Digital ecosystems as social institutions: exploring the role of consumption through four research streams of digital ecosystems

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The growth of global digital ecosystems such as Google, Apple and Uber has led to radical changes in economic activity, work and consumption. It has also challenged established economic, social and organisation theory, which has clear limitations in understanding these phenomena. The discourses on these topics are conducted in various arenas, which are not linked, and conceptualise digital ecosystems differently. What kind of theoretical object is this? And what is the role of consumption in digital ecosystems? To investigate these issues, we conducted an investigation in two steps. First, we performed a focused and a comparative analysis of the research on platforms and digital ecosystems. We identified four research streams: the political, the economic, the technological, and the social and cultural. In the second step, we explored a typology of the role of consumption in the four streams, that is, the position in the ecosystem, the consumer agency and the currency of exchange. We associated the consumer as the critical actor of digital ecosystems, because the impact of digital ecosystem development hinges on the way in which consumers perform, accept and integrate the technology into their everyday lives. Our findings highlight that the relationship between consumption and digital technology is multifaceted and non-deterministic.

Key words consumer role • digital ecosystems • digital platforms • institutions • research streams

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Introduction

In her book *Digital Sociology: The Reinvention of Social Research* from 2017, Nortje Marres stated: ‘Indeed, the digital is today opening up a new “crisis of representation” as it casts doubt on the capacity of social research to adequately and legitimately represent society.’ She discussed the object of her study; are sociologists investigating the social or the digital? She found that the answer is not obvious, as the object of digital social enquiry is ambiguous. Similarly, John Torpey expressed his concerns about sociology’s inattention to recent technological developments in an article published in a recent *Theory and Society* special edition on digitalisation (Torpey, 2020). Despite a long theoretical tradition of investigating the nexus of technology and social order, he argues, ‘Sociology has so far not yet had a great deal to say about the era of “tech” (formerly “high-tech”) – that is, of an age dominated by such “technoscientific” developments as robotics, artificial intelligence, machine learning, bioengineering, and the like’ (Torpey, 2020: 749). Marres seems to share Torpey’s view on the need for ‘unpacking the “black box” of computer software’ and making the digital sensible for sociological examination. In Marres’s view, technology and digital infrastructures, in particular, raise questions of epistemology and epistemic practices that problematise knowledge, sociality and politics. Her response to this challenge was to call for an interdisciplinary research agenda, taking account of the various research traditions and knowledge bases for further investigation.

Our ambition in this article is to contribute to making the digital sensible for sociology. We do so by focusing on a central institution in the ‘era of tech’, digital ecosystems, such as Google, Amazon, Apple and other well-known companies. Digital ecosystems are not only large business structures; they are also a new organisational form. What characterises this form is the central role of the consumer, who is both the target and the driving force in the machinery of these systems. In focusing on the relationship between digital ecosystems and consumption, we propose an interdisciplinary approach for knowledge-building and further investigation. We proceed in three steps. First, to create a common ground across disciplines, we discuss the phenomenon of digital ecosystems as a theoretical concept; there are both epistemological and ontological divergences reflecting the more profound disputes within social studies of science and technology.

Second, we do a comparative analysis of the research on platforms and digital ecosystems. We identify four research streams: the technological, the market, the political, and the social and cultural. We analyse all streams according to their key insights and identify the most important knowledge sources. We find that the discourses are conducted in various arenas, which are not linked, and conceptualise digital ecosystems differently. Our key point here is that although digital ecosystems are experienced at a personal and a group level, we also need to study the phenomenon from an institutional level.

Third, to level the ground for an institutional analysis of digital ecosystems, we propose an approach that takes account of the respective logics identified within the four research streams. We illustrate this approach by focusing on the consumption side of digital platforms. Although the complexities of digital ecosystems illustrate how state, market and civil society are intertwined (Van Dijck, 2021), we argue for focusing on the consumption side in particular. Digital platforms have staged the consumer as the critical actor of digitalisation, and Facebook epitomises the many-sided roles the consumers enter into in their interaction with digital
technology. The consumption side refers to the ways in which ordinary users use these technologies and the ways in which their use is transforming everyday life (Torpey, 2020). We apply the various research streams to explore a typology of the various roles ascribed to the consumers in their interaction with digital ecosystems.

**Why digital ecosystems?**

Both from our daily experiences and from a research perspective, it is clear that digital ecosystems are changing the world: in business and finance; in production, retail and consumption; in health care and public services; and in dating and love (Subramaniam, 2020). During the past 20 years, few phenomena have caught the public's interest and fascination as much as the flood of digital platform-based products and services from Google, Amazon, Apple and many others. Online markets, such as eBay, were introduced in the 1990s, but the first occurrence of the term ‘digital ecosystem’ is often attributed to an EU Commission publication (Nachira et al, 2007), which addressed how digital technology should overcome the fragmented markets of Europe. A few years later, the term ‘platform ecosystems’ was used to describe the digital ecosystems of Apple and Android, as the device companies BlackBerry and Nokia lost the competition against the platform firms (Tiwana et al, 2010).

It is hard to overstate the significance of this global digitalisation wave. Technologically, these companies are structures that the world has never seen before, enabling billions of people to connect to such services as Google, email and Wikipedia. Facebook has three billion users, but its response time is shorter than that of one’s local intranet. Economically, Parker et al (2016) argued that the hegemony has moved from pipeline companies (traditional value chain firms) to platform companies, such as Amazon and Uber. This means that established theories on economies of scale and scarce resources are challenged by theories of multisided markets and network effects. Politically, the social media have led to a dramatic change in the public discourse, with new possibilities for participation, but also economic and social manipulation at a global scale (Zuboff, 2019). Culturally, the change includes a fast globalisation of media and communication forms, whereby the New York stockbroker and the fisherman in Sri Lanka live in the same digital world.

**Defining and researching digital ecosystems**

What do digital ecosystems mean sociologically? Ecosystem is a metaphor from biology, and may be somewhat misleading in the sense that the mechanisms and dynamics of biological ecosystems are quite different from those of the digital ecosystems we study here (Nachira et al, 2007). However, the term is widely used both in research and in practice, and we approach it as an empirical and theoretical concept. De Reuver et al (2017) argued that the object of study lacks conceptual clarity, and asked for definitions that specify the unit of analysis, degree of digitality and the sociotechnical nature of digital platforms.

A digital ecosystem can be defined as an open, adaptive, sociotechnical system, characterised by self-organisation and sustainability (Nachira et al, 2007). Or expressed more simply, a digital ecosystem is a network of people and organisations, connected by digital technology, often with a core, called a platform (Baldwin and Woodard, 2008).¹ A more theoretical approach was offered by Jacobides et al (2018), who...
suggested that an ecosystem is ‘a set of actors with varying degrees of multilateral, non-generic complementarities that are not fully hierarchically controlled’ (2264). A non-generic complementarity can be exemplified by Uber, a digital platform that does not work without specific apps for customers and drivers, and vice versa. Multilateral denotes a set of roles that link the actors together, such as the platform owner, producers and consumers.

The establishment of a digital ecosystem is challenging; it requires an organisation-driven agency or deliberate decisions and actions. It is usually the result of deliberate experimentation and engineering from different actors trying to create some complex joint-value proposition; given the complexity of making heterogeneous and complementary technologies work together, one must build some sort of system around it which is not always possible to design by foresight, it must be experimented with (Gawer and Cusumano, 2014). However, digital ecosystems do not grow through centralised planning, but through network effects (Parker et al, 2016 and sociotechnical mechanisms such as innovation, adoption and scaling (Henfridsson and Bygstad, 2013). Although digital ecosystems are not administered by centralised planning, Van Dijk (2021) argues that the dominant ecosystems of Google, Amazon, Facebook, Apple and Microsoft cannot be understood without an idea of power concentration in the system’s middle – described by Van Dijk as processes of integration, infrastructuralisation and cross-sectorisation.

From an epistemological viewpoint, our starting point is that digital ecosystems are not observable; we can observe the Facebook page and the users, but the enormous technical and economic structure is empirically unavailable. For the user, this fact illustrates the asymmetrical relationship between him/her and the ecosystem owner, while for the researcher, it indicates a methodological barrier. In a much–cited article on Google – ‘Reverse engineering Google’s innovation machine’ – the authors explained that the researchers tried to get inside the company, but had to manage with Google(!) searches on the web (Iyer and Davenport, 2008). As researchers, we often have to document the digital traces of the ecosystem, and infer the underlying structures. However, comprehensive research also requires a deep knowledge of the data structures and algorithms of the ecosystem (Zuboff, 2019).

Related to the epistemological aspect is the recent discourse on socio-materiality (Leonardi, 2013), being the latest contribution to a long-standing controversy on technological versus social determinism, which has been a central topic in science and technology studies and information systems research. We have no ambition to make a substantial contribution to this quite theoretical discourse, since our aim in this article is not to solve the ontological and epistemological issues on the technology–social relationship. We will, however, return to some aspects of socio-materiality during our discussion.

Methods and analysis

Initially, we began this article with an ambition of providing an overview of the research area of digital ecosystems and of comparing developments through a more quantitative and a systematic approach. In trying to follow the methodology of a systematic approach, we encountered several challenges. First, by crossing disciplinary boundaries, we were bound to draw on theories from a variety of fields that often apply identical concepts, but from different interpretations (Webster and Watson, 2002). One noticeable example is the keyword ‘network’,
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which as a conceptual container is given diverse distinct meanings and analytical understandings, depending on the discipline. Furthermore, because the topic of digital ecosystems is a new and emergent research field, our ambition is rather to identify its theoretical foundations and to elaborate key concepts rather than to present a synthesis. This type of review, according to Snyder (2019), often requires a more creative collection of data, because the purpose is usually not to cover all articles ever published on the topic but rather to combine perspectives and insights from different fields or research traditions.

To follow Snyder’s suggestion of using an increasingly integrative approach, we applied a rapid research method (Harker and Kleijnen, 2012) and a snowball method in combination. The review was organised into four steps. We first made an open search on Google Scholar, Scopus, ProQuest and Web of Science to get a general idea of the scope of the literature. As an emerging field of research, the concept ‘digital ecosystem’ is characterised by an immense volume of scholarly attention from a broad range of academic fields (about 20,400 matches on Google Scholar in September 2021). In the second step, we restricted the selection of units by using queries that were expected to capture the institutional attributes of digital ecosystems. We applied keywords such as ‘platform ecosystem’, ‘platform capitalism’, ‘digital governance’, ‘peer-to-peer platforms’, ‘internet monopolies’, ‘sharing economy’, etc. The number of matches for each keyword was limited to between 100 and 2,000. During the third step, through Google Scholar, we chose a selection of 30–40 titles with the highest number of citation scores. Exclusion criteria were deployed; we selected only studies of platform ecosystems, that is, two-sided markets or structures, excluding other digitalisation phenomena, such as the General Data Protection Regulation (GDPR), internet of things (IoT) and artificial intelligence (AI). By deviating from the strict criteria of a systematic review method, the structure of the article is more like a quasi-literature review.

In the final stage, we employed an iterative process of inductive classification. The process ended in the following classification of four streams according to their keywords:

• **Technological stream**: platform ecosystems, peer-to-peer platforms, online platforms, platform tuning.
• **Market stream**: platform economics, data-driven economy, network externalities, two-sided markets, digital economy.
• **Political stream**: information capitalism, surveillance capitalism, internet monopolies, digital transformation.
• **Social and cultural stream**: sharing economy, opt-in consent, self-tracking, data privacy, consumer rights, digital sociology and big data.

The relevance of our categories is challenged in a field where knowledge production is accelerating at a tremendous speed while at the same time remaining disciplinary. Overlaps occur because one theoretical contribution may be as relevant in one category as in another, particularly in social sciences.

We conducted further data analysis by assessing each contribution by asking the following three questions: How is digital ecosystem conceptualised? What is the research question? What is the major hypothesis? We used these distinctions to identify sub-streams. Then we applied the institutional perspective, assessing how the
research object was defined, and what characterised the institutional logic, in terms of macro-social formations that structure and govern social action.

**Technological stream**

The technological stream deals with the development of large sociotechnical networks, but also with various technical architectures for digital ecosystems. One foundational contribution is Hughes’s (1983) work on the development of the American power grid as a technical and political process. Hanseth and Monteiro introduced the concept of information infrastructure, moving from single IT systems to connected infrastructures. Building on actor–network theory, they showed how such infrastructures grow organically through use, not planned design (Hanseth and Monteiro, 1996).

A seminal event for the formation of platform ecosystems was Apple’s decision in 2008 to open its IOS platform to external developers (Eaton et al, 2015), which means that an app developer anywhere in the world can, for a substantial fee, and after an approval process, market and sell apps for iPhone on the Appstore platform. This decision created the world’s largest software ecosystem, growing to a mind-blowing half a trillion dollars.

The basic technical structure of platform ecosystems was described by Baldwin and Woodard (2008); platform ecosystems are composed by a stable core (the platform), and external components with great variety (for instance, apps). To this structure Ghazawneh and Henfridsson (2013) added that the platform owner governs the ecosystem through boundary resources (such as technical interfaces) that connect the platform with the apps. These boundary resources greatly improve earlier IT architectures, often characterised by many silo systems. The underlying research question: How do platform ecosystems mitigate technical complexity?

The technical power of platform ecosystems originates from two characteristics: first, they introduce a specific order of platform core, boundary resources and complements (such as apps) and, second, they balance the forces of centralisation and autonomy through governance mechanisms. Boundary resources are key attributes of digital ecosystems, because they connect the central part (platform) and peripheral parts (such as apps) of the system (Ghazawneh and Henfridsson, 2013). Boundary resources are partly technical, such as application program interfaces (APIs) and security mechanisms, and partly social, such as rules of interaction. These rules, usually instigated by the platform owner, are a central part of the ecosystem governance. One such rule can be, for example, in an e-health ecosystem with sensitive patient data, that an app must provide a certain certificate to access information from the platform.

A central contribution is Tiwana’s Platform Ecosystems (2014), describing the technical structure in typical platforms such as Airbnb and Uber. Two aspects are central: architecture and governance. Architecture concerns the technical structure of digital ecosystems, while governance primarily deals with the relationship between the platform owner, vendors and users. Tiwana proposes four control mechanisms: gatekeeping (who is allowed into the ecosystem); process (how the platform owner incentivises app developers to follow the procedures for mutual benefit); metrics (monitoring of the performance of the ecosystem); and relational (shared norms and values in the ecosystem).
O'Reilly showed that also the public sector is well suited for ecosystem thinking, since public registers can become platforms for public services. In *Government as a Platform*, O'Reilly argued that the public sector can learn from the successful platform companies to establish radically new structures and services in the public sector (O'Reilly, 2011). He called for openness in data, experimentation in projects and broad democratic participation. In a similar vein, Bygstad and D'Silva (2015) showed how government registers historically have been a foundation for the Nordic welfare state, and are now used as platforms for services to citizens and companies.

From a sociological perspective, these contributions are concerned with platforms as technical institutions, that is, organised efforts to deal with technical complexity. The organisational logic of technical ecosystems has been addressed in various ways. Governance aspects have been discussed mainly from the perspective of the platform owner. While Tiwana (2014) was concerned with the architecture and governance of the simple and ideal-typical platforms of Uber and Airbnb, other researchers have investigated more complex structures; Wareham et al (2014) have proposed various forms of more distributed governance to mitigate the tensions between different actors. Another example from the growing field of programmatic advertisement is Alaimo and Kallinikos's study of how ecosystems transfer power from the publisher companies to the advertising firms and their algorithms (Alaimo and Kallinikos, 2018).

The technological stream is, as may be expected, technology-optimistic and normative. The technology-optimism is inspired from the Californian blend of high-tech innovation and a relaxed lifestyle, a blend that has characterised many of the large and small IT companies, particularly in the San Francisco area (Levina and Hasinoff, 2017). The normative aspect is prominent in the focus on best practices, based on experiences from successful firms. Although most platform initiatives fail, this fact is not reflected much in this literature. However, several researchers, such as Ferrari (2020), have criticised this culture from a political perspective.

**Market stream**

The market stream is partly built on the theory of network effects and partly on the theory of transaction costs. Network effects or externalities mean that a new user/customer in an ecosystem not only increases revenues, but also increases the usefulness for all other users. For example, a new mobile phone customer increases the number of possible connections for other customers. This phenomenon implies that, invisible for the individual actors, the value of the network grows much faster than the growth in the number of users. Theories on network effects and n-sided market dynamics were developed by researchers such as Katz and Shapiro (1994) and Rochet and Tirole (2003).

Transaction cost theory implies that the border between organisations and markets is defined by the cost of conducting a transaction, such as finding the wanted product, agreeing on the terms and transferring money (Williamson, 1975). The structure of digital ecosystems, such as Amazon, lowers these costs by digital search, display of products and secure mechanisms for payment. This structure allows firms to organise in network structures rather than large hierarchies. The underlying research question: How do platform ecosystems deal with, or exploit, market imperfections?

These contributions set digital ecosystems in the centre of current economic and strategy theory. Indeed, Parker et al (2016) characterised platform ecosystems as the
world's innovation engine. A key issue: How do ecosystems create value? One answer is that while traditional companies create value through an internal value chain or a supply chain, digital platforms use an ecosystem of autonomous agents to co-create value (Hein et al, 2020). They suggested two value-creating mechanisms: transactions and innovation. The transactions mechanism helps complementors and consumers locate and interact with each other and exchange value in a reciprocally beneficial way; the digital platform acts as an intermediary by matching supply to demand. The second mechanism is innovation, where complementors (such as third-party vendors in open banking) can exploit the services of the platform to develop new services (Hein et al, 2020). The platform owner may offer development tools for complementors, who, in turn, can use those boundary resources to co-create value-adding complements (Ghazawneh and Henfridsson, 2013). For example, companies such as SAP, the largest software firm in Europe, leverages third-party innovation on its SAP Cloud Platform. This leveraging feature means that other companies can sell apps that access information from the SAP platform.

From a sociological perspective, these contributions are concerned with platform ecosystems as economic institutions, that is, organised efforts to deal with market imperfections, or to exploit them. From this perspective, a platform is an institution that effectively links sellers and buyers, like a medieval market connected farmers and city dwellers. A digital platform works much the same way, but is connected to a much larger ecosystem through digital technology. Parker et al (2016) argued that a platform company, as an organisational form, is vastly superior in competitive terms, compared with a ‘pipeline’ company: In open competition, Uber will win over local taxi firms, and Airbnb will win over local room vendors. The simple reason is that transaction costs (information, contracts and payment costs) are much lower.

Some contributions discussed the institutional logic of platform ecosystems, focusing on the practices of platform owners and the interplay with platform users. For instance, Gawer and Cusumano (2014) investigated how platform companies such as Microsoft create their environments, but also their threats, because the power relations between platform owners and platform users are unstable and under continuous negotiation. An example is the taxi firm Uber, which does have a strong hand in its relationship with the drivers, but also has to deal with the fact that many drivers work for competing platforms, and will prioritise the platform that offers the best conditions.

Similarly, Eaton et al showed, with the Apple ecosystem as an example, that platform ecosystems experience conflicts between control and autonomy. These conflicts are mitigated by tuning, that is, a dialectic process of resistance and accommodation, whereby actors with different positions and interests in the ecosystem continually reshape the ecosystem logic. The context here is the continuous repositioning of actors, such as Microsoft, Adobe and third-party developers, through specific technical components (Eaton et al, 2015). Other researchers have investigated the position and strategic options of the peripheral actors in ecosystems, and have found that the peripheral actors in the ecosystem should leverage external resources to innovate, preferably by participating in several ecosystems (Selander et al, 2013). These perspectives offer nuances to the common picture of a dominant platform owner and powerless peripheral actors.

Dealing theoretically with these issues, a literature on collaborative governance has emerged, focusing on public and private stakeholders, together in collective forums.
with public agencies, to engage in consensus-oriented decision-making (Ansell and Gash, 2008). Some researchers have suggested the managed ecosystem governance form (Altman et al, 2019). This governance form is designed to handle situations where a central platform organisation manages ecosystem interactions such that the locus of activity (such as Foodora’s coordination of restaurants’ deliveries) is outside organisational boundaries, while the locus of control remains within the organisation. They argue that this governance model represents a ‘translucent hand’ that is in between the invisible hand of the market and the visible hand of organisational hierarchy (Altman et al, 2019).

The market stream has mainly focused on market efficiency, and to a lesser degree addressed the more problematic aspects of the market dominance of such actors as Google, Amazon and Airbnb. There are some exceptions to this, however. For instance, the Nobel Prize Winner, Tirole, warned against the increasing tendency to natural monopoly situations, and a winner-takes-all scenario (Tirole, 2017; 2020).

**Political stream**

The political stream can be linked to the study of the connection between technology and societal formation, particularly related to concepts such as power, institutionalisation, governance and organisation. We identify two sub-streams: a future-optimistic approach strongly influenced by sociological modernisation theory and a more critical research stream inspired by neo-Marxist theories of the 1960s and 1970s.

The first sub-stream emphasises great paradigmatic shifts of society as a result of technological progress, particularly related to information technology and data processing. In his book *The Coming of the Post-Industrial Society*, Daniel Bell (1973) outlined how the industrial society was superseded by the post-industrial society, which was mostly information-led and service-oriented. Although neither the internet nor digital platforms existed when Bell wrote his book, Bell predicted how access to huge quantities of data, and techniques of processing and data analysis, would be a crucial component in the transformation to a post-industrial society. In his book *The Third Wave*, Alvin Toffler (1980) was more explicit on the role of how information technology reorganises our everyday lives and reconfigures organisational structures in terms of social integration and non-hierarchical structures. Although he was accused of being utopian in his depiction of future societies, several of his concepts have become adopted as analytical concepts. He argues that technological development leads to a reintegration of production and consumption, coined as ‘the rise of the prosumer’, a concept that later was reintroduced by Ritzer and Jurgenson (2010) as a criticism of Marxism and post-modernist theories. An influential sociological study from the late 1990s was Castells’s *The Rise of the Network Society*, which identified information technology as the great enabler of economic and social globalisation, with various forms of networks, instead of countries and organisations, becoming the key organisational forms (Castells, 2000). Of course, Castells was too early to deal with digital ecosystems.

In a similar way, Klaus Schwab – founder and chairman of the World Economic Forum – envisaged nothing less than a ‘transformation of humankind’ in his book *The Fourth Industrial Revolution* (Schwab, 2016). Due to technological breakthroughs, we are ‘at the beginning of a revolution that is fundamentally changing the way we
live, work, and relate to one another’ (2016: vii). Schwab’s narrative has had a massive impact on the way visionary businesspersons and politicians express themselves, communicate and imagine the future in positive and optimistic terms. Imaginations of the future serve as justifications for policy actions of today. Evgeny Morozov (2014: 168) observed that the historiography of technology has a tendency of ‘pro-innovation bias’ in the sense that articles on innovations tend to avoid the negative and undesirable outcomes of innovation. Such pro-innovation bias, Morozov contends, is responsible for the belief that all innovations are benevolent to society, whereas innovations in, for example, the pharmaceutical industry reveal that there are reasons to examine issues such as justice in the diffusion of innovation. ‘This requires going beyond preoccupation with novelty and efficiency and asking difficult, normative questions about power, legitimacy, and morality’ (2014: 169).

Grabher and König (2020) also oppose the idea of digital platforms itself as a disruptive mechanism, but from a perspective inspired by Karl Polanyi’s The Great Transformation (Polanyi, 2015). They argue against a technological essentialism because market dynamics cannot be perceived outside of and disentangled from state action. The emergence of digital platforms could be conceived only as an outcome of three fundamental interconnected drivers of transformation: technology, science and the state (Grabher and König, 2020: 108).

The second sub-stream gathers inspiration from critical theories of the post-war period. From a Marxist viewpoint, technology was regarded as a factor that could mitigate the antagonism between work and capital, particularly in explaining why capitalism prevailed as a social and economic system, in spite of the prophecies of Karl Marx. According to Srnicek in his book Platform Capitalism (Srnicek, 2017), technological start-ups and digital platforms became a valuable and attractive target for venture capital investments in the 1990s, when the profit-rate in conventional industries plunged. As such, digital platforms and digital ecosystems created the engine that could reform modern capitalism – creating a new dynamic of economic growth based on personal data as a new commodity. Srnicek describes how data has been critically analysed in the context of capitalism – implicitly or explicitly – as a commodity. Similarly, Sadowski (2019) extends Srnicek’s argument by adding that data should be regarded not only as a commodity but also as a form of capital itself in a digital capitalism. His statement points to an emerging political economic shift in which data is created, collected and circulated as capital. However, as businesses and government bodies begin treating data as capital, there is a need for examining the characteristics and dynamics of ‘data capital’.

Shoshana Zuboff has been even more explicit in demonstrating how digital ecosystems and big data relate to political economy, using the Google ecosystem as her empirical evidence. In her seminal article ‘Big other: Surveillance capitalism and the prospects of an information civilization’ (2015) and her book The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power (2019), she described and analysed the emergence of ‘surveillance capitalism’ and how Google’s exploitation of personal data is intrinsically tied to a new form of ‘accumulation logic’ within modern economies. Furthermore, she argues that algorithms aimed at predicting social behaviour contribute to new structures of power, structures which lead to alienation and commodification of people’s everyday lives, emerging forms of commodification and power associated with surveillance capitalism (Zuboff, 2019). Zuboff’s approach can be viewed as an opposition to the idea that digital technology
has increased individuals’ capacities for self-governance, such as in work life – where employees, due to access to new technology, achieve both negotiation power and autonomy in the workplace so that they to a lesser degree become subordinated to managerial surveillance from above (Pongratz and Voß, 2003). Instead, if we follow Zuboff’s lines of arguments, power seems to bypass these internal regulatory capacities because individuals depend on ‘Big Other’, that is, processes of ‘datafication’ (Sadowski, 2019), and the constraints resulting from the digital infrastructure. Whereas the first perspective observes self-governance as strongly correlated with technological innovations, that latter one finds manipulations and objectification of the self as an ubiquitous outcome of surveillance technologies.

A criticism that can be raised against recent analysis of surveillance capitalism is the absence of an in-depth empirical investigation of the governance structures of digital ecosystems consisting of cloud computing, big data and algorithms. Zuboff (2015) could be one example, whose study of Google depends on secondary sources from Google employees. Another objection that can be raised against Zuboff is that she tends to ignore that people understand and embrace digital technology from diverse motivations, and how they integrate and adopt digital platforms into their everyday lives. We cannot exclude the fact that people use surveillance technology because they find it useful and meaningful, for example by using apps that monitor and follow the spatial movements of their kids, or more widespread, as various forms of self-tracking (Lupton, 2016). Miller and Horst (2020) demonstrate that there is a thin dividing line between surveillance and care exemplified by their discussion of how digital platforms facilitate ‘transnational mothering’, where Filipina domestic workers abroad are capable of continuing as mothers through digital communication with their children in the Philippines. See a further discussion of Miller and Horst’s view (2020) in the next section.

### Social and cultural stream

The social and cultural stream covers the relationship between the social actor and the digital ecosystem. There is a large body of literature that focuses on the social micro-level, more specifically on the relationship between the acting individual – in most cases the user – and the digital ecosystem. For this research stream, there are two overarching research questions: How do digital ecosystems affect social interaction? And to what extent do patterns of social interaction affect the design of digital solutions? From a sociological perspective, we find a spectrum of theoretical approaches, ranging from a technology-deterministic approach on the one end to a social-constructivist approach on the other, and where different variations over social-technical and practice-oriented theories are to be found as middle positions. Although we do not go deeply into those discourses, as mentioned in the introduction, they constitute a backdrop or a conceptual frame of reference from several contributions within this stream. Whereas the first two positions are assuming a one-way causal index, the middle positions rely on a mutual causal relationship between social interaction and digitalisation. As already stated, there is a line of argument – particularly from scholars of social and technology studies – that has emphasised the blurred boundaries between technical and social realms. Earlier research in actor–network theory (Latour, 1987) proposed that the borders between the technical and the social are useful for differentiating academic disciplines, but are not demarcations that reflect the experienced world.
Thematically, we will divide this research stream into three major topics: sharing, surveillance, and risk and consumer rights. The concept of sharing online has strong theoretical connotations in the social sciences both as a mode of social interaction and as a mode of economic exchange (Belk, 2010; Sahakian, 2016). Both modes are present in the current notion of the sharing economy that has been associated with how digital platforms and ecosystems enable the emergence of new market and non-market mechanisms for the allocation of goods and services (cooperatives, recycling arrangements, and so on). There are several definitions. Frenken and Schor define the ‘sharing economy’ as the practice whereby ‘consumers grant each other temporary access to their under-utilized physical assets’ (Frenken and Schor, 2017: 4), whereas Belk understands the sharing economy as a mode of economic exchange aimed at a revitalisation of social connectivity through the collaborative use of idle resources (Belk, 2013).

Under the heading of the sharing economy, Schor and Vallas (2021) identifies three economic trends: peer-to-peer exchange, access over ownership, and circular business models. Peer-to-peer exchange signifies exchange relationships where monetary compensations either are absent or do not constitute the currency for the allocations of goods, services and labour (Mason, 2016: 128). Classical examples are Wikipedia or open-access programs used by Linux. Social scientists have expressed their optimism on the platforms as prospective incubators of networks characterised by sharing, symmetrical transactional relationships and norms of reciprocity, as is typically contended by Russel Belk (2010). The term ‘sharing economy’ is rhetorically used with businesses such as Airbnb, Uber, Lyft and Deliveroo, and with ‘alternative’ economic initiatives including car-sharing apps, community energy cooperatives and alternative crypto currencies.

Several authors have challenged the concept of the sharing economy as a description of a solidaristic form of economic interaction (Frenken and Schor, 2017; Wahlen and Laamanen, 2017; Schor and Vallas, 2021), a dispute referred to as ‘the sharing vs platform controversy’ (Grabher and König, 2020: 96, italics in original). As pointed out by Laamanen et al (2018), the literature on the sharing economy has identified several challenges, including unfair valuations of users’ inputs, absence of proper consumer protection and neglect of workers’ rights (Scholz, 2016). Humphreys and Grayson (2008) argue that the sharing economy represents only a transfer of unpaid work from the platform owner to the consumer. Constantiou and Kallinikos demonstrated several years ago how data from social-platform users became the source that fuelled the expansion of digital ecosystems (Constantiou and Kallinikos, 2015).

The recent work of Vallas and Schor on the sharing economy represents in our view a huge step forward in connecting behaviour and human action to political economy (Vallas and Schor, 2020). Through a comparative literature review, they explore how work and employment in the gig economy are organised under various regulatory and national contexts. Vallas and Schor (2020: 278) conclude that although platforms tend to ‘scale, dominate markets, and gain enough monopoly power that they can dictate conditions of exchange or develop monopolistic positions in their labour markets’, there are still possibilities for alternative and more democratic scenarios. Among them is a more state-like regulatory solution which regulates gains of sharing from platform owners to users, or a cooperative platform model which is citizen-led and under democratic control. Laamaanen et al’s (2018: 1226) analysis of platforms for sharing of idle time (timebanking) represents an example showing...
that the sharing economy can be moved into a more pro-social direction through using reciprocal networks.

In contrast to the work on the sharing economy, there is a growing literature exploring the ways in which young people use digital platforms to monitor, survey, evaluate and optimise themselves through technologies of self-tracking. Lupton (2016) argues that various forms of intended and unintended digitised self-tracking are examples of ‘dataveillance’ that can be associated with the emergence of what she denotes as ‘the quantified self’, where people use digital devices to achieve improved health, improved fitness or mental wellbeing. Lupton finds that users of these devices do not reflect very much on ‘the quantified self’ in terms of unwanted distribution of personal data. Instead, she emphasises how these technologies are important resources for young people getting to know about their bodies and health. Furthermore, the appropriation of these technologies takes place within a broader network of friends, families, and colleagues, where learning about health is a ‘distributed relational capacity between humans and nonhuman, and that connections with others are crucial elements of these assemblages’ (Lupton, 2020: 11).

Similar to Lupton, Miller and Horst emphasise how the impact of the technology is created by the collectivity of consumers (Miller and Horst, 2020: 3). By focusing on the appropriation of Facebook among Facebook users across eight countries from all continents, Miller and his team conclude that users shape social media and not the other way around (Miller et al, 2016). They oppose the premise that activities on social media lead to individualism or fragmentations of social networks as suggested by Castells (2000). Instead, digital platforms complement social networks by bridging the distinction between private and public life, thereby creating an additional space of social kinship: ‘For the anthropologist, there is no such thing as Facebook; there is only the aggregate of its particular usages by specific populations’ (Miller, 2020: 152). Furthermore, Miller and Horst resist what they call a more holistic notion of the digital platform user, either in terms of digital citizens or the prosumer, homogenous concepts that overshadow expressions of cultural differences (Miller and Horst, 2020: 18). These are differences that should be at the core of any empirical investigation. Miller and Horst portray a proactive and self-governing user of media platforms, a portrayal that contests the one-dimensional and deterministic depiction of the individual as a victimised provider of valuable privacy data. Both Lupton and Miller and Horst show how kinship and friendship intercede in the use of digital platforms, and how the appropriation of digital technology is embedded in social relations.

Discussion

In the course of a few years, ‘digital ecosystems’ has become a household term, and an analytical concept. In this article we have presented four research streams, illustrating the broad use of the term. Our basic claim is that the literature on digital ecosystems is rapidly accelerating yet fragmented. The fragmentation is because the field of digital ecosystems: (1) is multi-disciplinary; (2) there are a variety of contexts in which digital ecosystems are conceptualised and defined; and (3) platforms operate across many different sectors and social domains. All of which means that there are numerous economic, political, social and cultural impacts. The application of the concept digital ecosystems is very technical on the one hand – describing an infrastructure of bit streams – and explicitly politicised on the other – describing
widespread controversies surrounding aspects of the platform economy (Yates, 2020; Van Dijck, 2021).

The four streams deal differently with this organisational form in their conception of institutional logic. The technical stream focuses on how the physical topology of ecosystems determines the roles of platform owners and peripheral actors, and many of the practices of these actors. However, the organisation form also allows for negotiating practices in the ecosystem, such as tuning (Eaton et al, 2015) and the possibility for peripheral actors to participate in competing ecosystems (Selander et al, 2013). The market stream deals with the organisational form as a strategic advantage for the platform owners, that is, the platform firms will outcompete the traditional ‘value chain’ firms because of lower transaction and scaling costs (Parker et al, 2016). The critical political stream (Srnicek, 2017; Zuboff, 2019) argues that the organisational form is deeply asymmetrical, and that it allows for a new type of exploitation via surveillance. The social and cultural stream deals with the asymmetry issue in various ways. Some researchers perceive the organisational form as monolithic and blackboxed, because the individual actor ambivalently struggles between convenience and powerlessness. Others have studied how users and cultural dimensions and social embeddedness also constitute the ecosystem (Miller and Horst, 2020).

While disciplinary focus is hugely important, we argue for the importance of maintaining a view across different research streams in order to understand in more general terms how digital ecosystems shape our understanding of the consumption side. We now analyse how consumers and consumption are conceptualised among the four research streams along three dimensions: consumer role, consumer agency, and currency.

**Digital ecosystems from a consumption perspective**

Each of the four streams epitomises the various roles of consumption in society, thereby offering different perspectives on consumption. How to frame consumers and consumption within the various research streams? And how can consumption shed light on questions of political economy, sociocultural tensions and social relations related to the emergence of digital platforms?

In our analysis, we differentiate between consumer role, consumer agency and currency. Consumer role refers to the position in the ecosystem described by the corresponding stream of literature; consumer agency denotes the concrete actions the consumer may take; and currency denotes what is being exchanged. Currency is commonly understood as all forms of money, but in this analysis, we use the term metaphorically to describe different types of exchange in digital ecosystems. The different types of exchange have been investigated by researchers such as Fan et al (2012), focusing on the currency of data. Extending this perspective, we offer this definition: Currency denotes the content of transactions in digital ecosystems. For

<table>
<thead>
<tr>
<th>Research stream</th>
<th>Consumer role</th>
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<tbody>
<tr>
<td>Technological</td>
<td>Software user</td>
<td>Purposeful use of application</td>
<td>Data streams</td>
</tr>
<tr>
<td>Market</td>
<td>Customer</td>
<td>Buying (and selling)</td>
<td>Money</td>
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<tr>
<td>Political</td>
<td>Citizen</td>
<td>Manipulated actions</td>
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<tr>
<td>Social and cultural</td>
<td>Individual</td>
<td>Sharing information, goods or services</td>
<td>Social relations</td>
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instance, the main currency in Facebook is \textit{relations}, expressed as ‘friend’ or ‘like’ or smileys (see Table 1).

There are many reasons to use Facebook as an example to illustrate our argument. Facebook exemplifies the many-sided roles of consumers interacting with digital platforms. Facebook is the most widely used social media, with 2.91 billion monthly users in 2021.\textsuperscript{2} With a global reach and a high media profile, Facebook has been involved in several controversies, such as political manipulation, mass surveillance, user addiction and fake news (Vaidyanathan, 2018).

\textit{From the technological stream} perspective, Facebook offers the user a graphical user design which is appealing and easy to use. The technological stream defines usefulness and ease of use as the standard of value and as operating as a driver of appropriation. Nobody needed to attend a course to use Facebook. Over time, Facebook has improved the usability of the various services; for instance, uploading pictures and videos (which is relatively complex technically) is quite easy for the average user. The currency that is exchanged is \textit{data streams} in Facebook and connected platforms, such as Messenger, WhatsApp and Instagram, enabling Facebook (or its owner company Meta) to ‘infrastructuralise’ the ecosystem (Van Dijck, 2021). This means that the large platforms not only are large data repositories, but also work as channels for data streams between other platforms and users. For instance, Facebook channels the data between Instagram and its users.

\textit{From the market stream} perspective, Facebook offers a two-sided market, where consumers’ interests are linked to advertisers’ products. The two-sided market is masked, in the sense that the customer’s purpose is usually not to buy anything, but to exchange information with other users. Initially, Facebook was a pure social network, but by 2006, large American companies started to explore how Facebook enabled advertisers to create new and effective customer relationships on a scale nobody had seen before. In August 2007, Facebook announced that it was looking to ‘translate its popularity into bigger profits’ by offering advertisers direct access to their targeted demographic consumers (Brügger, 2015). For advertisers, Facebook has become a marketing platform that is both global and personal, and advertising accounts for around 80 per cent of its revenues. Researchers have found that the most effective marketing, seen from the advertiser’s viewpoint, is a combination of product exposure and ‘brand personality’, such as humour and emotion (Lee et al, 2018).

\textit{From the political stream} perspective, a Facebook user is a citizen. Much of the research literature describes the actions of the Facebook citizen as manipulations (Srnicek, 2017; Zuboff, 2019), taking various forms. One is that personal data is used not only for individual marketing purposes but also to manipulate public opinion and actions, and to distribute fake news (Vaidyanathan, 2018). Another aspect is that Facebook has become a powerful tool for political movements, beginning with the US presidential election of 2008, and continuing with the Cambridge Analytica scandal in the US elections in 2016.

The currency of these exchanges is personal data that is accumulated, analysed and used for various purposes. Personal data is widely used by forces that Facebook users, when consenting to Facebook’s terms, may not be aware of. The 2021 whistle-blower Francis Haugen revealed that Facebook intentionally amplifies content that has a strong emotional character, thus contributing to polarisation and conflicts (Albergotti, 2021). One of the regulatory accomplishments of platform businesses,
Grabher and König (2020) contend, is the extent to which they have succeeded in getting approval for a soft regulation approach from governments instead of an unwanted top-down regulatory regime. Grabher and König argue that regulators, concerned about stimulating the digital economy, often must rely on technical experts and lobbyists who themselves are in favour of self-regulation and self-reporting as means of standardised control. Yates (2020) pushes the manipulation argument even further by describing how platform businesses lobby their anti-regulation agenda by sponsoring grassroot alliances or creating quasi-non-governmental organisations that campaign for their interests. Vallas and Schor (2020) have described the obstacles regulators in California are facing when trying to regulate app-based ride-hailing and delivery companies to comply with labour law. The events of the past few years raise multiple questions about the voice of consumers, investors, workers, customers, cities and the wider public, represented on platforms by advocacy groups, regulators, legislators and the courts.

From the social and cultural stream, Facebook offers an arena for sharing information, goods or services, often using social connectivity for collaborative use of idle resources (Belk, 2013). Facebook is well suited for such sharing, because of reasonably secure user identity, and abounds with special interest groups which share information, goods and services. One recent study investigated how Polish immigrants in Germany, Norway and the United Kingdom used Facebook to share information on employment, but also for finding accommodation (Filipek, 2016). The researchers also identified sharing economy models, such as freecycling, swapping and bartering, by analysing Facebook posts. Another example is a study of low-income digital entrepreneurs, who used Facebook buy-and-sell groups as a new form of subsistence market in developed countries (Delacroix et al, 2019). Timebanking, as another example, demonstrates that householding can simultaneously be a political project for activists as well as a necessity project for its users. These examples demonstrate how projects are influenced and amplified by networking technologies that allow the community to reach and include larger areas, the likeminded (kin) as well as strangers (see also Laamanen et al, 2018: 1226). The currency of these exchanges is relations, that is, the embeddedness and social networks of the users. This social capital can be transformed into non-profit projects, influencer networks or pure commercial business.

To sum up, the massive global impact of Facebook use not only relies on Facebook’s success as a business model and the manner in which Facebook exploits privacy for commercial purposes, but also is due to the advanced usability of the technology and its capacity for connecting and creating social relations.

Together, these four aspects of Facebook use indicate a Faustian pact for the consumer; we know that the price we pay is unacceptable, but we cannot live without the platform. Vaidhyanathan (2018) described Facebook as a ‘pleasure machine’, but argued that it ‘disconnects’ us in several dimensions – surveillance, political coercion, misinformation – leading to the erosion of democracy. The obvious answer to these challenges is regulation, but this has proven to be very difficult. Van Dijck (2021) attributed this difficulty to the fact that Facebook adopts a double legitimacy as a public square and a marketplace, while avoiding public accountabilities. However, in March 2022, the European Union lawmakers agreed on the Digital Markets Act, which will require platform companies such as Apple, Facebook and Google to let their services intertwine with those of their rivals. According to the European Union, this requirement means...
that consumers will get the choice to use the core services of Big Tech companies such as browsers, search engines or messaging, and all that without losing control over their data (‘Deal on Digital Markets Act: EU rules to ensure fair competition and more choice for users’, press release from the European Parliament, 24 March 2022).

Conclusion

In her 2017 book on digitalisation, Nortje Marres proposed an interdisciplinary research agenda, taking account of the various research traditions and knowledge bases for further investigation, an approach which could be crucial for a sociology in addressing the digitalisation of society adequately and legitimately. Comparing the research streams, we note that the different discourses are not connected, leading to separate silos of knowledge. We attribute this problem to the fact that the object of study is defined too narrowly in each stream. To investigate this issue, we have conducted an integrative and focused review on digital ecosystems by identifying four research streams. All four streams and sub-streams offer rich and complementary contributions on digital ecosystems, contributions that provide us with a set of concepts that illustrate both the complementary and the contradictory roles of consumers and consumption.

Furthermore, we have identified the consumer as the critical actor of digital ecosystems in two distinct meanings of the word, first because the impact of digital ecosystem development hinges on the way in which consumers perform, accept and integrate the technology into their everyday lives. In the second meaning, because digital platforms are critical for people’s lives. Digital platforms exert power by imposing a choice architecture for economic exchange and a script for interpersonal communication. Digital platforms themselves change how we socialise, interact and communicate with each other, and increase our exposure to different cultures and therefore alter our tastes. Contestations, both serious and trivial, take place over consumption, and through them we can get insight in the political-economic dimensions of globally interconnected platform ecosystems.

In our analysis, we do not argue for a synthetic theory or a holistic concept describing the consumer operating in a digital ecosystem or in a ‘digital society’, because our roles on digital platforms encompass diverse phenomena and dispersed activity distributed across many practices that connect to everyday life in diverse manners. This is illustrated by how consumers are connected to digital ecosystems through diverse roles, agencies and currencies. Theoretically, our conclusions suggest that the relationship between consumption and digital technology is multifaceted and non-deterministic because several mechanisms of interaction operate simultaneously. We should therefore nurture interdisciplinary approaches and accept the utility of various theoretical perspectives.

Notes

1 The literature uses ‘digital ecosystem’ and ‘platform ecosystem’ interchangeably.
2 Facebook Reports Third Quarter 2021 Results.

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Conflict of interest
The authors declare that there is no conflict of interest.

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