RESEARCH ARTICLE

The "Network Society" moves in mysterious ways: 25 years in the reception of a core concept

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ABSTRACT

The "Network Society" is an analytical concept developed by Manuel Castells to describe a new form of societal organization underpinned by microelectronics and based on information flows. Since it was introduced in the 1990s, this key contribution to social theory has framed much of academic research and policy-relevant worldviews when it comes to understanding contemporary digital ways. By quantitatively exploring the impact of his contributions, this study inquires into how Castells' concept was received by scientific communities publishing in peer-reviewed academic journals. Through a comprehensive and integrative bibliometric analysis, the findings reveal a three-phase build-up process of appropriation and highlight how the concept was predominantly exploited in the domains of Communication and Sociology, with an emphasis on connectivity and its implications for governance and policymaking, particularly in Western countries. There is evidence of its adaptability in capturing the evolving opportunities and challenges of the digital era.

1. INTRODUCTION

The "Network Society" became a well-known label after the publication of *The rise of the network society*, a book authored by the sociologist Manuel Castells (1996). Castells identified a new social structure that was just gaining shape, mainly characterized by interconnections and interactive dynamics, features empowered by the internet as the leading informational infrastructure and by an all-encompassing digital sphere. Castells outlined the emergence of a network(ed) society and an interdependent political economy, whose lifeblood is the flow of information. While the author himself rejected peremptorily any forecasting imprint in his work (Castells, 2010), it is undeniable that in the following decades we would witness some forms of sociotechnical arrangements that at least pay some resemblance to Castells' core presuppositions.

Rather than trying to set forth an analysis of whether the real world matched the key points highlighted by the author, we attempt an account of the reception of his ideas and world-view. In particular, we trace the academic impact of the Network Society concept and offer evidence regarding how it evolved as ensuing scholarly work deployed it. By analyzing bibliometric data extracted from formal research publications produced by the scientific community (i.e., peer-reviewed papers in internationally indexed academic journals), we aim to understand the views stemming from what is arguably Castells' key contribution to social

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theory, as well as to capture any variations in the meaning of the concept itself. Therefore, the research question guiding our enquiry is the following: *How did the usage of the concept of "Network Society" develop over time?*

To grasp how this concept emerged and has been used in different fields of knowledge in real historical time, we identify the exact term introduced by Castells in the *title, abstract,* or *keywords* of papers. Additionally, by rereading his original contribution and exploring its emergence context, and by revisiting classic books that preceded it, we mobilize a diverse set of resources so as to attempt a more holistic approach (i.e., an *integrative review* of the concept in action; Breslin & Gatrell, 2020; Cronin & George, 2020; Mendonça, 2017). Unlike traditional surveys and contemporary systematic literature reviews, our analysis attempts to achieve a distinctive conceptual focus and brings together different materials and sources to raise the potential for extra interpretability and reflexivity about this subject.

We find that the concept of the Network Society was adopted mostly in the social sciences, in particular in Communication studies and Sociology. The most impactful literature addresses governance and policymaking issues. We also witness the Network Society staying close to the communicational and technological areas since its emergence, but it is not a stagnant concept. More recently, we see the usage of the term evolving to applications in the platform connectivity realm. Echoing the current era of digitalization, it proves to be efficient and agile in analyzing this fast-paced changing field.

This article is organized as follows. Section 2 presents, describes and explores the concept of the Network Society. Section 3 details the methodological framework. Section 4 presents the main results of this study. Section 5 goes on to offer final remarks and outlines some limitations and opportunities for future research.

2. THE RISE OF THE NETWORK

How the Network Society may have been an elastic framework to accommodate a number of interrelated overlapping changes is a relevant matter to this paper. This section performs two preliminary tasks by adopting a root-and-branch approach. First, it reviews the successive waves of transformations which constitute the subject matter of Castells' work. Second, it surveys the major thought lines that preceded his own contribution.

2.1. Navigating the Labels

The power of "computer-mediated communications" was captured early on in the aptly titled book *Network Nation*. Hiltz and Turoff (1978/1993) sharply noted that connected terminals supported in expensive sophisticated electronics were not the whole story; that is, rather than espousing a technology determinist view (graphic hardware, portable devices, and the like being a transformation in themselves), these authors emphasized how development was conditional on a new policy, regulation, managerial choices, and social practices. Thus, the analytical emphasis was not on the primacy of flexible low-cost technological linkages nor on the structure of social interaction, but on a new, combinatorial and augmented, all-embedding techno-social system. In the Preface to the revised edition of 1993, the authors refer to the defining "superconnectivity" character of the coming age. In between these two dates, Cohen and Zysman (1987) were referring to "telecommunications nets."

By the turn of the century, indeed, the notion that changes were coalescing into a new type of framework was gaining currency in business and among governments. From an economic history perspective, this was tantamount to a structural shift breaking through the legacy of

industrial society: a true *information revolution* (i.e., a new setup of technologies and institutions that made use of integrated circuits as core input and are supported by new basic infrastructures like the internet; Freeman & Louçã, 2001). Not only are these activities propelled by new rising industries (electronics, software, etc.), they would soon permeate the capabilities of firms in every industry and guide their problem-solving modes of operation (Louçã & Mendonça, 2002; Mendonça, 2003).

In the early 2000s, academic authors and media commentators were referring to a new phase of development; terms such as "information society" and "knowledge-driven economy" became focal points (Mansell & Steinmueller, 2000; Webster, 2007). Sources of economic value were now perceived as being driven by intangibles and processes highly dependent on interactive dynamics. As David (2002) noted, terminology-hunting became all the rage: "e-economy," "digital economy," "weightless economy," "intellectual capitalism," "New Economy," "Next Economy," etc. As the "dot.com" bubble burst, the feverish proliferation of efforts to brand the putatively newest epoch had indeed been an indicator of hype (Christensen & Maskell, 2003; Sapsed, 2005).

By the late 2000s, a debate about the new informational environments was taking place. Overall, a wide array of authors nurtured a positive and optimistic view (Benkler, 2006; Lessig, 2008; Shirky, 2008; Sunstein, 2006; Surowiecki, 2005; Tapscott & Williams, 2006). This literature stressed the endless opportunities and liberating possibilities that openness and connectivity could offer to society. A new form of distributed organization was regarded to improve democracy and autonomy and to promote justice and level playing fields (Friedman, 2005). Networks were seen as a means of empowerment and a pathway to enhanced individual and collective human freedom. Self-organizing groups and collaboration were regarded as viable for community-like socioeconomic modes of coordination: *handshakes* as the emerging template (i.e., the go-to solution between the *visible hand* (hierarchies) and the *invisible hand* (markets)). In the media system, networks allowed for the appearance of a new communicational model, designated as the *networking communicational model* of information societies (Cardoso, 2008), characterized by a networking of mass and interpersonal media.

Through the 2010s more skeptical overtones appeared. Authors and commentators somewhat felt that the hopes brought about by the internet space had been converted into a new Gilded Age (Marciano, Nicita, & Ramello, 2020; Mukherjee, 2018; Wu, 2016; Varoufakis, 2023; Zuboff, 2019). In fact, an all-encompassing electronic ecosystem dominated by digital platforms now threatened to harness the sphere of personal privacy, capture and commodify human attention, and control reality itself as it hybridized with cloud-based AI-driven computing in the context of ubiquitous wireless broadband. The rise of Big Tech is purported to have changed the nature of the internet as we then knew it. The way these monopolies gathered and acted on data, assuming a strategic intermediation role in different contexts, seemed to be an example of centralization and not decentralization. Mobilizing huge profits, digital platforms collect, process, interpret, and leverage unprecedented amounts of intelligence about their users. Big Tech companies also display significant research activity, mainly through scientific publishing (Damásio, Mendonça, & Silva, 2023; Mendonça, Silva, & Damásio, 2025). These dynamic capabilities offer immense potential for commercial value creation, but they also raise questions about possible threats to competition and societal governance at large (Mansell & Steinmueller, 2020; Mendonça, Damásio et al., 2022; Mendonça, Archibugi et al., 2024). Thus, terms like "platform capitalism" and "surveillance capitalism" gained traction in policy-making, antitrust, and communications regulation (Parker, Van Alstyne, & Choudary, 2016; Srnicek, 2017).

2.2. Paving the Way for the Network Society

Our focus in this paper is on how the Network Society concept engages with the nexus of momentous transformations that have come to define the current times. But Castells' answer to the puzzle is backed with several theoretical ingredients that preceded it. It is worthwhile revisiting the road to his contribution; in particular, this will be done with the help of a number of key references in media and management studies: Bell (1973), Toffler (1980), Rogers (1986), McLuhan and Powers (1989), and Drucker (1993).

Marshall McLuhan gave important contributions to the media theory field and Communication studies. McLuhan (1963) and McLuhan and Powers (1989) had worked on the idea of a "global village" already in the 1960s. According to the author, electronic media cannot be analyzed linearly, and thus there is a need for new communication models for the electronic age. Future communication media would take us from individualism to a collective whole, and this would result in the materialization of what would be called "globalization." The economy would also become more direct, and access to information less editorialized. Information would spread faster and would not be subjected to state-owned control; it would break cognitive monopolies, being available for everyone, at any time.

The sociologist Daniel Bell addressed issues related to science, technology, and capitalism, and their influence on individuals. In the conceptualization presented by Bell (1973), society may be divided into three phases: Pre-industrial, Industrial, and Post-industrial. From the lens of a Post-industrial society, Bell regards communication as the main medium for connection and the economy as global and unified (see Bell, 1990, 1999). The axial principle of post-industrialism is the codification of theoretical knowledge and the belief that science and technology are not independent. The assumption is that innovations, such as electronic developments and digitalization processes, are rooted in prior scientific research. This new technology should be perceived as an intellectual technology. It is based on telecommunications, programming, algorithms, and modeling, greatly differing from a merely mechanical system. Human capital is thus the strategic resource in the transition to a services-intensive economy. Higher education is perceived as a means to achieve success.

Alvin Toffler was a popular writer and a futurist. Toffler defined three phases of society, which he denoted as "waves"; after the agricultural society, and after the industrial society, the Third Wave is related to the Information Revolution. Toffler (1980) stated that the way new technologies impact society would lead to a whole new civilization, which would have information as its crucial underpinning. The Third Wave is defined by its flexible rhythm, personalization, segmentation, diversity, and pressures on the nation-state. The author predicted the Third Wave technologies to be smaller, simpler, reusable, and less energy-consuming. This would result in a generalized inadequacy of inherited social and political structures.

Rogers (1986) observed society from a communicational point of view. The author perceived that the way communication is implemented changed in the 1980s. In computerized channels the message flow takes place on a many-to-many basis, a pattern which sharply contrasts with the characteristics of the mass media. Rogers noted that these main features of interactive communication originate from a shift in control, as power is no longer exclusive to the producers of a message. All the individuals in this communication system are participants with potentially equal influence.

Drucker (1993) placed the beginning of the "Post-Capitalist Society" immediately after the Second World War and defined it as a transition period. According to the author, knowledge (defined as information in action) is the basic economic resource. The main idea is that

innovation creates value. In Drucker's view, knowledge management is a function performed by organizations, which are seen as groups of specialized people. Knowledge workers, who virtually become owners of enterprises, are simultaneously dependent on and independent of the organization: They are employees and owners of the major means of production (expertise).

2.3. Castells, Intellectual Profile

Sociologist Manuel Castells was born in Catalonia in 1942. His intellectual journey as an academic and researcher started with studies on Urban Sociology and social movements. Later, there emerged the theme of information and communication technologies (ICTs). Regardless of the specific study field under the spotlight at a given time (as research areas of interest evolved and overlapped since his career began in the late 1960s), Castells identified power as the central subject in all his work (Castells, 2016; Rantanen, 2005).

Power relationships cross all aspects of society, shaping and influencing it at social, economic, political, technological, and communicational levels. In Castells, power is always seen through the lens of grounded theory, meaning that all the research is strongly empirical and cross-cultural, and relies on a constant open-theorizing mindset towards the discovery of new patterns and interthematicity to remain relevant (Costa, Quintanilha, & Mendonça, 2019).

2.4. An Integrative Concept Emerges

The focus of Castells on power in society leads us to his acclaimed trilogy *The information age*. The first volume, *The rise of the network society*, was first published in 1996 and re-edited twice. Castells presents a new social structure:

> The network society, in its various institutional expressions, is, for the time being, a capitalist society. Furthermore, for the first time in history, the capitalist mode of production shapes social relationships over the entire planet. But this brand of capitalism is profoundly different from its historical predecessors. It has two fundamental distinctive features: it is global, and it is structured to a large extent around a network of financial flows. (Castells, 2010, p. 502)

Informationalism is designated as the object of analysis, and it is classified as pervasive. This means that the central point under analysis—information—is not fixed in a certain sector of society. It is expansive and embedded in a myriad of societal domains. A network is defined as a dynamic and adaptable set of interconnected nodes, holding and exchanging information which flows in this system (Castells & Cardoso, 2006). The merger of social structure with the new network information technologies had never happened before (Castells, 2010). Power is thus reorganized in society and major transformations occur. Castells aimed to study this logic with a concept of wide scale and scope.

2.5. A Tale of Technology, Communication, and Globalization: The Informational Economy

Starting in the 1970s, the Information Revolution was propelled by a series of technical improvements and new uses of microelectronics, telecommunications, wireless infrastructures, and bandwidth capacity (Castells, 2002; Castells, Fernandez-Ardevol et al., 2009). Besides being the technological basis for the Network Society, the internet is also a medium liberating autonomous, direct, and immediate communication. It provides a new public space for citizens, with a potentially global reach (Castells, 2005, 2007).

In the Network Society, connectivity is crucial for people, cities, corporations, and countries (Castells, 2010). The author details the emergence of a new type of communication: mass self-communication (Castells, 2007, 2016). Digital communications, from "many selves to many selves," represent a challenge to the political system inherited from the industrial age, where mass media were a channel to exert power over hearts and minds. Now for the first time, social movements could have an unfettered voice through digital networking apps. These technological and communicational changes would shake the existing political framework. By acknowledging this, Castells (2010) described the debut of a new economy: the informational economy. It is of interest whether our bibliometric analysis is able to pick out a number of themes which define this new reality. For instance, this new techno-economic paradigm is based on data as the key raw material and knowledge as the key factor of production (Costa et al., 2019).

Globalization is a major theme in the analysis of the Network Society, as it describes the fundamental idea of interconnection and interdependency (Castells, 2016). This new economy is global in the sense that all the economies are now integrated in the same arena (Castells, 2010). This economic system is constituted by global financial markets, which have become wider and more internationalized, a process in which new electronic technologies play a relevant part (Castells, 2005, 2010).

2.6. Castells and the Darker Side of the Network Society

While Castells resonated with an optimistic view, the author acknowledged a potentially darker side of this new social structure. When revisiting his assumptions, some years after the publication of *The rise of the network society*, Castells (2010) pointed out that the permeability of the networks' infrastructures to be controlled, and without clear regulation, offers those in control the possibility of surveillance and of a stronger power over many more domains. Castells noted questions of sovereignty and privacy, it being now difficult to state that the internet is as free as imagined before (Castells, 2002, p. 176). A high degree of connectivity between economies can be dangerous during a crisis, accelerating its cascading effects (Castells, Caraça, & Cardoso, 2012). Additionally, a relation can be established between economic crisis and the outbreak of social mobilizations (Cardoso, Accornero et al., 2017). The digital divide is referred to, as it is clear that connectivity coexists with exclusion. The network society is also punctuated by an ICT-related inequality (Mendonça, Crespo, & Simões, 2015) and regional asymmetries (Manica, Damásio, & Mendonça, 2024). Not everyone and every place has access, or has the same conditions of access, to the internet and to informational goods. That is to say, an optimistic discourse about their democratic potential was followed by a more skeptical perspective, which raised concerns about expanded and polarized power, and brought to the surface regulatory and ethical questions. Covering 25 years, our empirical analysis strives to capture this shift in overtones.

3. METHODOLOGY

3.1. A Bibliometric Approach to Research Development

Bibliometrics is a set of techniques used to measure academic output and impact (Aria & Cuccurullo, 2017; Broadus, 1987; Glänzel, Moed et al., 2019; Hood & Wilson, 2001; Pritchard, 1969; Sangam & Savanur, 2010; van Raan, 2004). It typically computes the number of publications and citations. It is an approach which strives to understand the configuration of a body of research in terms of relevant scholars, countries, institutions, contributions, and content. By extracting and analyzing information from academic documents, this branch of

scientometrics is a useful methodology in unveiling the trends and turns in a topic of study. It can be applied to different scientific areas, including sociological studies (Sooryamoorthy, 2020). Moreover, it has been advanced as a way to reconstruct and explore profiles of relevant authors that have proved instrumental in advancing key approaches and shaping entire fields (Heß & Damásio, 2025; Mendonça, 2017; Meyer, Pereira et al., 2004; Schirone, 2023). Our paper pushes forward this agenda by singling out a major concept as a way to examine its academic power, namely to assess the development of the wider set of efforts that used the concept as a vehicle to understand a central phenomenon of their time.

3.2. Research Design

Considering that Castells is a sociologist, his work might hold some citation and publication patterns common in the Social Sciences. Sociology is a discipline that often finds its works published in written forms such as books or nonscholarly press (Hicks, 1999, 2004), and which heterogeneity and applicability is reflected frequently in citations coming from different areas of expertise (Barnett, Huh et al., 2011; Nederhof, 2006). Given its broad applicability, bibliometrics seems an adequate approach to address the main objective of this paper: to trace the impact of the concept of Network Society, but in a constrained way, that is, focused on journal-based academic literature. Bibliometrics offers a wide range of indicators, which may be regarded as ways to quantify concepts (Sugimoto & Larivière, 2018). Through this perspective, an indicator is a proxy of some unobservable underlying concept (research quality, for instance) and it is capable of measuring it through observable variables (number of publications or citations, for instance). These potentialities allow a quantitative view over the studied topic. Yet it is important to be aware that the inherent quantitative rigor of a metric can suffer the influence of many factors, and it should be applied within its specific context (Sugimoto & Larivière, 2018). Figure 1 details the step-by-step process performed in the analysis, specifically describing data collection and data analysis procedures.

3.3. Data Collection

Evidence was retrieved from Web of Science (WoS), a multidisciplinary source with extended coverage and whose findings are highly correlated with other databases (Archambault, Campbell et al., 2009; Harzing & Alakangas, 2016; Mongeon & Paul-Hus, 2016; Zupic & Čater, 2015). WoS is also considered to be preferable in terms of historical depth, data quality resulting from initial high-level indexing practices, and availability of metadata (Sugimoto & Larivière, 2018).

A search was conducted for the exact term "Network Society" in the fields *title, abstract*, or *keywords* (both those chosen by the authors and those assigned automatically by the system, designated as "Keywords Plus") in Web of Science Core Collection, without any exclusion concerning document types. Later, for reasons of consistency and comparability, findings were refined to include only articles and reviews in peer-reviewed academic journals. The public repository of journal metrics SCImago was used, namely its service on Journal & Country Rank (SJR), because it gives a Quartiles classification scheme, Quartile 1 being (Q1) the highest and Quartile 4 (Q4) the lowest.

No other topic, term, or synonym of Network Society was included in the search criteria, in order to reach its sense in the most accurate way. The search was conducted solely in the English language. Data retrieval took place on March 2, 2021. Regarding cleaning, a preliminary analysis of the raw data revealed name and word ambiguity problems (Tang & Walsh, 2010), which were addressed to guarantee that they would not have implications for the final

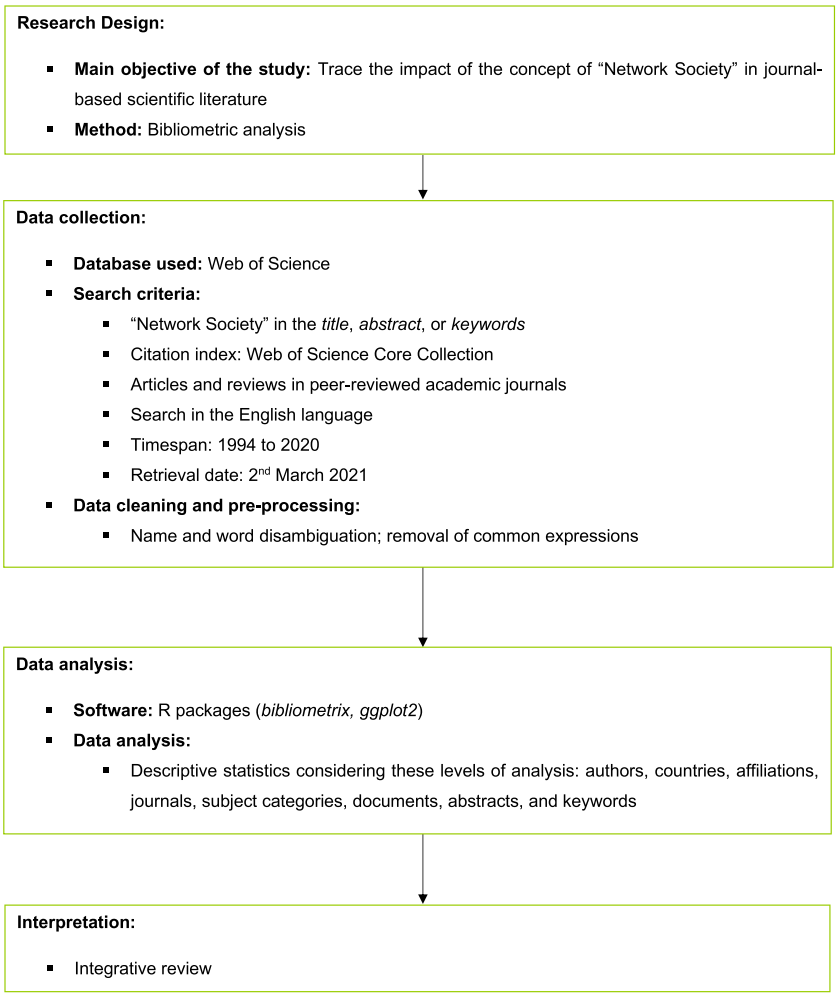


Figure 1. Workflow for the bibliometric study.

results. Figure 2 shows the data collection procedures, the number of records excluded and reasons for exclusion, and the final number of items used in the analysis.

The final corpus is constituted of 441 documents (425 articles and 16 reviews) from 323 different peer-reviewed academic journals indexed in WoS. Of these articles, 86.6% are Single Country Publications (SCP), meaning publications with only one country of affiliation; 9.5% are Multiple Country Publications, in which authors have more than one country of affiliation. Some 96.1% of the articles have an identified country of affiliation. The 441 documents present 16,440 references, 1,526 authors' keywords, and 394 Keywords Plus. There is 738 authors.

4. RESULTS AND DISCUSSION

4.1. The Adoption Dynamics of the Network Society Term

From 1994 to 1999, the term Network Society had somewhat of a slow start. There are no occurrences in 1995 and 1996, and only one article was published in each of the years 1994, 1997, 1998, and 1999 (Figure 3). The average number of publications per year in this period is 0.67. It is possible to affirm that the first edition of *The rise of the network society* did not promote an immediate take-up of the concept.

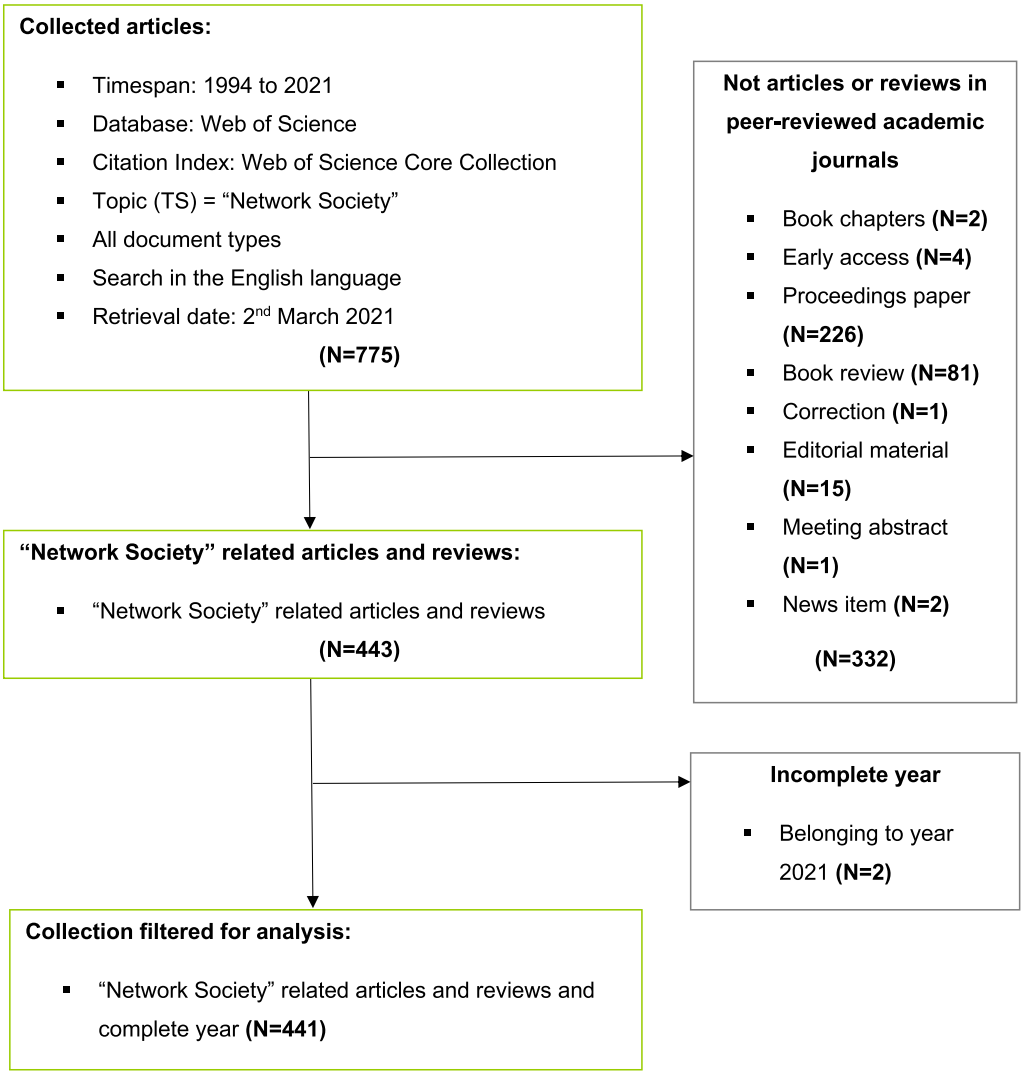


Figure 2. Data collection procedures.

By 2000, the concept had gained traction and in the ensuing decade the number of relevant publications averaged 10.4 per year. However, it was from 2010 to 2020 that scientific production had a marked step jump. The average yearly publication tripled (30.27). From 2015 on, we may consider that the peak of production was reached: 2017 (49 papers) is the year with the highest number of publications. That is to say, we arrive at the following stylized facts: First, the Network Society achieved a new relevance in the last years of the timespan; second, we may consider a build-up process in three phases: 1994–1999, 2000–2009, and 2010–2020.

4.2. Authorship

Castells is the most productive (six publications) and the most impactful (841 citations) author in this collection. His first two documents are published in 2000 and obtain 636 citations. This was a hit year for the author: The highest number of published documents and citations was achieved. Four more articles were published in the analyzed period, but without a comparable

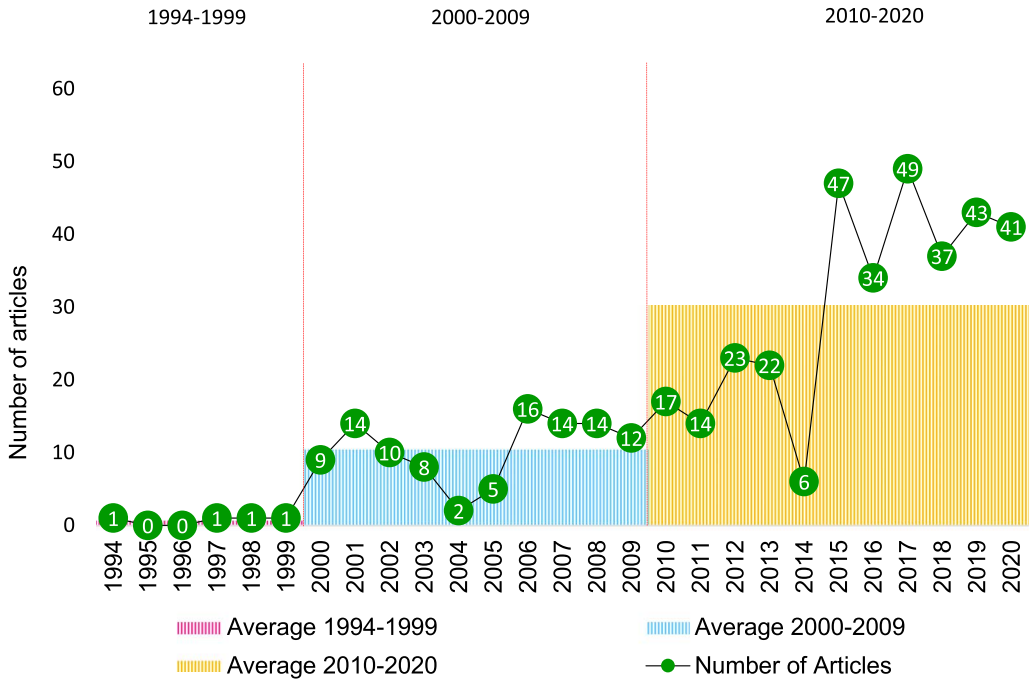


Figure 3. Annual scientific production from 1994 to 2020.

number of citations. Castells' last publication was in 2010, before the increase in production was verified in the 2010s. This means that the "father" of the Network Society is the most remarkable user of the concept, even outside the pages of his book. Castells occupies an instigating position, by being the most active contributor to a topic that he himself coined. Considering the remaining most productive authors (Table 1), only one has four published articles explicitly related to the "Network Society." Seven share the third position in the ranking. This is a group composed of scholars from different countries and diverse affiliations. Their works achieve a relatively low volume of citations, especially when compared with Castells' numbers.

Table 1. Most productive authors on the topic of the Network Society

Position in ranking	Author	Number of publications	Total citations
1	Manuel Castells	6	841
2	Peter Millward	4	83
3	Aimei Yang	3	19
	Iain Munro	3	67
	Irina Kuzheleva-Sagan	3	3
	Brett Hutchins	3	142
	Robert Hassan	3	2
	José Antonio Caride Gómez	3	2
	Gregg Bordowitz	3	0

4.3. Citations

The 441 documents in this data set generated 6,353 citations (Figure 4). From 1994 to 1999, the average number of citations per year is 2.5. From 2000 to 2009, this average value increases to 463.6. The total citations peak is in 2003 (939). Following this peak in the early 2000s, a clear decreasing trend is evident. This evolution is somehow expected in bibliometric analysis. Older articles tend to accumulate more citations than recent works, as they benefit from a larger period to be referenced. Plus, in this data set, scientific production from 2000 to 2009 is superior to that from 1994 to 1999, which also helps to explain a higher volume of citations in the early 2000s. From 2010 to 2020, the yearly average of citations is 154.7, which is approximately one-third of the value in the previous period. This decline might indicate that the concept is losing impact. The citations' evolution over time also displays a partition into three phases, each one matching the decades previously referred: 1994–1999 (lower number of citations), 2000–2009 (higher number of citations), and 2010–2020 (medium number of citations, a strong decrease compared with the preceding period).

Assessing the citations per article ratio (Figure 5) proves that the higher volume of citations verified from 2000 to 2009 is not only dependent on the higher number of articles published in the referred period. In fact, this decade begins with a ratio of 100 citations per article and, in 2003, this value increases to 117 citations per publication. This means that the total citations peak (939 citations) is attained by only eight published documents. The first half of the 2000s is when this high ratio is more visible. The second half of this decade already displays a decreasing trend, which becomes more pronounced in the period from 2010 to 2020. In this timeframe of 10 complete years, in which 76 articles are published, the value of 20 citations per article is not surpassed. This evolution shows that the articles published from 2000 to 2009 (especially those with a publication year between 2000 and 2005) are more impactful than those published afterwards. This impact is not necessarily due to an increase in scientific

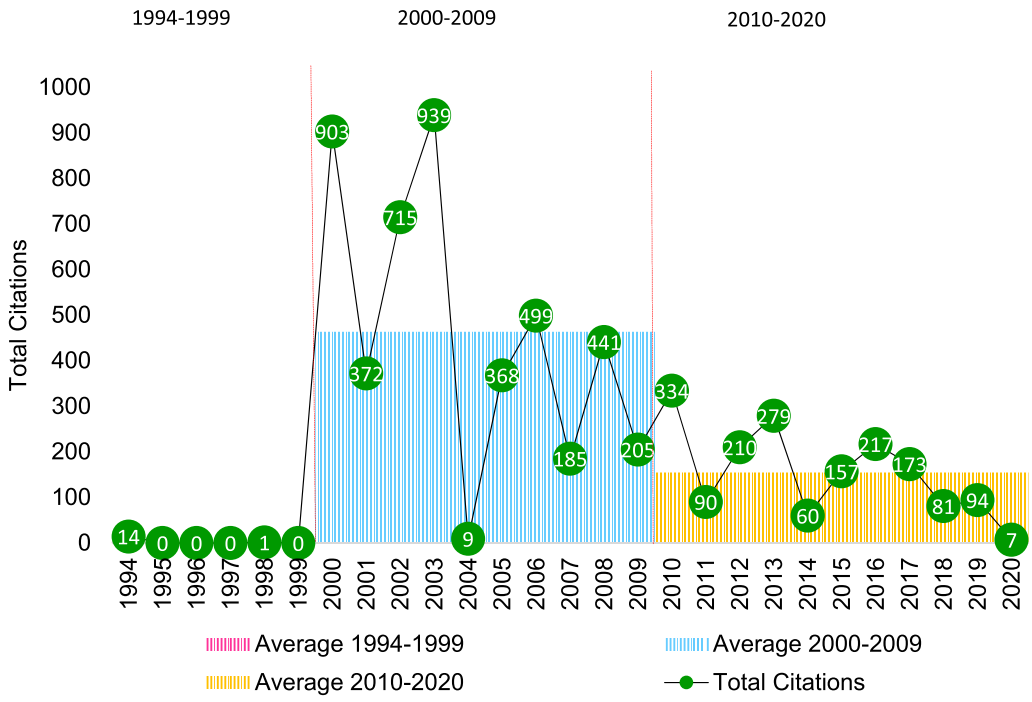


Figure 4. Total citations per year of papers on the Network Society.

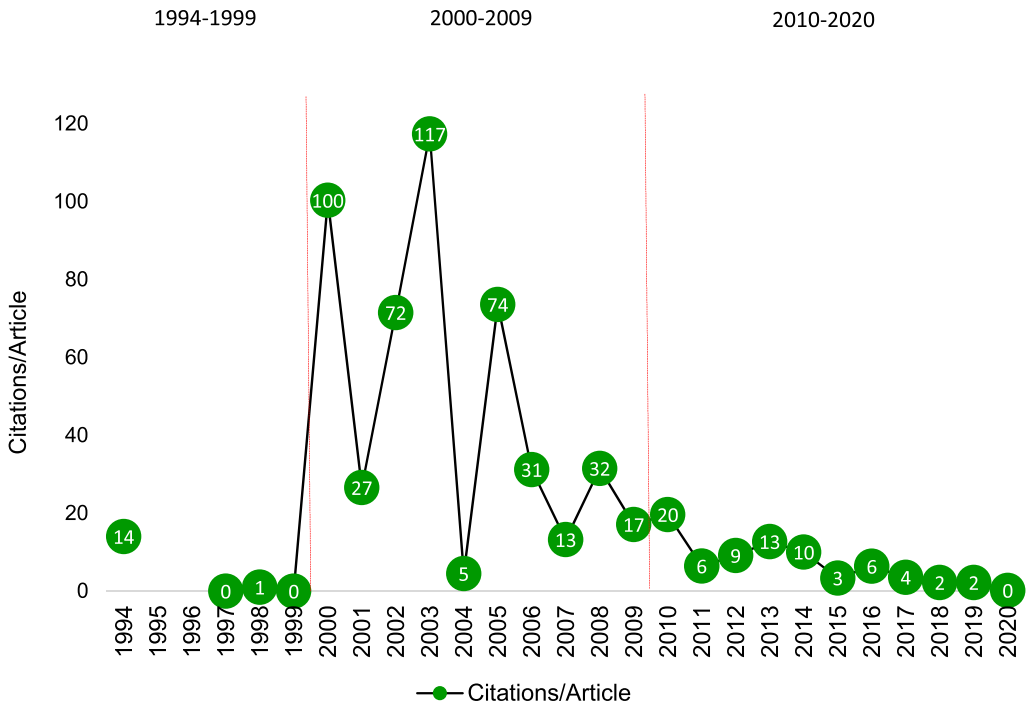


Figure 5. Citations per article evolution of papers on the Network Society.

production, but to the effective relevance obtained by the literature addressing the Network Society theme at the beginning of the 21st century.

In terms of the volume of total citations (Table 2), Castells is the most cited author in our corpus: 841 citations. Next, we find the names of Kenneth Hacker and Jan van Dijk, both with 541 citations due to their work on a single paper in both cases.

Apart from Castells, all of the most cited authors achieve top positions in the ranking with a scientific production of one or two articles. This low number of published articles per author might be a sign of usage, but not a connection with the concept. That is to say, although these authors resort to the Network Society in their research, they do not seem to engage in continuous study involving the term.

4.4. Countries

Regarding the first authors' country of affiliation (Figure 6), our data set is constituted by 50 countries. Of these, 34% (17) belong to the Global South (Finance Center For South-South Cooperation, 2023), that is to say, developing countries. This means that most of the affiliation countries of the authors working on the Network Society concept (33 or 66%) are Western developed economies, a defining characteristic in the field of Communication and Media Studies (Demeter, 2018).

The most cited countries are the United States (51 papers, 11.6% of the total), Spain (46 or 10.4%), the United Kingdom (43 or 9.8%), Russia (32 or 7.3%), and the Netherlands (29 or 6.6%). Among the Global South countries, the most cited are Brazil (21 or 4.8%), China (14 or 3.2%), and South Africa (10 or 2.3%). Among the most cited countries, international collaboration is low, although the standing of BRICS countries is of note (Costa, 2020; Costa & Li, 2023). Only 9.5% (42) of the papers are identified as having authors from different

Table 2. Top-cited authors on the topic of the Network Society

Position in ranking	Author	Country of affiliation	Total citations	Number of publications	Publication year start
1	Manuel Castells	United States	841	6	2000
2	Kenneth Hacker	United States	541	1	2003
	Jan van Dijk	Netherlands	541	1	2003
3	Jonathan Beaverstock	United Kingdom	536	2	2002
4	Erik-Hans Klijn	Netherlands	414	2	2002
5	Joop F. M. Koppenjan	Netherlands	243	1	2003
	Ellen M. van Bueren	Netherlands	243	1	2003
6	Mark Deuze	United States	223	1	2006
7	Michael Dillon	United Kingdom	204	2	2001
8	Geert R. Teisman	Netherlands	171	1	2002
9	Keith Hampton	United States	169	2	2001
10	Julian Reid	United Kingdom	165	1	2001

affiliation countries. Spain is the country with the highest number of Multiple Country Publications (MCPs): In 46 articles with a first author affiliated in Spain, six have coauthor(s) affiliated in a different country. The next countries with the highest number of MCPs are the United Kingdom (five) and the Netherlands (four).

The Netherlands (1,690 citations), the United States (1,566 citations), and the United Kingdom (1,402 citations) stand out as the most influential countries (Table 3). Together, these three countries contributed 73.3% of the total citations in the corpus. It is interesting to note that, while being the most cited country, the Netherlands has a lower level of production when compared to those of the United States, United Kingdom, and Spain. In the top 10 of the most influential countries, only one could tentatively be characterized as Global South: Singapore (97 citations or 1.5%).

4.5. Journals

The *Fujitsu Scientific & Technical Journal* is the most popular vehicle publishing Network Society-related research (eight articles). These publications occurred between 1997 and 2009. The *Fujitsu* journal includes no further publications in the last 10 years of our timespan (2010–2020), and this may characterize it as an early (strong) but not a recent (or sustained) contributor. This is the outlet in which the giant Japanese tech company Fujitsu publishes its research. While holding the highest number of articles, it is not one of the most cited journals (Table 4). The top-cited outlets are *Information Society* (788 citations), *British Journal of Sociology* (529 citations), and *Geoforum* (332 citations). All the journals presented are published in Western countries, most of them in English-speaking territories.

Considering all the categories of the most relevant journals in terms of production (with four or more publications) and impact (with more than 150 citations) in this collection (Figure 7), the median quartile is 1 for most of the analyzed timespan. From 1999 (first year with data

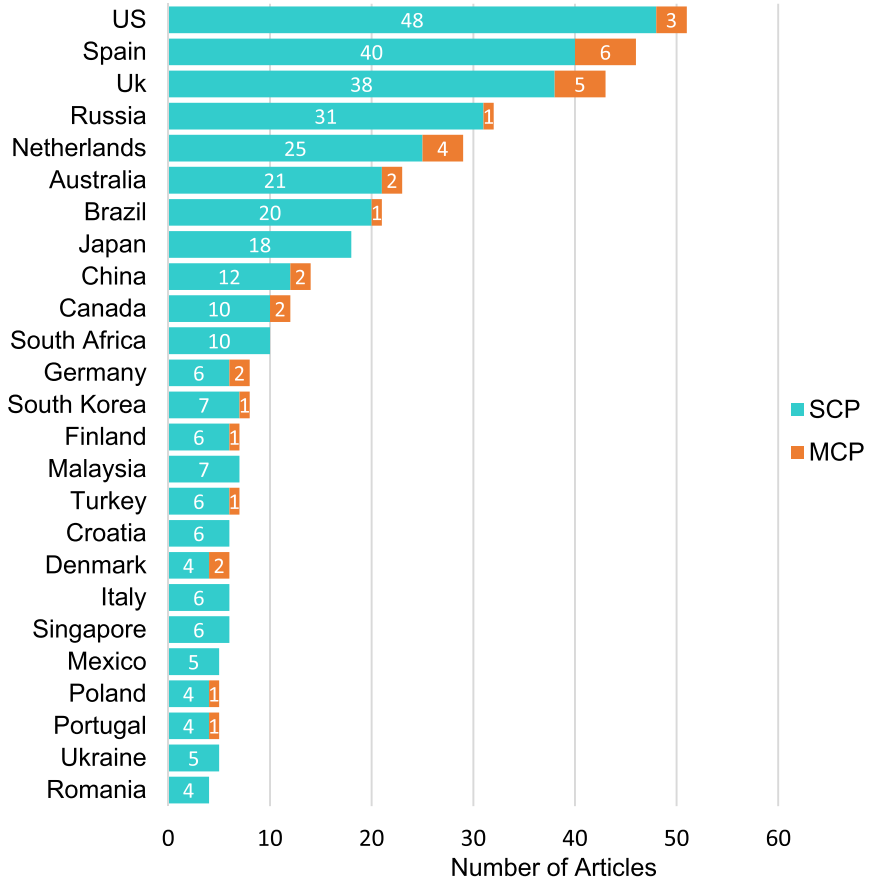


Figure 6. First author's country of affiliation, Single Country Publications (SCP) and Multiple Country Publications (MCP).

Table 3. Top-cited countries on the topic of the Network Society

Position in ranking	Country	Total citations	% for the total data set	Number of publications (first authors)	% for the total data set
1	Netherlands	1,690	26.6	29	6.6
2	United States	1,566	24.6	51	11.6
3	United Kingdom	1,402	22.1	43	9.8
4	Spain	327	5.1	46	10.4
5	Australia	289	4.5	23	5.2
6	Denmark	154	2.4	6	1.4
7	Canada	131	2.1	12	2.7
8	South Korea	115	1.8	8	1.8
9	Singapore	97	1.5	6	1.4
10	Finland	64	1.0	7	1.6

Table 4. Top-cited journals on the topic of the Network Society

Position in ranking	Journals	Total citations	% for total citations in data set	Number of publications	Country
1	*Information Society*	788	12.4	6	United Kingdom
2	*British Journal of Sociology*	529	8.3	2	United Kingdom
3	*Geoforum*	332	5.2	3	United Kingdom
4	*Journal of Ethnic and Migration Studies*	309	5.9	2	United Kingdom
5	*Media, Culture & Society*	264	4.2	6	United Kingdom
6	*Journal of Public Administration Research and Theory*	243	3.8	1	United Kingdom
7	*Public Administration Review*	171	2.7	1	United Kingdom
8	*Journal of Business Ethics*	169	2.7	3	Netherlands
	American Behavioral Scientist	169	2.7	2	United States
9	*Millennium – Journal of International Studies*	165	2.6	1	United Kingdom
10	*Ecology and Society*	143	2.3	1	Canada
11	*European Planning Studies*	142	2.2	1	United Kingdom
12	*Online Information Review*	129	2	1	United Kingdom
13	*Theory, Culture and Society*	127	2	6	United Kingdom
14	*New Media & Society*	126	2	5	United States
15	*Technological Forecasting and Social Change*	115	1.8	1	United States

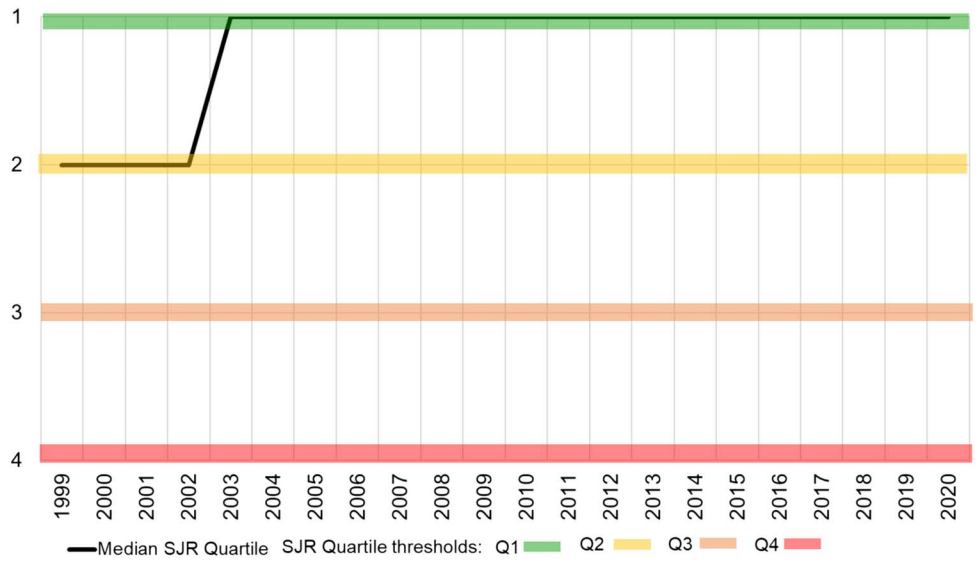


Figure 7. Yearly evolution of the median of SJR quartiles of the most relevant journals. (Note: own computations based on SCImago.)

availability) to 2002, the median quartile is 2, which is nevertheless the second highest quartile. The median quartile is never below 2. In 2003 this metric rises to 1, a threshold which is maintained throughout the following years. From 2014 until 2020, that is, in the last seven years analyzed, 50% of journal quartiles are Q1. This means that, while a relevant increase in quality classification is already visible at the beginning of the 2000s, it is in the second half of the 2010s that it is clearly apparent. In fact, from 2014 on, all quartiles Q2, Q3, and Q4 are considered outliers in this distribution, which reinforces the predominance of Q1 among the most relevant analyzed journals. These dynamics might be interpreted as a sign of the increasing and sustained relative importance of this topic on the agenda. That is, articles applying the concept of the Network Society are being progressively published in journals with higher rankings in terms of quality classification.

4.6. Top Articles

Between 1994 and 2020, the most cited article on the topic of the Network Society (Table 5) is "The digital divide as a complex and dynamic phenomenon" (541 citations). In this piece, van Dijk and Hacker (2003) emphasize the usage gap in IT. The second most cited article (525 citations) is "Materials for an exploratory theory of the Network Society" (Castells, 2000). This is a journal article in which the author clarifies some main aspects of the Network Society. While the appearance of Castells' articles amongst the most cited works does not come as a surprise, it is interesting to note that a work examining disconnectivity and the digital divide leads the ranking. Jonathan Beaverstock signs the next two most cited documents (Beaverstock, 2002, 2005). These articles both address skilled international migration in global cities, departing from the examples of specific locations: Britain, Singapore, and New York. Three titles in this ranking mention geographical locations, implying that there is a degree of localism inherent to the literature applying the concept of the Network Society. Governance and policymaking matters seem to emerge as dominant themes in the most influential documents. This suggests that the concept of a Network Society is being used as a tool, available to be applied in different situations. There is a sense that the Network Society is a lens that can be used to analyze structures and methods. The majority of the most cited articles in this collection were published in the 2000s. This is in line with the higher volume of citations verified in this decade, but also ends up being a common feature in bibliometric analysis, as the oldest articles have more time to be cited and accumulate citations. Hence, it is worth narrowing our analysis window to consider only articles published in the last five years, that is, between 2016 and 2020 (Table 6). Considering the most cited papers in the period 2016–2020, we verify that Communication studies is one of the main subject areas. The research includes works on journalism, media, and social media, with a special emphasis on digital communication technologies. We may also highlight studies related to urban strategic planning and the touristic sector, with a focus on sustainability. The term "Big Data" is used in two titles. Two studies focus on Education, both relying on Spanish case studies. Governance and policymaking issues continue to be attached to the use of the term, as noted in the most cited articles in the full timespan.

4.7. Subject Categories

Figure 8 shows the most frequent knowledge categories into which the articles are classified in WoS, due to the journals in which they are published. Note that each document may belong to more than one category, as well as having no categorization at all. Most of the literature related to the topic of the Network Society belongs to the fields of Communication (78 articles, 17.7%) and Sociology (55 articles, 12.5%). These can be considered the two core areas of research. Both disciplines fit under the broader umbrella of the Social Sciences. Communication and Sociology are intrinsically plural and related to Castells' studies. The author is in fact a

Table 5. Top-cited documents on the topic of the Network Society (1994–2020)

Position in ranking	Document	Authors	Year	Journal	Total citations	% of total citations in data set
1	The digital divide as a complex and dynamic phenomenon	Jan van Dijk & Kenneth Hacker	2003	*Information Society*	541	8.5
2	Materials for an exploratory theory of the network society	Manuel Castells	2000	*British Journal of Sociology*	525	8.3
3	Transnational elites in global cities: British expatriates in Singapore's financial district	Jonathan Beaverstock	2002	*Geoforum*	270	4.2
4	Transnational elites in the city: British highly-skilled inter-company transferees in New York city's financial district	Jonathan Beaverstock	2005	*Journal of Ethnic and Migration Studies*	266	4.2
5	Dealing with wicked problems in networks: Analyzing an environmental debate from a network perspective	Ellen M. van Bueren, Erik-Hans Klijn, & Joop F. M. Koppenjan	2003	*Journal of Public Administration Research and Theory*	243	3.8
6	Participation, remediation, bricolage: Considering principal components of a digital culture	Mark Deuze	2006	*Information Society*	223	3.5
7	Partnership arrangements: Governmental rhetoric or governance scheme?	Geert R. Teisman & Erik-Hans Klijn	2002	*Public Administration Review*	171	2.7
8	Global liberal governance: Biopolitics, security and war	Michael Dillon & Julian Reid	2001	*Millennium – Journal of International Studies*	165	2.6
9	Disentangling scale approaches in governance research: Comparing monocentric, multilevel and adaptive governance	Catrien J. A. M. Termeer, Art Dewulf, & Maartje van Lieshout	2010	*Ecology and Society*	143	2.3
10	Spatial planning in the network society: Rethinking the principles of planning in the Netherlands	Maarten Hajer & Wil Zonneveld	2000	*European Planning Studies*	142	2.2

Table 6. Top-cited documents on the topic of the Network Society (2016–2020)

Position in ranking	Document	Authors	Year	Journal	Total citations
1	Persistent and pervasive community: New communication technologies and the future of community	Keith N. Hampton	2015	*American Behavioral Scientist*	72
2	Towards adaptive tourism areas? A complexity perspective to examine the conditions for adaptive capacity	Stefan Hartman	2015	*Journal of Sustainable Tourism*	30
3	Tales of the digital sublime: Tracing the relationship between big data and professional sport	Brett Hutchins	2016	*Convergence*	29
4	Networks and collaboration in Spanish education policy	Cecilia M. Azorín & Daniel Muijs	2017	*Educational Research*	20
5	Digital leisure and perceived family functioning in youth of upper secondary education	M. Valdemoros-San-Emeterio, E. Sanz-Arazuri, & A. Ponce-de-León-Elizondo	2017	*Comunicar*	19
6	Reconsidering the role of the digital in global production networks	Christopher Foster & Mark Graham	2017	*Global Networks*	19
7	Technological and communicative innovation to fight misinformation: 135 experiences for a change of direction	J. Vázquez-Herrero, Á. Vizoso, & X. López-García	2019	*Profesional de la Información*	14
8	Apache Hama: An emerging bulk synchronous parallel computing framework for big data applications	K. Siddique, Z. Akhtar, E. J. Yoon, Y.-S. Jeong, D. Dasgupta, & Y. Kim	2016	*IEEE Access*	14
9	What is smart for the future city? Mobilities and automation	M. Freudendal-Pedersen, S. Kesselring, & E. Servou	2019	*Sustainability*	13
10	About pseudo quarrels and trustworthiness: A multi-method study of health journalism, sourcing practices and Twitter	Annelore Deprez & Sarah Van Leuven	2017	*Journalism Studies*	12

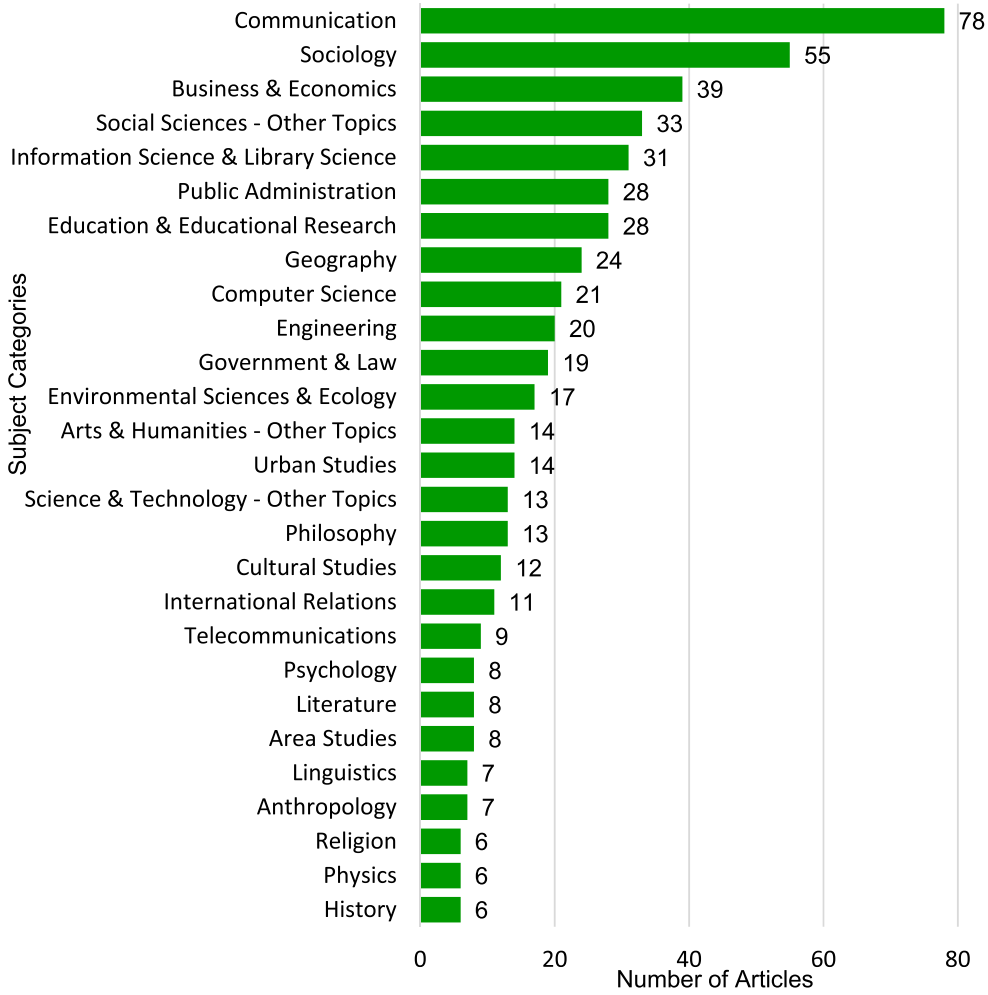


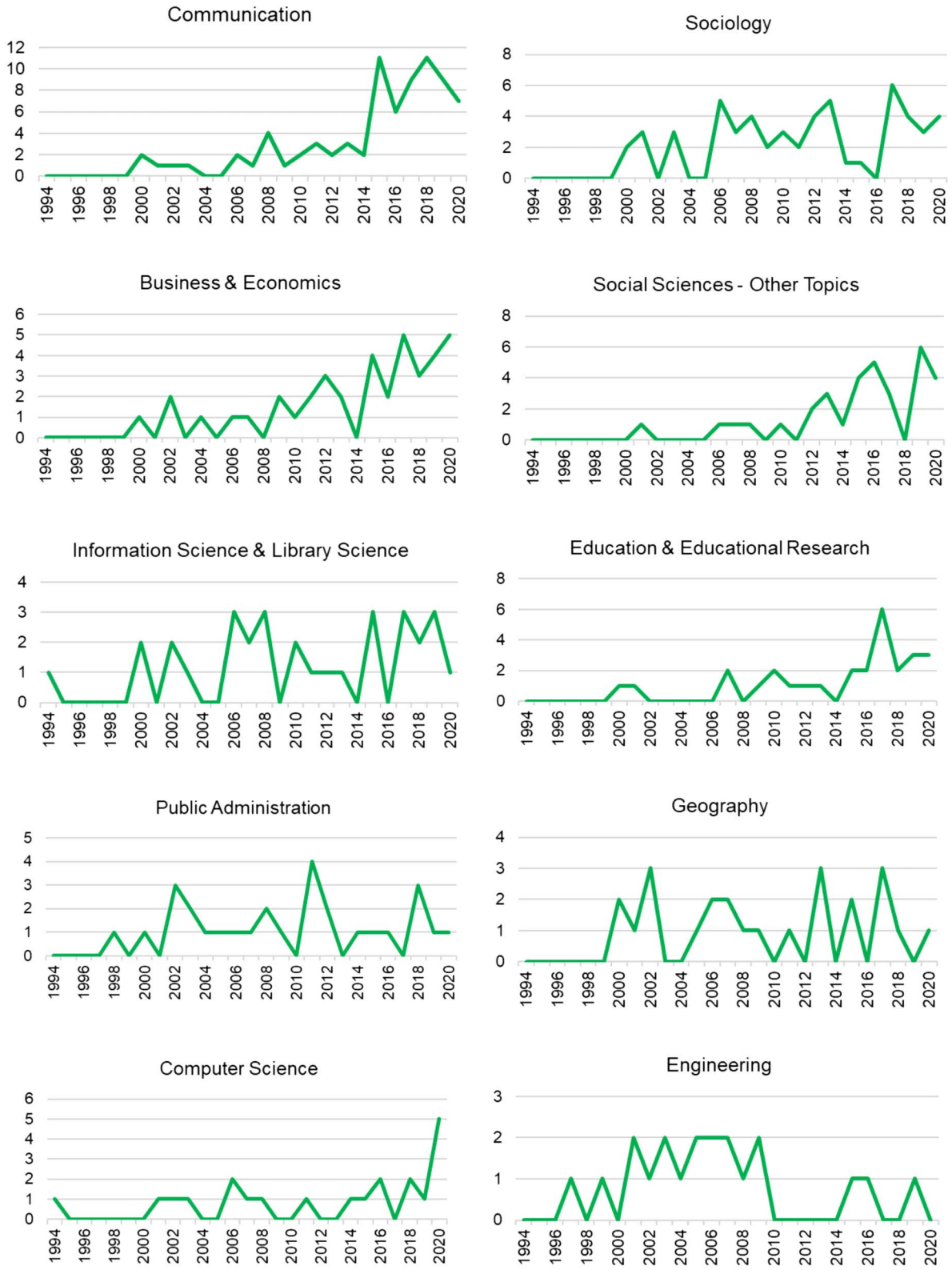
Figure 8. Most frequent subject categories.

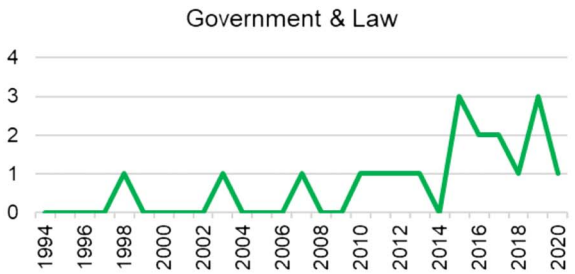
sociologist, the Network Society being his major contribution to social theory. Communication emerges as one of the main themes when analyzing this new form of social organization, mainly because its own nature has changed. Digital channels call for a nonlinear and horizontal system of message flows, something which is different from the previous linear model. The authors producing research in the Communication field seem to capitalize on the relevance of a concept such as the Network Society in the scope of their work.

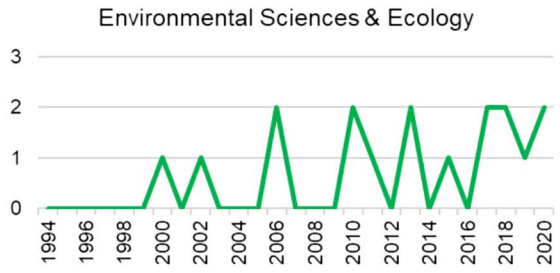
The Network Society is multidisciplinary. It comprises areas related to Social Sciences, but also to Engineering, Technology, Economics, Public Policy, and Governance (Figure 9). The Network Society appears to contribute to research streams of different knowledge territories, which confirms its categorization as a wide-scope concept. We may verify that the categories of Business & Economics, Social Sciences, Education & Educational Research, and Computer Science seem to be assuming an increasing trend in the number of published articles.

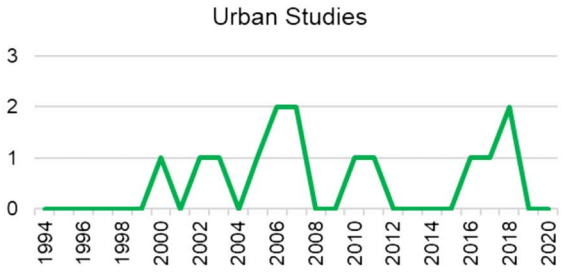
4.8. Abstract Bigrams

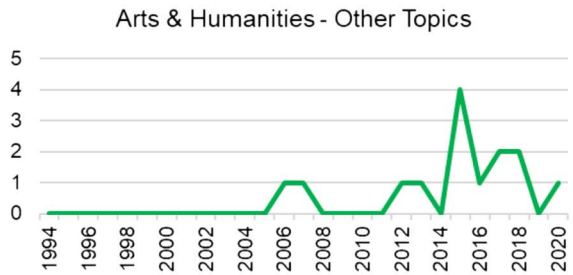
Focusing on content analysis, the most common bigrams in the abstracts of the analyzed articles provide an overview of the relevant terms in each phase. Due to the low number of articles published between 1994 and 1999, there are only six expressions with two or more

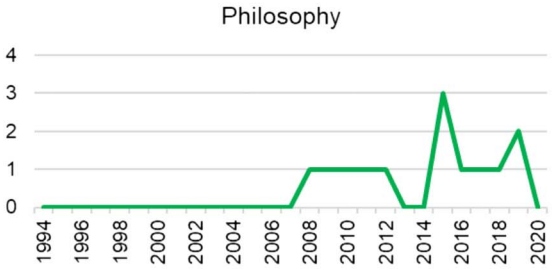


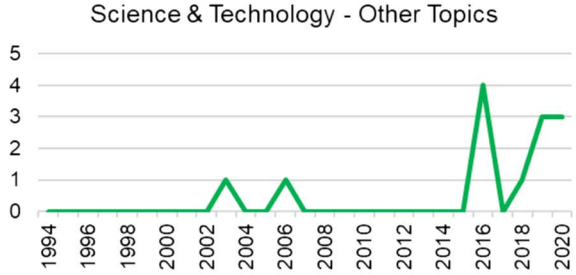


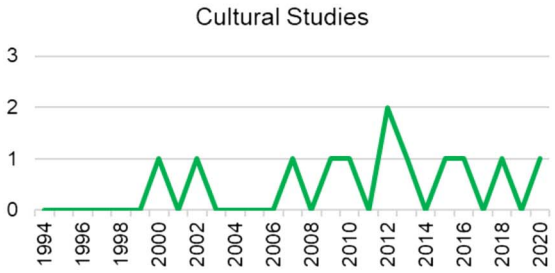


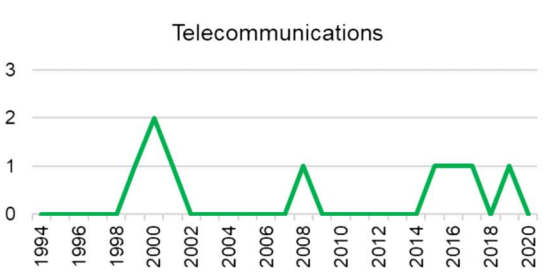


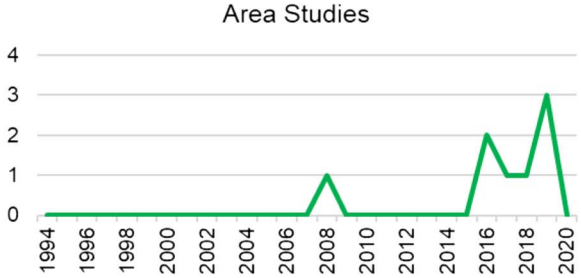












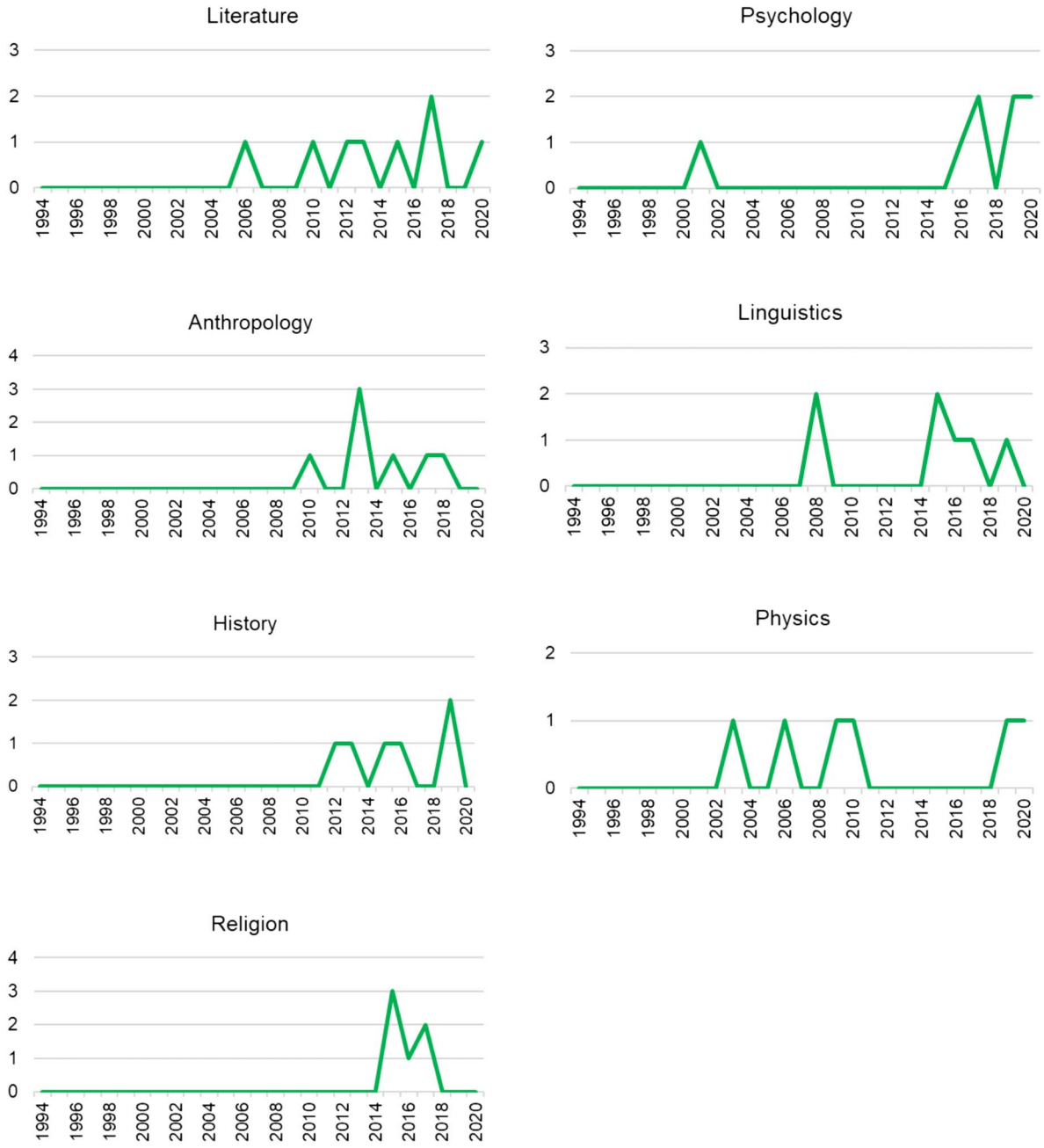


Figure 9. Evolution of subject categories per year.

occurrences: Document Information (3), Democratic Potential (2), Information Retrieval (2), Information Sharing (2), Network Society (2), and NTT Data (2). While having relatively low frequencies, it is interesting to note references to "Democratic" (something that does not happen in the top-25 of the subsequent periods), and to a specific IT company, "NTT Data."

The most common bigrams in the articles published between 2000 and 2009 (Figure 10) portray the connectivity spirit of that time. In terms such as "Learning Society," "Network Learning," "Knowledge Networks," "Ubiquitous Network," "Collaborative Planning," "Spatial Data," and "Structured Network" we may find the expression of processes that strongly rely on

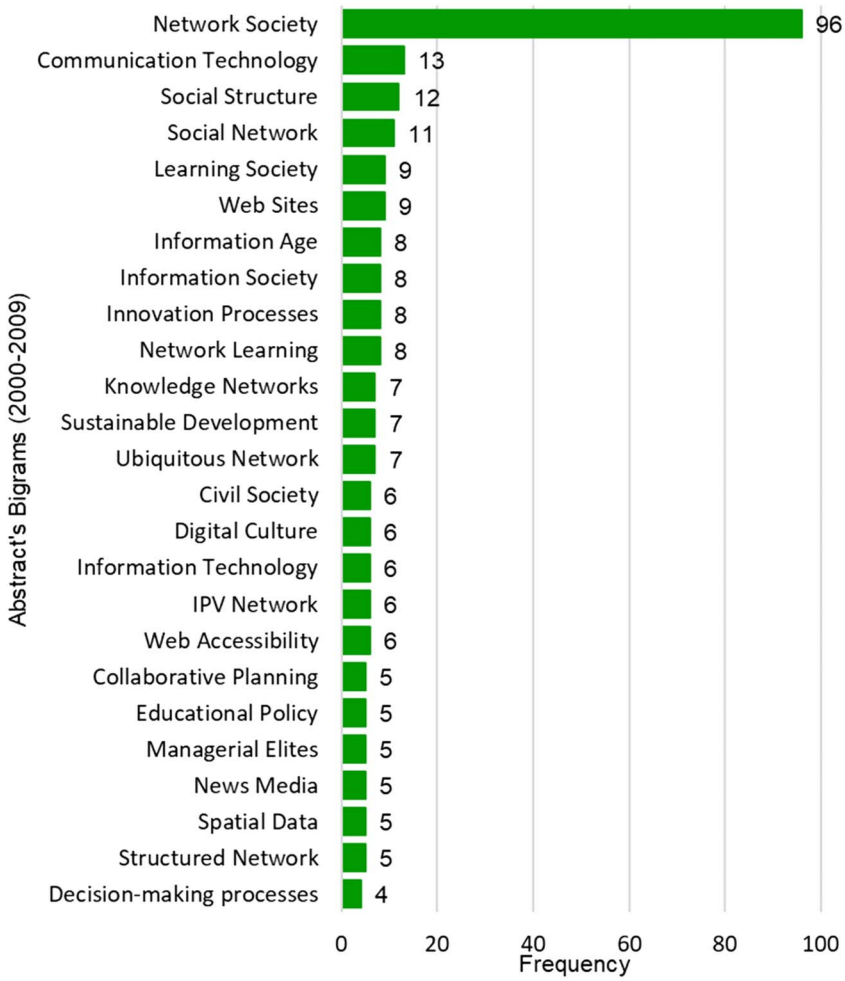


Figure 10. Most frequent abstract bigrams (2000–2009).

the interaction between different agents, structures, and systems. These terms resonate with the "superconnectivity" euphoria that particularly preceded the launch of the Network Society concept, and still persisted in the first years of the 2000s. However, the clear sense of the 2000s is found in the appearance of terms that can be considered synonyms of the "Network Society", namely "Information Age" (which is indeed the title of Castells' trilogy), and "Information Society." Among the most common abstract bigrams of the 2000s, some are linked to technology and communication, which are two of the main topics addressed by Castells when characterizing the new informational economy. "Communication Technology" and "Information Technology" are examples of this, in a broad sense. Then, in a more pinpointed view, the terms "Web Sites," "Digital Culture," "IPV Network," and "Web Accessibility" also reflect a digitalization process of communication. Although the media sphere is paramount in defining the basis for the "Network Society," it does not come as a relevant area expressed by these terms ("News Media" obtains five occurrences). Management, governance and policy views appear to be more pressing themes, mainly if attention is paid to terms such as "Innovation Processes," "Sustainable Development," "Civil Society," "Educational Policy," and "Managerial Elites." When looking at the top five bigrams, the "Network Society" is accompanied by "Social Structure" and "Social Network," which in the end reflects a social imprint that characterizes Castells' work.

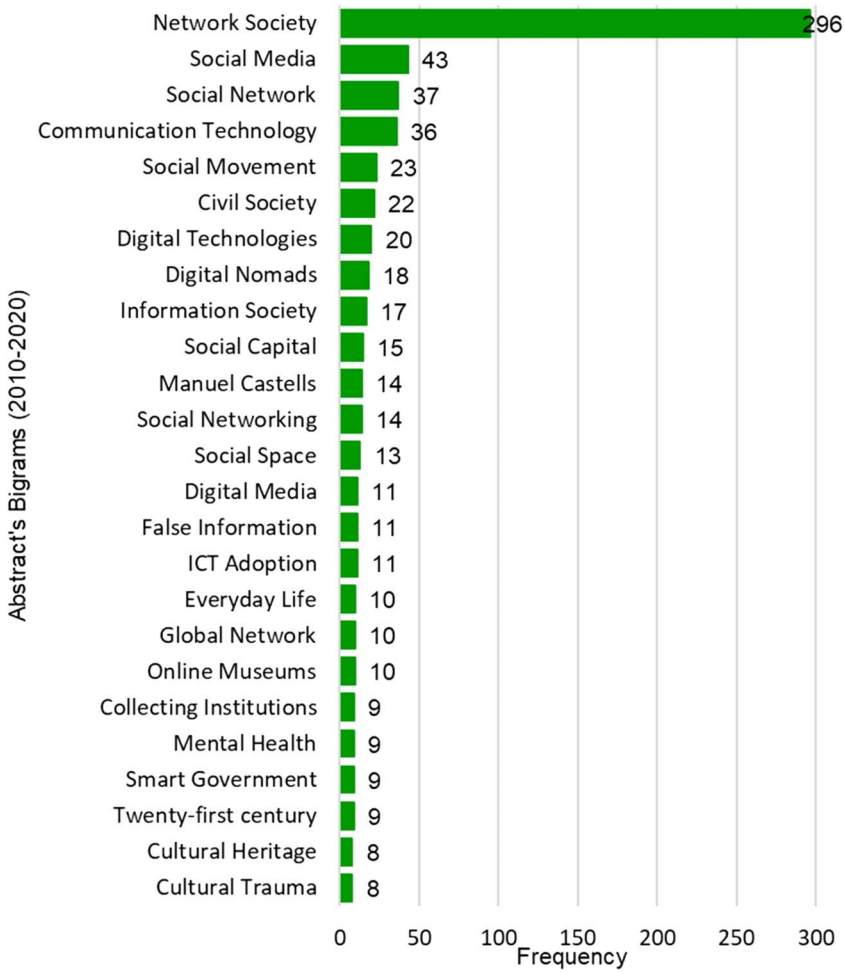


Figure 11. Most frequent abstract bigrams (2010–2020).

The most common abstract bigrams in the following period of 2010 to 2020 (Figure 11) display a rather different profile. Media—a fundamental area in Castells' conceptualization that does not show up as a relevant term in the 2000s—now comes into action. "Social Media" is the second most common bigram, with 43 occurrences. "Digital Media" is also part of this group. The digital imprint already visible between 2000 and 2009 is reinforced and more clearly shaped, mainly through the appearance of terms such as "Digital Technologies," "Digital Nomads," "ICT Adoption," "Online Museums," and "Smart Government." Globalization, as expressed by Castells in the context of the Network Society, is related to interdependency, particularly at the economic level. Although this idea does show up in this analysis ("Global Network" numbers 10 occurrences), the globalization framework ends up being more present at individual and institutional levels, as in "Everyday Life," "Collecting Institutions," and "Mental Health." It is interesting to note that "Social Movements," which are at the root of Castells' intellectual journey, show up now as the fifth most frequent bigram, while being absent in the preceding period. The skeptical overtones that characterized this epoch with regard to the appliance and consequences of digitalization processes are explicitly expressed in terms such as "False Information" and "Cultural Trauma."

We may say that two "waves" of content flow hand-in-hand with the Network Society concept. Firstly, in the period from 2000 to 2009, technological connectivity is a transversal theme

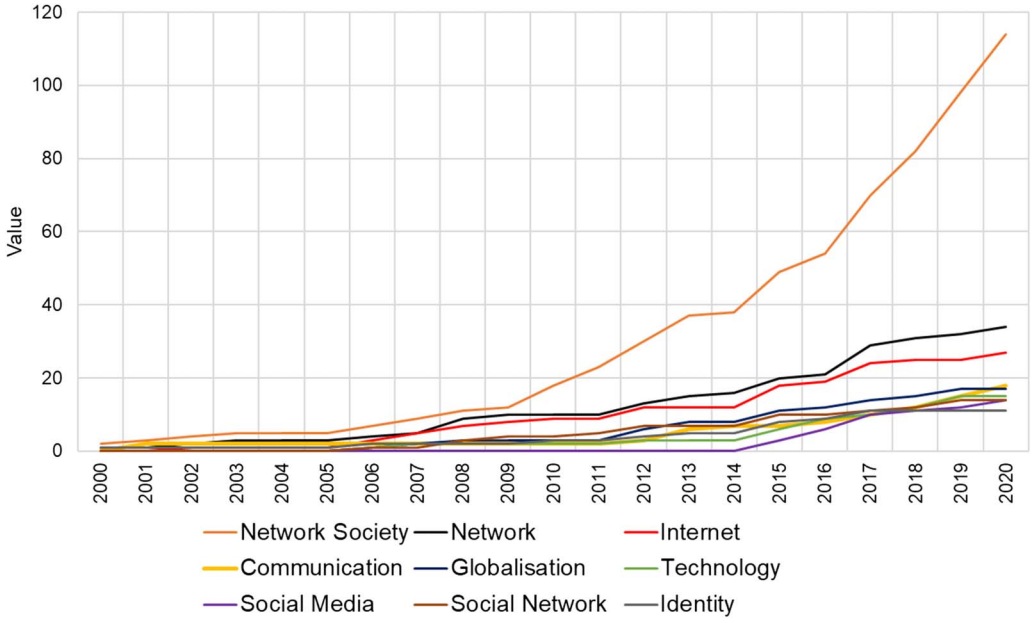


Figure 12. Authors' most relevant keywords (cumulative).

to most of the terms. Later, in the 2010s, it is worth noticing the emergence of a negative terminology, closely linked to the previous digitalization process. We may affirm that, just as in societal evolution, after a wave of enthusiastic connectivity comes a wave of re-evaluation and rethinking of digital affairs, actors, and the possible dangers and darker elements that may come attached.

4.9. Keywords

The term "Network Society" is the most frequent keyword chosen by the authors (114 occurrences), displaying a robust increase from 2017 onward (Figure 12). The concept appears in 25.9% of the documents published from 1994 to 2020. The second most frequent keyword is "network" (34 occurrences, 7.7%). This term is common to a vast array of subjects, as it synthetizes the fundamental idea of connectivity. The next most common keywords are "internet" (27 occurrences, 6.1%), "communication" (18 occurrences, 4.1%), and "globalization" (17 occurrences, 3.9%). All these are foundational themes in the Network Society conceptualization. "Social media" debuts as a keyword in 2015. It is worth mentioning a recent adoption by the authors of platform-related terms such as "social media" and "social network" in the context of the study of the Network Society. In fact, "social media" is the top 10 keyword with the most significant growth (+367%) between 2015 and 2020. This is in line with the appearance of "Social Media" as one of the most common abstract bigrams in the period 2010–2020. These keywords are paramount features of the digital and technological age in which the Network Society emerges and later contributes to shape.

5. CONCLUSIONS

This paper traces the impact of the Network Society concept, presented and developed by Manuel Castells. We tap into the research audiences publishing in peer-reviewed academic journals to understand how this concept has been received formally by the scientific community. Bibliometrics is the applied methodology, as it allows a comprehensive analysis of

journal-based scientific literature, but the results are critically appreciated in the light of substantive knowledge of the author's work and the previous classic books which preceded his contribution. A quarter of a century has passed since the first publication of *The rise of the network society*, suggesting that this is an appropriate time to study the life cycle of this concept.

Unusually, this work is focused on a concept, and this makes us interested in its evolution as it was appropriated in changing circumstances. Time is an important driver in our approach. We first tried to understand the concept in its origins, tracing a timeline of possible theoretical roots from the 1960s until the 1990s. In these decades, abundant terminology captured and strived to define an unsteady time. Regardless of different terminological formulations, it was argued that society was going through a transition phase, which would ultimately lead to a more interconnected world boosted by wired-up computing (ICTs) and novel social routines and institutions. Beyond the terms used, different periods ended up reading and writing the times through different subjacent tones: Optimism in the 2000s was followed by skepticism in the 2010s. The Network Society concept was born as a multidimensional perspective, moving and flowing on different grounds as the new age was dawning. Technology, communication, and media are key areas. Digital globalization, sustained by intertwined data transactions and information sharing, is perhaps one of the most apt ways to grasp the concept introduced by Castells on the verge of the 21st century.

Regarding a time-sensitive view of the Network Society, we find that three different phases can be identified: 1994 to 1999, 2000 to 2009, and 2010 to 2020. In the early days, just after the introduction of the concept, journal articles are few and scattered. Thereafter, the periods from 2000 to 2009 and 2010 to 2020 have rather distinct profiles. The first decade is less productive (fewer papers) but more impactful (more citations), whereas the second is more productive but less impactful. Indeed, the peak of citations is reached in 2003, while the maximum of publications takes place in 2017. Castells' concept seems to hold as an early enactor of meaning concerning the Network Society, setting the stage for a range of applications thereafter. Additionally, content analysis revealed that the "change in tones" which defined the literature of the analyzed epochs was also notable in the academic works being produced. In fact, the 2000s show a focus on connectivity potential and applicability, while the 2010s denote an emphasis on the consequences of globalization and digitalization.

We may also outline that this field is multidisciplinary. The concept presented by Castells serves a vast and varied group of subject categories. However, just two fields emerge as core research areas: Communication and Sociology. Citation impact is highest in the Social Sciences, and the articles applying the term seem to be associated with a growing trend of quality classification. Governance and policymaking are the prevailing themes in the most cited works drawing on Castells. Digital communication technologies and media-related matters come on the scene only if we consider citation impact in the most recent documents. Specific geographical locations are often mentioned, which points to an inherent degree of localism in these studies. Interestingly, what seems at face value a global and expansive concept is used to address situated circumstances.

Castells is the driving force of the concept, which was in fact picked up by academia in earnest from the outset. However, the results show this appropriation was not very sustained. Any other author or group of authors seems to be consistently exploring the term and building knowledge upon it. Plus, international collaboration is low, and the most impactful contributors come from Western countries, which suggests that the Network Society has not fully achieved a global usage reach. The concept appears to remain remote to non-Western academic circles.

Some methodological limitations should be considered when interpreting the findings of this study. Our goal was to investigate the appropriation of the concept by professional research audiences. Consequently, the choices undertaken attempt to reach the most purely academic sense possible. For this reason, we only considered articles and reviews in peer-reviewed academic journals indexed in WoS. Knowing that the studied topic is strongly related to the Social Sciences, more information surely exists in books, press, and gray literature, sources that are not included in this analysis. In our setup, we also exclude from the corpus proceedings papers, which are arguably a more technical type of literature. We believe that future studies may benefit from incorporating these documents into the data set. In addition, this research only analyzes literature written in English. This might be a fact worth considering, as English is not Castells' first language. The author may well have enhanced relevance in Spanish-written papers, which would be interesting to incorporate in a future data set.

This study offers some hints about the importance of the Network Society in terms of governance and policymaking. In a platform economy, and on the verge of a next-G era or Gigabit society, informational forces will certainly shape debates and practices. As society benefits from enhanced digital connectivity and disruptive breakthroughs such as Artificial Intelligence, there will be novel ethical, privacy, and political issues arising. In this context, a concept such as the Network Society, born out of a period of transformation, may provide a useful lens to keep studying the reception of the evolving communications technologies.

AUTHOR CONTRIBUTIONS

Catarina Cardoso: Data curation, Formal analysis, Methodology, Visualization, Writing—original draft, Writing—review & editing. Cátia Miriam Costa: Conceptualization, Formal analysis, Methodology, Writing—review & editing. Bruno Damásio: Conceptualization, Formal analysis, Methodology, Software, Visualization, Writing—review & editing. Sandro Mendonça: Conceptualization, Methodology, Project administration, Writing—original draft, Writing—review & editing.

COMPETING INTERESTS

The authors have no competing interests.

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DATA AVAILABILITY

For legal reasons, data from Web of Science cannot be made openly available.

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