et al. (2005); Sawhney et al.(2005); Chellappa and Sin(2005); Ko et al.(2005)
2006-2008	e-WOM, m-commerce, e-tourism, models, co-creation with customers, personalization	Kobsa et al. (2006); Chiu et al. (2006); Vaidya and Kumar (2006); Dinev and Hart(2006); Flavi´an et al.(2006); Collier and Bienstock(2006); Awad and Krishnan (2006); Bauer et al. (2006); Cyr et al. (2006); Gruen et al. (2006); Overby and Lee (2006); Dellarocas(2006); Flavi´an and Guinal´ıu(2006); Kressmann et al.(2006); Eastlick et al. (2006); Holzwarth et al. (2006); Brown et al. (2007); Dellarocas et al. (2007); Gentile et al. (2007); Sen and Lerman (2007); Norberg et al. (2007); Buhalis and Law(2008); Pang et al.(2008); Kim et al.(2008); Litvin et al.(2008); Duan et al.(2008); Pang et al.(2008); Kim et al.(2008)
2009-2010.	trust, opinion mining, decision models, e-tourism, e-reviews, e-WOM, customer relationship and engagement	Vermeulen and Seegers(2009); Mangold and Faulds(2009); Jansen et al.(2009); Valenzuela et al. (2009); Vermeulen and Seegers (2009); Ha and Stoel (2009); Ye et al. (2009); Schau et al. (2009); Trusov et al. (2009); Verhoef et al. (2009); Xiang and Gretzel (2010); Van Doorn et al. (2010); Ritzer and Jurgenson (2010); Kirschner and Karpinski (2010); Hennig-Thurau et al. (2010); Hoyer et al.(2010)
2011-2013.	customer engagement, satisfaction, e-WOM, e-WOM (tourism), e-branding, brand community, research models, e- commerce trust	Brodie et al. (2011); Chu and Kim (2011); Hanna et al. (2011); Sparks and Browning (2011); Ye et al. (2011); Aral and Walker (2011); Ordanini et al. (2011); Veil et al. (2011); Kim et al. (2011); Moe and Trusov (2011); De Vries et al. (2012); Poetz and Schreier (2012); Vivek et al. (2012); Kim and Ko (2012); Cheung and Thadani (2012); Sashi (2012); Brodie et al. (2013); Clark and Melancon (2013); Goh et al. (2013); Huang and Benyoucef (2013); Stieglitz and Dang-Xuan(2013); Bolton et al.(2013); He et al.(2013); Aral et al.(2013); Kim and Park(2013)
2014-2015	Customer engagement and co-creation, e-WOM, repurchase and trust, CRM in social media, opinion mining, e-tourism, personalized advertising, brand community, social networks, Facebook, Big data analytics, m-apps	Belk (2014); Hollebeek et al. (2014); King et al. (2014); Chiu et al. (2014); Atzori et al. (2014); Van Laer et al. (2013); Filieri and McLeay (2014); Alexandrov et al. (2014); Trainor et al. (2014); Gerber (2014); Fang et al. (2014); Law et al. (2014); Tucker(2014); Andreu-Perez et al.(2015); Ashley and Tuten(2015); Ngai et al. (2015); Liu and Park (2015); Kosinski et al. (2015); Slade et al. (2015); Gandomi and Haider(2015); Verhoef et al.(2015); Guttentag(2015); Mohlmann(2015); Tandoc Jr et al.(2015); Chandler and Lusch(2015); Zupic and Cˇater(2015)
2016-2017	Social media engagement, reviews, customer engagement, e-tourism (branding), video advertising, big data analytics	Weiss et al. (2016); Bello-Orgaz et al. (2016); Wirtz et al. (2016); Ranjan and Read(2016); Babic´Rosario et al.(2016); Kumar et al.(2016); Salehan and Kim (2016); Lu et al. (2016); Hsiao et al. (2016); Storbacka et al. (2016); Tripathy et al. (2016); Akter and Wamba(2016); Randhawa et al. (2016); Zhao et al. (2016); Vargo and Lusch (2017); Chen et al. (2017); Guo et al. (2017); Grewal et al. (2017); Xiang et al. (2017); Harmeling et al. (2017); Sun et al. (2017); Felix et al. (2017); Henseler (2017); Harrigan et al. (2017); Khan (2017); Zhang et al. (2016); Kannan and Li (2017); Sun et al. (2017); Liu et al. (2017); Phua et al. (2017); Xu et al. (2017); Jing et al. (2017), Jeong et al. (2017);
2018	Social media marketing, branding, e-tourism-virtual reality, IoT based data collection, video, advertising and engagement of customers	Kapoor et al. (2018); Stieglitz et al. (2018); Kamboj et al. (2018); Xu et al. (2017); Tom Dieck and Jung (2018); Shiau et al. (2018); Santoro et al. (2018); Buhrmester et al. (2018); Islam et al. (2018); Liang et al. (2018); Kleis Nielsen and Ganter (2018); Lee et al. (2018); Autio et al. (2018); Aswani et al. (2018); Tussyadiah et al. (2018)
2019	Opinion mining, m-banking, e-WOM, Big data and data mining, virtual reality, Social media marketing, Shared economy	Shareef et al. (2019); Meißner et al. (2017); Bag et al. (2019); Cheng et al. (2019); Abrate and Viglia (2019); Kumar et al. (2019); Li et al. (2018); Yen and Tang (2019); Bunce (2019); Baabdullah et al. (2019); Urena et al. (2019); Arora and Sanni (2019); Martins et al. (2019)

Table 4: Topic evolution model for the major evolutionary stages of digital marketing

Stages	Year	Major topics	Stage name
Stage 1.	Up to 2000	customer trust, internet marketing, telemarketing, online advertisement, internet forums	Startup stage
Stage 2.	2000-2005	Customer satisfaction, online communities	Customer satisfaction and analysis stage
Stage 3.	2006-2010	Customer satisfaction, Online reviews	Social network and multichannel stage
Stage 4.	2011-2015	Co-creation, Customer engagement, e-Tourism, data mining	Customer engagement stage
Stage 5.	2016-2019	Big data analytics, Customer engagement, content generation, video advertisement, IoT applications	AI, IoT and virtual reality stage

Table 5: Topics of core research articles in the main path

Phase	Period	Topic
1.	1998-2000	Regulations and policy regulations on ethical and security issues, Policies and regulations
2.	2001-2006	Ethical and security issues
3.	2006-2009	Multichannel service delivery, Mobile marketing
4.	2009-2010	social network marketing
5.	2010-2013	Telepresence
6.	2013-2014	eWOM, eCRM
7.	2014-2016	Mobile advertising
8.	2016-2018	Mobile banking
9.	2018-2019	Discussion forums, brand groups
10.	2019-	Digital sensory marketing, AI and IoT based virtual reality applications in digital marketing

Table 6. The 30 articles with highest citations in the citation network

No.	Article Label	Citations	Topic
1	Kozinets, R. V., 2002	1320	Netnography
2	Mangold, W. G., 2009	1090	Promotion mix
3	Godes, D., 2004	1012	e-WoM
4	Trusov, M., 2009	905	e-WoM
5	Zhu, F., 2010	829	consumer review
6	Berger, J., 2012	745	viral marketing
7	Kozinets R. V., 2010	714	e-WoM
8	Lin, K.Y., 2011	616	social networking sites
9	Hollebeek L. D., 2014	583	Branding
10	De Vries, L., 2012	539	Branding
11	Hanna, R., 2011	525	social media
12	Sen, S ., 2007	445	negative consumer review
13	Kim, A. J., 2012	442	Branding
14	Mollen, A., 2010	387	interactive media
15	Connell, J., 2006	382	Tourism
16	Degeratu, A. M., 2000	367	Branding
17	Phelps, J., 2000	360	e-WoM, privacy
18	Park, C., 2009	340	e-WoM
19	Muntinga, D. G., 2011	330	COBRAs- branding
20	Hennig-Thurau, T., 2003	328	e-WoM
21	Ansari, A., 2003	320	model e-customization
22	Calder, B. J., 2009	314	Advertising
23	Liang, T. P., 1998	308	consumer acceptance
24	Hoffman D. L., 2009	305	online flow-future
25	Smith, A. N., 2012	301	brand, channels
26	Aral, S., 2011	298	viral product- design
27	Cheung, C. M. K ., 2012b	281	e-WoM
28	Wang, X., 2012	278	purchase intention
29	Fournier, S., 2011	269	Branding
30	Balasubramanian, S., 1998	254	Comparison

Table 7: The 30 articles with the highest citations in the co-citation network.

No.	Article Label	Citations	Topic
1	Fornell C., 1981	572	structural equation model
2	Kaplan A. M., 2010	380	social media
3	Hennig-Thurau T., 2004	256	e-WOM
4	Podsako P. M., 2003	237	behavioral research
5	Muniz A. M., 2001	232	brand community
6	Anderson J. C., 1988	208	structural equation model
7	Mangold W. G., 2009	199	promotion mix
8	Chevalier J. A., 2006	195	e-WoM-book review
9	Davis F.D., 1989	188	computer system adoption
10	Algesheimer R., 2005	186	brand community
11	Bagozzi R. P., 1988	181	structural equation model
12	Trusov M., 2009	173	e-wom, marketing sites
13	De Vries L., 2012	170	brand marketing
14	Brodie R. J., 2013	161	customer engagement
15	Boyd D. M., 2007	160	social network sites
16	Hoffman D. L., 1996	160	hyper media-IT
17	Dholakia U. M., 2004	158	social influence model
18	Kietzmann J. H., 2011	158	social media
19	Van Doorn J., 2010	156	customer engagement
20	Kempe D., 2003	153	social network model
21	Hollebeek L. D., 2014	151	brand engagement
22	Mcalexander J. H., 2002	150	brand community
23	Ajzen I., 1991	149	planned behavior-theory
24	Morgan R. M., 1994	146	relationship marketing
25	Kozinets R. V., 2010	145	e-WOM
26	Brodie R. J., 2011	133	customer engagement
27	Kozinets R. V., 2002	128	netnography
28	Schau H. J., 2009	126	brand community
29	Chu S C., 2011	122	e-WOM
30	Vargo S. L., 2004	118	Co-creation

Table 8. The 25 journals with the highest citations in the co-citation network.

Journal	Documents	Citations
Journal of Interactive Marketing	138	8335
Journal of Business Research	117	5646
Tourism Management	47	5117
Marketing Science	76	4951
Journal of Marketing Research	48	4829
Journal of Marketing	33	4319
Business Horizons	50	3784
Computers In Human Behavior	86	2620
International Journal of Research In Marketing	34	2300
Journal of Advertising Research	76	1953
Journal of Advertising	32	1832
International Journal of Information Management	47	1654
European Journal of Marketing	68	1444
International Journal of Electronic Commerce	33	1379
Industrial Marketing Management	42	1320
International Journal of Advertising	62	1261
Psychology & Marketing	43	1122
Journal of Travel & Tourism Marketing	39	1051
Electronic Commerce Research And Applications	51	800
International Marketing Review	25	620
Journal of Destination Marketing & Management	24	569
Journal of Marketing Management	36	467
International Journal of Market Research	25	360
Journal of Research In Interactive Marketing	80	354

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