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Networks

Infrastructures, Materiality, and Communities from Ancient Rome to Social Media

Abstract: Network is one of the most symbolic and obsessively repeated keywords in digital literacy. But networks are obviously not exclusively digital. In Ancient Rome, transportation networks were built and maintained to link a dispersed and immense empire. Postal networks were crucial in the early modern period to foster communications and acted as a premodern info-structure. Electric telegraphy, telephony, and then wireless allowed instantaneous communication from the nineteenth century, changing the sense of speed and place, and acting as info-structure for nascent train and plane systems. The word network was then applied to radio and TV in the twentieth century.

After an overview of what we call digital network studies, this chapter aims to historicize and deconstruct the arguments surrounding networks in a long-term perspective, highlighting continuities and changes over time. We will focus specifically on two dimensions: networks as infrastructures and networks as socio-cultural tools to build communities.

Keywords: infrastructure, space and time, nodes and hubs, social network, longue durée

The word "network" is neither new nor native digital, but this lemma has acquired multiple meanings over time. One of the oldest connotations – the word *networke* appears in the 1530 Tyndale Bible – was with "Work (esp. manufactured work) in which threads, wires, etc., are crossed or interlaced in the fashion of a net" (Oxford English Dictionary Online; henceforth *OED*). The net-work is a net that needs human work to be made, for example fishermen's nets which require a long process of sewing to be completed and especially maintained (Musso 1997).

It was only from the nineteenth century that the concept became widespread and directly connected with communications. Indeed, the second etymology of network deals with "Any netlike or complex system or collection of interrelated things, as topographical features, lines of transportation, or telecommunications routes (esp. telephone lines)" (*OED*). Translated in contemporary research fields, the Macro-Systemic and/or Large Technical Systems (LTS)

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dimension of networks is a second and relevant character. Communication networks are both made of several interrelated technologies and social practices, as Thomas Hughes (1983), Alain Gras (1993) and several other authors have shown.

A third etymology of network emerged in the twentieth century, as "an interconnected group of people; an organization; spec. a group of people having certain connections (frequently as a result of attending a particular school or university) which may be exploited to gain preferment, information, etc., esp. for professional advantage" (*OED*). A network, then, is not only a socio-technical and material system made of interrelated technologies assembled by humans, but it can also symbolize social groups where humans meet face-to-face, in virtual settings, or groups that never meet but to which people belong (for example the alumni of a prestigious college). From this perspective, networks create profitable and invisible connections, social ties and links among people both inside and outside the network itself.

Even if networks are embedded in human societies for centuries, this concept became a buzzword in the digital age: we might think about terms like network society and social network (site). Or, again, we can consider how the suffix –net was used as the extension of web dominions (.net), in digital neologisms (netiquette), in the names of digital corporations (Netscape, Netflix) and in relevant political debates (net neutrality). Networks seem to be at the center of digital culture and to drive it metaphorically.

In the first section of this chapter, we offer a concise overview of the ways in which the concept of network has been used in digital literacy over time. Then, in the second section, we historicize the ideas surrounding networks and deconstruct its meanings with historical examples from Ancient Rome to the twentieth century. Continuities and differences in the way networks are considered are addressed specifically in the conclusion.

1 *Digital Network Studies*. A Brief Overview

There are various, and sometimes conflicting, ways of naming studies about digital networks. For example, network science is an academic field examining complex networks mainly through mathematical models. Social network analysis investigates social structures using networks and graph theory. Network analysis aims at creating maps and graphs of the degrees and intensity of connections among people in different settings.

We decided to use the term *digital network studies* to label a branch of media and communication studies dealing with digital networks. This is neither a discipline nor an academic field, but a way to grasp how digital literacy, especially from the 1990s to today, has used the concept of networks in very different realms. Providing an overview of all these research fields is nearly impossible and, consequently, we focus only on some of the media and communication "classics" in digital network studies.

As already mentioned, network society is probably one of the most renowned concepts in digital network studies. In 1996, Manuel Castells wrote *The Rise of the Network Society*, becoming probably the best-known scholar in the field. Castells focuses on five interrelated phenomena which, according to him, have changed contemporary societies since the 1970s. First, the trend of liberalization and deregulation of financial markets, which caused economic and financial transformations. Second, the pressing need for skilled and highly educated workers changed the job market – in line with Daniel Bell's idea of post-industrial societies. Third, the emergence of connected cities and places in the global architecture of networks (e.g., New York becoming a hub able to attract wealth, power, culture, innovation, and people) has created different "spaces of flows" where "the material arrangements allow for the simultaneity of social practices without territorial contiguity" (Castells 1999, 295). Thanks to infrastructures made of nodes and hubs, social actors operating the network and electronic spaces such as websites for exploiting interactions, people can experience new forms of geography and spatial interactions. A fourth and similar transformation emerged with what Castells called "timeless time": from the end of the twentieth century, societies started to be no longer characterized by the "clock time" of the industrial age or by the "natural" rhythm of pre-industrial ages, but by a constant tension and desire for instantaneity, a minimization of time-lapses, and by the flexibility of timeslots. For Castells, this time-space compression is mainly caused by new digital communication technologies: this is the fifth transformation creating contemporary network societies, with the expansion of the internet, wireless technologies and, more generally, interactive, peer-to-peer and horizontal media instead of vertical and hierarchic ones. These media, according to Castells, favor a "mass self-communication," where audience/users decide and create their own schedules or timetables, fragmenting their media consumption.

A second champion of network society is Jan van Dijk who, in a book written in Dutch in 1991 and then translated into English at the end of the decade, claims: "With little exaggeration, we may call the 21st century the age of networks. Networks are becoming the nervous system of our society, and we can expect this infrastructure to have more influence on our entire social and personal lives than did the construction of roads for the transportation of goods

and people in the past" (van Dijk 1999, 2). In other words, a new form of society based on digital networked media is gradually replacing or complementing previously existing personal communications. The so-called networked media have economic, legal, socio-cultural, psychological, and political "effects" on contemporary societies, transforming them into network societies, where people become linked to one another and have access to information and communication continuously and on-demand. As well as providing a historical overview of networks in "ancient history," van Dijk argues that "A network can be defined as *a collection of links between elements of a unit*. The elements are called nodes. Units are often called systems" (van Dijk 1999, 24).

Link is also the title of a famous book (subtitled *The New Science of Networks*) written by the physicist Albert-László Barabási and which is another classic work in digital network studies. Barabasi (2002) compared how networks operate in very different spheres like biology, physics, mathematics, virology, and communications, among others. There are similar characteristics: the presence of hubs (key nodes of communication, highly interconnected) and links (connections); the fact that big and very well connected hubs tend to grow over time, while small hubs tend to decrease their relevance ("The rich get richer and the poor get poorer"); and, finally, the fact that nodes in different networks require just a few steps to be accessed, according to the well-known "small world" and "degrees of separation" theories. Barabasi's book is relevant for digital network theory not only because he analyzes the Internet and the Web, but especially because he reminds us that the ways in which networks are designed (their so-called architecture) can shape flows and power dynamics of communication.

From the mid-2000s, the explosion of so-called social network sites (SNSs) like MySpace, Facebook, LinkedIn, Instagram, and others changed the paradigm of digital network studies. danah boyd and Nicole Ellison (2007, 211) were among the first scholars to define SNSs, claiming that "What makes social network sites unique is not that they allow individuals to meet strangers, but rather that they enable users to *articulate and make visible their social networks*. [. . .] participants are not necessarily 'networking' or looking to meet new people; instead, *they are primarily communicating with people who are already a part of their extended social network*. To emphasize this articulated social network as a critical organizing feature of these sites, we label them 'social network sites'". If in the 1980s and especially the 1990s, computer networks were used to meet new people and to perform new roles and personalities (possibly anonymously), from the mid-2000s SNSs have been studied as places where the personality and the inner self of people could be built in the public sphere. Not by chance, Zizi Papacharissi (2011) has introduced the acronym "networked self," while Alice Marwick (2013) has focused her attention on the practices of celebrities in SNSs.

In the last decade of digital network studies, the political, social, and especially economic relevance gained by the SNSs has led to the triumph and then decline of digital networks as a buzz concept of our age. A triumph because network has become an obsessively repeated buzzword even outside academia. "Networking," and related concepts like connecting, are used in everyday language and by digital corporations to explain their missions: for example, a 2006 Facebook tagline was "Facebook is a social utility that connects you with the people around you [. . .] made up of lots of separate networks – like schools, companies, and regions" (Reagan 2009). Despite (or maybe because of) its success, digital network studies have started to rethink the role and substitute the concept of network with other ones. Due to the transformation of SNSs into enclosed "walled gardens," where users can spend their entire navigation experience, platform is probably the next attractive and popular concept which has started to replace or integrate "network" in digital studies (e.g., van Dijck, Poell, and de Waal 2018). Platforms have been defined in different and sometimes contrasting ways, but they share several elements with networks: the material and socio-technical dimension, the power to shape and control flows of information, the speed and acceleration in social relationships, among others.

This does not mean that network will soon disappear in digital and media studies. This concept is too embedded in how people think about and represent their communication practices. For this reason, asking why and how the concept has emerged over time, how it was imagined in past societies and which characteristics are enduring is an essential task for contemporary media studies.

2 Deconstructing and Historicizing Networks: Two Long-standing Ideas

Two main ideas and characteristics of networks emerge both in the etymological definitions provided at the beginning of this chapter and in the overview of digital network studies. On the one hand, networks have an infrastructural dimension; they are complex systems that help, process and shape flows of information through nodes and hubs. This represents a material notion of network, focusing on networks of transportation, technological networks, networks of cities. On the other hand, networks have a social dimension, being used by individuals to interact with each other or to build communities. The latter is more a metaphoric conception of networks, focusing on the social networking allowed by networks (a tautology) and on the communication flows generated by them.

2.1 Networks as Infrastructures: The Shape of Materiality

This section introduces the infrastructural dimension of communication networks over the centuries and the discourses generated by them: what are their "effects" and how do they shape or are shaped by political issues, economic interests, and cultural ideas?

2.1.1 Infrastructure, Politics, and Power

First of all, the ways in which communication networks are built is not neutral but politically driven; understanding the materiality of networks means understanding the political ideology behind them. In this regard, the high-speed courier service and road networks of ancient Rome are often described as the earliest examples of network infrastructures that allowed people to connect, interact, and communicate, with information and goods transmitted and shared from the Iberian Peninsula to Asia, from Italy to Britain. These information and administrative infrastructures were designed to link a dispersed and immense empire (Innis 1950) and they shared some common characteristics: used by the Roman army to conquer new territories or immediately after to link them to Rome, they had to last over time (and some of them are still visible and usable) and were designed to maximize the speed of communication (with stations for the exchange of horses, for example). This network infrastructure was mainly centripetal and the Latin *Omnes viae Romam ducunt* ("all roads lead to Rome") is a metaphorical way of expressing the infrastructural design of the Roman road networks.

Nowadays, as in the past, the architecture and organization of networks can shape the flows and power dynamics of communications. For this reason, administrative structures represented another important infrastructural element in the formation of communication networks by pre-modern political or religious authorities. For empires like that of Philip II of Habsburg (1527–1598), which extended from Spain to the Philippines and South America, reliable communication networks were crucial elements for the government of the state. Philip II established various communication infrastructures and an information network which spanned over oceans in order to rule over the Spanish "Global Empire." "Monarchy without letters, Empire without light," commented the Spanish bishop Bravo de la Serna in 1674, underlining the importance of the correspondence network to rule over the vast territories of the Spanish Habsburgs (Castillo Gomez 2006, 7).

The regular exchange of documents had a similar importance for the administration of international religious orders such as the Jesuits, which operated via

a communication system on a worldwide scale, encompassing various hubs and transmission nodes of the Society of Jesus's network. The Jesuits made limited use of commercial post and couriers, but "diplomatic, mercantile, and maritime networks all intersected with Jesuit communication at key points" (Nelles 2015, 440). The Society's bureaucratic infrastructures of information originated from their institutional hub in Rome, transmitting administrative correspondence and newssheets via strategic nodes such as Lisbon and Seville in order to communicate with their overseas missions in the New World, Asia, and Africa. In order to support communication within such a wide topographical range, and also to store all of these rivers of paper, the Jesuits created a complex "network of archives" that closely mirrored the institutional framework of the Society bureaucracy (Friedrich 2010). This was a network of coordinated and subsidiary archives designed to irradiate administrative knowledge from a central hub to specific locations, aiming to create a delicate (and not always effective) balance between centralizing and decentralizing power.

Establishing and controlling information and knowledge networks was interpreted as a form power also for all the colonial empires in different historical times, for example, the Colonial administration of the British Empire, stretching from the Atlantic to the Pacific. Adapting Manuel Castells' concept of a information order, Christopher Bayly has shown that between the eighteenth and nineteenth centuries British colonial authority over India was based on a dense informative network of spies, messengers and local scribes. Preserving the same time-space relation of the early modern period, this information system was still mostly based on human runners and horse posts. Despite showing several dysfunctionalities and sometimes creating dis-connections, this information network persisted well into the 1850s, when it was then replaced by new material infrastructures such as the railways and the electric telegraph which permitted the survival of British power (Bayly 1996).

The electric telegraph is another example of how networks encompass politics and power. Nineteenth-century maps of submarine cables clearly show how the global infrastructure of communication was centered on London. The city was, symbolically but also materially, the center of the world, the place from and to where a network of cables crossing the Oceans and the whole world was connected. Those cables brought information and communication from all over the British Empire and were mainly owned by British companies, which had a dominant position in this market. The network of submarine cables, still relevant and driven by political dynamics today (Starosielski 2015), has been considered by scholars like Daniel Headrick (1991) as the "invisible weapons" of the nineteenth- and twentieth-century empires. In the last two centuries, countries owning submarine cables and, more in general, telecommunications infrastructures have

always played a leading role in global politics. Not by chance, there was a "change of the guard" in cable dominance between the United Kingdom and United States of America in the twentieth century and today China is slowly replacing the US, with infrastructural projects like the "One Belt One Road" initiative.

In the twentieth century, radio and TV networks symbolized the growing power of the media themselves. In the *OED*, a fourth etymology of network etymology is "A broadcasting system consisting of a series of transmitters able to be linked together to carry the same program; a group of radio or television stations linked by such a system; (chiefly U.S.) a large (esp. nationwide) broadcasting company which produces programs to be relayed to affiliated local stations. Also (occasionally): a nationwide broadcasting channel." This infrastructural definition gradually became metaphorical and, for a long time, the word network has been associated with broadcasting, probably the most important medium of the twentieth century. Not by chance, one the most symbolic movies on the media is entitled *Network* (1976). In this movie, the director Sydney Lumet focuses on the "powerful effect" that TV had on its audience.[1] TV was (and still is) considered a political weapon, so dangerous that its ownership is regulated strictly: in several countries, specific laws forbid private companies to own a certain quantity of channels and networks and so to establish dominant positions in the broadcasting market. Like in the case of the Internet today, networks of communication have always been tools of power and have been driven by political needs and worries.

2.1.2 Complexity: Nodes, Hubs, Flows

A second defining feature of networks as material infrastructures is their configuration as complex systems characterized by the presence of highly interconnected hubs, links and nodes of communication. In this respect, as pointed out by Wolfgang Behringer, the dynamics of the early modern postal network share many similar elements to Castells' description of the (digital) network society: "a 'space of flows' consists of, first, a 'technological infrastructure of information systems, telecommunications, and transportation lines'; secondly, 'nodes and hubs' at which exchanges of all kinds can take place and whose functional logic is dependent on their position within the network; and thirdly, the 'habitats of the social

1 In the 1970s, media research also experienced a (re)turn to focusing on the powerful effects of the media (think about the "cultivation", the "spiral of silence" and the "knowledge gap" theories).

actors who operate the network'" (Behringer 2003; Castells 1999, 19–20). Despite the irreducible differences between the contemporary "information age" and the pre-industrial period, such a theoretical model based on the "space of flows," "nodes and hubs" and "social actors" could be effectively applied to the period from the fifteenth to the seventeenth centuries and even later.

While in the contemporary digital age the term "space of flows" represents apparently deterritorialized spaces, early modern cities were instead territorial spaces that acted as networking hubs of exchange where flows of news and ideas were processed and transmitted. Within the already mentioned "Taxis Galaxy," for instance, a number of cities emerged as major points of exchange or key nodes (for example, Rome, Venice, and Milan; Antwerp and Brussels; Madrid and Lisbon; Constantinople; Lyon and Paris; Augsburg, Cologne and Frankfurt), along with secondary nodes that were nonetheless important in the architecture of the network for the regular flow of information (like Naples, Genoa, Florence). As a strategic commercial node with the Orient, a political capital of a large state and home to the largest printing industry in Europe, Venice in the sixteenth century was at the crucial intersection of vast regional and international communication and information networks (de Vivo 2007). As one of the most cosmopolitan metropolises of the time, Venice became a hub able to attract wealth, power, culture, innovation and people, similar to contemporary cities like New York.

It is often said that Internet networks of today are part of a composite infrastructure of other networks and that this complexity is hard to grasp and, consequently, to control. Again, this distinctiveness is historically inaccurate as networks of communication have always interacted with other networks of communication or of transportation. This was the case of the widespread news market that emerged during the pre-modern period and which depended on the creation of a series of interrelated hyper-networks of communication overlapping each other. For this reason, the concept of network was adopted as a metaphor to conceptualize early modern news (Raymond and Moxham 2016). Tangible transport infrastructures were built to support the pre-modern news network and to link the various hubs. Waterways, for instance, played a part in the transport revolution, making European information and postal networks increasingly more efficient, more accessible and geographically widespread over the continent. In the seventeenth century, for example, the Dutch Republic developed a system for transporting newspapers, letters, books, and people between Amsterdam and other cities, using canals and barges. On a global scale, new maritime routes and improvement in oceanic navigation expanded the transportation network that connected Europe, Asia, and the Americas and through a collection of links between different nodes produced a truly worldwide cosmopolitan web

of communication (McNeill and McNeill 2003). Similarly, from the nineteenth century, train and telegraph networks started to be seen as interlinked because, through the telegraph, train traffic could be regulated and the circulation of trains began to be safer and more rational (Schivelbusch 2014).[2] Communication and transportation networks, for a long time, have often been interrelated, have shared the same topographical features or routes and combined technologies and social practices. Not by chance, these networks have been built to favor flows of information, people, and goods and they can be melded in the concept of mobility (Balbi and Moraglio 2016). Therefore, their symbiosis started much earlier than the digital age, as did the complexity of the infrastructural dimension.

2.1.3 Acceleration: Compressing Time

Network infrastructures have always been considered as ways to accelerate the human experience. This is one of the most recurring arguments when a new network of communication is established.

It is acknowledged that, during the fifteenth and sixteenth centuries, a new acceleration of processes of communication took place and a comprehensive network of post routes and relay stations was (re)created in order to foster the political needs of European monarchs. The development of faster and more reliable postal services was fundamental to establishing an interconnected communication network embracing the whole continent (and beyond). The growth of this infrastructure was not brought about by any fundamental technological invention, but it responded to commercial and administrative needs, and was fostered by wide-ranging organizational improvements. This structural revolution in communications also accelerated the speed of old media – handwritten letters or correspondence networks – and increased their communicative power. By means of a dense network of postal stations connecting the Mediterranean to the North Sea, the horse-mounted couriers of the Taxis family (who in the fifteenth century created the first transregional high-speed postal service) linked the principal cities of Europe with the "empire of paper" of the Habsburgs, their principal patrons. Couriers offered their clients various services that differed in speed (and cost): the *cavalcata* was an ordinary mode of mail delivery, while in the sixteenth century a faster mode of transportation based on changing horses was introduced,

2 This "classic" vision is confronted with recent revisionist histories of the relations between train and telegraph networks, in which the two are less interconnected and inter-functioning (Sidney and Schwantes 2019).

the *estafette*. Thanks to this infrastructure, the average travel time between Rome and Paris was around 20 to 25 days but, depending on the urgency of the information, could be reduced to ten days.

According to several scholars, a further moment of acceleration occurred with the spread of the electric telegraph in the first half of the nineteenth century. As noted by James Carey (1989, 203), this "permitted for the first time the effective separation of communication from transportation" or, in other words, accelerated the transportation of messages up to the speed of light (freeing itself from the speed of the carrier, whether man, horse, or stagecoach). Telegraph networks transfer communications instantaneously and, for this reason, their invention was considered a remarkable acceleration of human experience. Contemporary observers claimed that the telegraph changed the ways in which people did business (accelerating the market stock exchange); the way they obtained information (speeding up and even creating a news business); or improved how people understood each other (in the words of a British ambassador in 1858, "What can be more likely to effect [peace] than a constant and complete intercourse between all nations and individuals in the world?" (Standage 1998, 90).

Similar acceleration effects were imputed to other networks of communication like the telephone, the wireless, satellite networks, and of course the Internet in the digital age (Cairncross 1997). Consequently, the re-emergence of the discourse about acceleration in communication networks should be addressed historically simply because time is a historical construct. Andreas Fickers and Pascal Griset claim that "This phenomenon of acceleration or speed lies at the very heart of the modernization process and is responsible for experiences of de-synchronization in the last two centuries" (Fickers and Griset 2019, 333). The "cult of speed," the idea that "modernity is speed" in the nineteenth and twentieth centuries was intrinsically paired with the emergence of new networks of communication. These infrastructures have been considered so powerful as to accelerate the daily lives of millions and then billions of people, or to even produce pathological effects like neurosis in the nineteenth century or the desire to disconnect (also called digital detox) today. In conclusion, acceleration is another long-term "effect" and, at the same time, another stereotype linked to the building of networks.

2.1.4 New Geographies: Compressing and Decompressing Space

There is a fourth and connected "effect" of the material dimension of networks, which emerged before the digital era. Whereas it is true that the emergence of connecting nodes and hubs in the global architecture of digital networks has transformed the geographic space of human experience, new networks of

communication have always shaped space, changed spatial interactions and created new geographies. For instance, while in the sixteenth century hubs such as Antwerp and Nuremberg were strategically located within the postal network, and consequently increased their relevance as fundamental nodes of communication, in the seventeenth century a city like Augsburg lost its position as the most important postal center in Germany and was replaced by Frankfurt.

By privileging some nodes and hubs over others, network infrastructure displayed one more time its political dimension and shaped a new geo-political map. As in the sixteenth century, one could dispatch letters from Rome as far as Russia with reliable postal services, but not to the nearby town of Tivoli because the local delivery network was not connected with the transregional postal network (Fedele, Gerosa, and Serra 2014). On the other hand, Tivoli could suddenly become a well-connected central node of an extended news-network when the pope was visiting the town. A seventeenth-century Londoner would know that on Thursdays "letters were sent to Brussels, Heidelberg, Cologne, Frankfurt, Prague, and the Paris-Turin-Madrid route," while "letters for the Hague and Holland left on Saturday night or very early on Sunday mornings" (Schobesberger et al. 2006, 58). In other words, some cities were closer or more distant on certain days than others, configuring a temporal geography made by networks. With electric telegraphy, this process of both space compression and new disconnections persisted: as Jonas Harvard (2011, 48–49) has shown in the case of the telegraph in Sweden, "When the telegraph worked as it should, in the 1870s Oresund-Posten could get news faster from cities far away than from nearby locations in the province. The telegraph placed news from Berlin, Paris, London and Vienna on a single temporal scale, and regional news was left behind." In sum, networks of communication like the post and the telegraph have a double and co-existent effect: on the one hand, they connect previously disconnected places (so compressing space) but, on the other, create more disconnection, privileging some nodes and hubs over others.

Radio and especially TV networks also had a similar and significant impact on contemporary geographies. John Thompson (1995) theorized the idea of "despatialized simultaneity," claiming that for the first time in history radio and TV audiences could enjoy the same programs live (or simultaneously) despite being at home (despatialized). In other terms, thanks to broadcasting, people became more synchronized even at a global level if we include events like the Olympics. In a similar vein, Joshua Meyrowitz (1985), in a book entitled *No Sense of Place*, theorized how TV networks undermined the connection between physical and social "place," reconfiguring the link between local and televised communities. Again, radio and TV networks have always been seen as electronic media able, on the one hand, to compress and annihilate space and, on the other, to create a new sense of place, made of de-territorialized connections and "televised" realities.

Compressing and decompressing, disconnecting from real geographies and connecting to virtual ones are the same asymmetries that digital networks are producing today. But this process is far from new.

2.2 The Social Network: Creating and Maintaining Communities

Beside their material dimension (made of roads, cables, technologies and cities), communication networks have a social dimension, and they create interconnected groups of people or organizations (remember the third etymology in the *OED*).

2.2.1 Being Part of a "Network": Advantages and Problems

Communication networks are part of and contribute to creating social networks (and vice versa). Social networking is probably one of the most familiar concepts for contemporary digital scholars and digital historians, but again this is clearly a pre-digital concept. Neville Morley (2010, 125) claims that "One way of thinking about the processes of Roman globalization is as the expansion and proliferation of networks, shared forms of social co-ordination which require the acceptance of certain standards in order to be accepted into membership." The Roman Empire was based on several networks: the already mentioned road and post infrastructures, but also social networks with access to social and economic benefits like the imperial elite, networks of Latin speakers or the users of Roman law, networks of trade, military networks, and others. The "membership of a network brings an individual into contact with new information, interpretations and practices, whether that individual likes it or not" (Morley 2010, 25). Resembling the theory of the strength of weak ties (Granovetter 1973), also in the Roman Empire joining exclusive social networks provided more chances to the members, even chances to be better informed.

By challenging this traditional view, which saw individuals as members of social groups, societies, institutions or nations, in the last two decades historians began to analyze the network of relations that defined social spaces. This coincided with a growing interest in associative a relational culture and to the social mechanisms and practices involved in communication and social networks. The *respublica litteraria* from the fifteenth to the seventeenth centuries, a transregional socially mixed community of learned people, is a classic example of social networking. The ways to define this pre-modern network society often adopt a digital

terminology: for instance, the epistolary network linking all the interconnected nodes seems to work as "a proxy for a social network" (van Miert, Hotson, and Wallnig 2019, 28). Moreover, quantitative network analysis has been consistently employed by historians to describe the complex system of relationships within this network. The Republic of Letters was an "imagined community" (Mayhew 2004) bound together by a combination of old media (correspondence) and new media (newspapers and journals) overlapping with each other: the personal networks created by letters were added to the wider webs created by the printing press. Through the publication of their own epistles, humanists could use this social network as a space to build their personality and inner self in the public arena (here we are explicitly reusing the same sentence of the paragraph on digital networks studies).

Other socially heterogeneous communities appeared in the early modern period, such as the network of "friends of friends" that connected migrant communities (Prajda 2018) or the travelling and highly mobile network of merchants. A network science approach has been used to analyze these trade networks that traversed commonly defined geographical, political, and cultural areas in the preindustrial world. These non-hierarchical networks were operated by economic and commercial communities that stretched all over Europe and beyond. By sharing news and useful information (but also fears and emotions) through the same routes employed for their trade, immaterial "*weak ties* linked external individuals with shared business goals and expectations" (Ribeiro 2016). These informal social networks created that sense of "familiarity among strangers" (Trivellato 2012) that could echo contemporary digital forms of social interaction.

Nonetheless, connection with strangers was not always a positive experience. In the late nineteenth and early twentieth centuries the telephone allowed people to interact over long distances and, potentially, to be called by strangers. This created new "etiquette" problems: especially young ladies could be sexually harassed by unknown voices and so, in order to solve this issue, specific rules were introduced. At the same time, the telephone was considered a tool able to cure loneliness. As reported by Fischer (1992, 50), the American 1907 Census of Telephone argued that "a sense of community life is impossible without this ready means of communication [. . .] The sense of loneliness or insecurity felt by farmers' wives under former conditions disappears."[3] Other twentieth-century observers claimed exactly the opposite: the telephone caused an increase in fear and loneliness because virtual meetings over telephone wires replaced physical ones (Balbi 2013). According to the economist Robert Gordon (2016), the telephone

3 On loneliness, see Brennan's chapter in this book.

(with electricity, gas, water, and sewer) was one of the five connections which made the house "networked." According to him, this revolution happened between 1870 and 1940 and it was more relevant than the digital revolution itself: in this period, houses in Western countries radically changed and people could profit from a series of overlapping networks without leaving their living rooms or bedrooms. Among these networks, Gordon forgets to mention radio and TV: thanks to them, the house became a self-sufficient place also in terms of information. This idea was theorized by Raymond Williams (1974), who coined the concept of "mobile privatization": thanks to radio and TV networks, from their sofa and without leaving the house, the audience could travel and adopt a "mobile" lifestyle. Audience could "see" and "visit" places, get information and entertainment, satisfy its need for mobility. Being part of a material and especially social network linking the world directly to your house is probably one of the least acknowledged changes in the history of communication – and a change that occurred in the years before digitalization started.

2.2.2 Materializing Social Networks

Communities could also coalesce around material objects, rather than around shared intellectual, financial or political interests. Material objects provide the most direct way to grasp examples of social network tools before the arrival of social media apps, as in the case of the formation of social networks around artefacts like sixteenth- and seventeenth-century friendship albums (*alba amicorum*) that invited encounters with friends or strangers. The *alba amicorum* were blank albums designed to collect signatures, mottos, coats-of-arms, portraits and visual imagery of acquaintances and encounters as students (but also merchants, artists, and humanists) moved between different places. "Albums were forms of social media that connected individuals to a network, sometimes of strangers," open to future members or readers (Wilson 2012) 206. Humanists' emblem books performed a similar function. Containing a motto, an image, an epigram and (sometimes) a dedication associated with fellow members of the scholarly community, *Emblemata* represented intermedia dictionaries of human relations (Almási 2009). Analogous to contemporary digital social networking (the *album amicorum* can be framed as a direct ancestor of Facebook, also because *amicus* in Latin means friend), these tools of communication constituted spaces of sociability, opened up possibilities for new encounters, connections, and associations, but at the same time also enabled users to articulate and

make visible their extended social networks – to use danah boyd and Nicole Ellison's SNS definition.

Other material objects such as seeds or porcelain could also act as central elements of global networks connecting individuals, as recent global histories of material culture have shown in relation to the circulation of artefacts in the early modern world (Gerritsen and Riello 2016). The same happened in the nineteenth century (and still today) with photographs travelling all over the world thanks to postal networks, as reminders of love affairs. In other words, communication devices have always had the power to re-activate or even to create social networks long before our smartphones.

2.2.3 Virtual and Real Networks: Replacement or Reinforcement?

For long-time *digital network studies* have believed that digital media could replace personal interactions and hence that "virtual" networks could replace "real" ones. This is now recognized as untrue, as the lockdown experience of the Covid-19 pandemic has dramatically demonstrated in recent times. On the contrary, humans experience an interrelated web of in-person and distant forms of communication through different and overlapping networks.

Even in the premodern period individuals could be part of overlapping networks (local, national or global), interconnected by multiple types of social relations: some based on face-to-face communication, others connected through different media or technologies. Within early modern urban society, for example, the advent of new media (e.g., print) made it possible to establish immaterial networks overlapping with (but not replacing) a widespread "culture of presence"[4] based on social media spaces such as streets or squares, markets or salons (Schlögl 2019). John-Paul Ghobrial (2013) has analyzed a similar interweaving of virtual and real networks, showing how the information flows that connected Europe and the Ottoman world were themselves the product of interpersonal exchanges that took place at the small-scale level of everyday practices of communication in cities like Paris, London and Istanbul during the seventeenth century. In the early colonial American South, a region that lacked a regular postal service or a printing press until the 1730s, Indians, Africans, and Europeans created oral communication networks that linked together people who otherwise shared no physical relationships (via spies, scouts, traders, missionaries, and other improvised couriers, such as sailors or hunters,

4 On (tele)presence in historical perspective, see Bourdon's chapter in this book.

see Dubcovsky 2016). Similarly, by illustrating how in eighteenth-century Paris oral poetry and word of mouth represented an ephemeral communication network that intersected with more established news networks, Robert Darnton (2010) challenged many assumptions about today's new and unprecedented information society. Finally, one of the most famous theories in the field of media studies has to do with issues of replacement and reinforcement. When Katz and Lazarsfeld (1955) introduced the two-step flow of communication model, they wanted to test how mass media (and especially radio and TV) influenced personal opinions. They concluded that most people form their opinions under the influence of opinion leaders, who in turn are influenced by the mass media (a two-step process). This was also a way to discover (or rediscover) the relevance of private networks, to contest the powerful effects of media and, especially, to underline that radio and TV networks and social networks are integrated sources of information and not opposing ones.

Conclusion

This chapter has historicized the concept of networks over time through two main axes. Firstly, the infrastructural/material dimension has always been a fundamental characteristic of communication networks: infrastructures have symbolized power to control information flows, have always been complex systems (often interconnected with other non-communication networks) and have been considered tools of compression and acceleration of time and space, even creating new geographies. The second axis deals with communication networks creating sociality/sociability and shaped by social interactions. Concerns and opportunities like strengthening or maintaining connections, exchanging material tools of social interaction and finding a balance between "virtual" and "real" meetings have been continuously discussed over the centuries. While the infrastructural and socio-cultural dimensions of networks are usually considered distinctive of the digital era, we have shown that similar arguments and characteristics of networks emerged much before.

So far, we have mainly underlined continuities, but with these final remarks we want to answer a simple question: has nothing really changed in the concept of networks during the digital era?[5] Of course, concepts and humans change

5 Beside the "newness ideology," claiming that everything related to digital is unprecedented and disruptive, there is indeed an opposite but similar alienation: an attempt to find historical antecedents and "constant continuities" (see Balbi and Magaudda 2018).

continuously, slowly or fast, in transparent or hidden ways and historians are well aware of it. They are also aware of the limits and strengths of the network concept applied to historical analysis and that the metaphor probably has been overused to draw (often anachronistic) historical comparisons, in particular in the wake of the "global turn."

The material/infrastructural and social dimensions in networking have also changed over time. We conclude by mentioning two possible lines of research for networks' historians. On the one hand, digital networks have increased the interconnections of previously separated networks: the Internet itself is an example of "networks of networks," but digital networks of communication are increasingly crucial to transportation, electricity, water, and other webs' functioning, as those non-communication networks are constantly digitized and changed by digitalization. This growing interconnection is creating a hyper-structure of hyper-networks that can no longer function separately. From a social perspective, there is a clear tendency towards the mobility of previously geographically fixed networks. Take the smartphone (and its network) or our social media profiles which follow us as we travel or relocate to other countries. Every single person is becoming a hub and a node of her/his social connections, while in the past cities or houses were the key places from where and to where information was produced and distributed. We are not arguing that all nodes are equal, because there are still people (and thus nodes) or servers (and thus hubs) that are more important than others. Nonetheless, we are saying that, theoretically, the power of networks has been re-distributed from politics to people and especially corporations. To understand these and other changes (as well as continuities), networks must be studied in long-term perspective.

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