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The data economy: How technological change has altered the role of the citizen-consumer

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ABSTRACT

Citizenship and consumption have been linked for over a century, emphasizing the pivotal role played by the citizen-consumer in society as a whole, and the voting power of the consumer's money. In the modern, digitalized world of the data economy, citizen-consumers are being assigned new roles: active market party, content producer, distributor, and an important source of economic value formation. This article examines how the role of the citizen-consumer is transforming in the data economy, giving a simplified account of historical continuities and discontinuities. We concentrate on the commercial side of consumer citizenship, scrutinizing two periods in the history of technology: first, the 1930s–40s when the mobile citizen-consumer was invented, designed, and promoted by the US car industry; and second, the post-1990s when an even greater sense of mobility was introduced by cell phones and the Internet, drawing examples from outlying yet technologically advanced Finland. We close with a discussion of how the digital turn has given citizen-consumers new channels of operations, querying how technological change has influenced their everyday lives.

1. Introduction

The history of 'citizen-consumers', who vote with their money, reveals a continuously changing role, connecting political, economic, and cultural aspects of consumption in a global, capitalized world; for women in particular, consumer citizenship, prior to gaining voting rights, was seen as a step towards a more independent position both in private and public life [1,2]. The emergence of the citizen-consumer is usually considered to have taken place in the United States in the early 20th century, when consumerism and citizens' rights became linked. At the same time, modern professional fields, such as advertising and industrial design, began actively contributing to the shaping of a new, more mobile and materialistic lifestyle in cooperation with corporations (e.g., Refs. [3–6]). In the 21st century, however, the Internet, social media, and digital devices, currently accompanying us everywhere, have transformed the role and image of consumers from that of captive audience into a highly important source of economic value formation. The dawn of the data economy draws even greater attention to the consumer's active role [7–11] compared to the traditional view of the consumer as a passive recipient of a stream of novelties. By the term data economy, we refer to the development of a digital economy where massive scale data is collected by everyone, also ordinary citizens, and where data circulates faster than ever.

In this article we analyze the changing attributes of citizen-consumers in the 20th century, exploring whether we have reached the point where we can claim that the data citizen has been born. We suggest that the citizen-consumer possesses three related features that emerged in the latter half of the 20th century in response to education, increasing affluence, market forces, and the development of economic thought: firstly, during and after the Second World War it was postulated that, ideally, consumers' choices should be based on their acting to further the household's well-being and even the collective interest—by 'buying local', for example—although consumption choices driven by the individual's preferences were becoming more acceptable; secondly, choices were assumed to rely increasingly on the consistent application of information, rather than inherited habits and customs; thirdly, with increased freedom of purchasing choice, membership in the consumer society became almost inevitable. Consumerism emerged as a central mechanism of society and a model for how goods, services, and (more generally) well-being should be distributed to citizens. Meanwhile, the idealized image of the consumer, openly propagated by, for example, the Century of Progress Expositions in Chicago in 1933, has been characterized in terms of a migration from city centers to suburbs and the rise in ownership of goods and appliances such as refrigerators, washing machines, cars, and television sets.

The latest role to be assigned to the citizen-consumer—a product of the Internet, social media, and digital devices—is that of 'data citizenship', which frames the consumer as a data producer and crucial source of value creation in the 'data economy'. This reflects four related developments: firstly, the collection of massive scale data by various

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sensors and tracking tools; secondly, the swift speed of data circulation from one domain to another; thirdly, the trend of seemingly ordinary citizens collecting, analyzing, and sharing data on their everyday life; and fourthly, the increasing domination of the evolution of the data economy by economies of scale and scope. One could list various technological and cultural steps in the move towards the data economy, such as the Smart phone, open/free source, Web 2.0, consumer generated content, and the Internet of things (e.g., Ref. [9]). Most notably, however, the data created in the digitalized life of consumers has become the prime source of economic value formation. With these steps the scale and scope of the data economy has expanded radically during the past few decades. As a consequence, an almost seamless global digital platform with various data feedbacks has emerged.

At the same time, seemingly separate industries like retail, media, and banking have become increasingly connected, supported, and conditioned by data flows and control of data. Furthermore, the data flow has enabled new opportunities for systemic changes, like a circular economy supported by the Internet of things. So far, discussion of the circular economy has focused on industry and production wherein resources are used effectively and recycled, and waste is minimized or used as a raw material. Citizen-consumers in the circular economy are thought to participate in novel ways in value creation [63], adapting new practices like sharing assets (sharing economy) or result-oriented services. The sharing of assets, often enabled by digital platforms, facilitates more effective resource use, reducing the need for new products and virgin raw materials [13]. It should be noted, however, that we are possibly witnessing a media exercise in hype with regard to this model: a "circulation of over exaggerated expectations … which might lead to unfounded excitement and disappointment" ([14]; 148). Interestingly, similar media-exaggerated expectations accompanied the development of the new automobile market between 1920 and 1940.

The data created in the course of the digitalized lives of data citizens—and frequently recorded by the subjects—have become the prime source of globalized, economic value formation in the 2010s [9,15], recently giving rise to giant organizations such as Google, Apple, Facebook, Amazon, and Microsoft (e.g., Ref. [16]). The flow of data has provided opportunities to gather information about citizen's preferences and opinions, thereby facilitating new ways of influencing general opinions and the direction of politics [17]. Web 1.0 brought with it an increased volume of texts from which to choose, but the information superhighway of the 1990s was one of unilinear communication. Web 2.0, with its social networking sites, opened new possibilities of dialogic communication and the consumer-production circuit moved to two-way communication with consumer-generated content. We can speculatively say that in Web 3.0 more business controlled and intensive circuitry became reality. Currently textual content is increasingly generated automatically with new types of data, for instance GPS position data, and data coming from playing Internet-based computer games or health tracking.

The fact that Google, for instance, could use behavioral data derived from analyzing a user's online history in a process known as 'cookie matching' links the user's likely interest with market offerings [18]; 114). In a complicated process, cookies, ad-servers, ad-networks and ad-exchanges tie people and things together. According to Zwick and Denegri Knott [19] (referred in Ref. [18] consumers are produced as 'novel sets of consumers' by these technologies:

> [C]omputerized information networks that continuously integrate dispersed sites of information solicitation with simultaneous feedback loops do not produce stable and enclosed repositories of meaning such as 'individuals', 'individuality' and 'identities', but dynamic and functional modulations of these, or what Deleuze [20] calls 'dividuals', an elementary form of 'the control society' ([19]; 235).[1]

In examining the evolution of 'data citizenship', this article concentrates on the commercial rather than the political side of consumer citizenship (cf. [3], identifying two crucial periods: the 1930s–40s when the mobile citizen-consumer was invented, designed, and promoted by the US car industry; and post-1990 when an even greater sense of mobility was introduced by cell phones and the Internet. The geographic locus of discussion inevitably reaches out from its epicenter in the US, with occasional comments on how developments have been reflected in the small, somewhat peripheral yet technologically advanced nation of Finland. Our historical examples and our research trajectory recalls Foucault's idea that "[g]enealogical analysis traces how contemporary practices and institutions emerged out of specific struggles, conflicts, alliances, and exercises of power, many of which are nowadays forgotten" [21]; 372). We focus on how big business approaches the citizen-consumer via visionary expectation management, noting that while the image of the consumer [67] as a passive receiver of manufactured commodities has been replaced by one of an active participant in a network economy, the change is, fundamentally, limited. More tangible transformation, however, has occurred in terms of value creation, wherein digital feedback binds consumer/data citizens into a new (net)world in which consumer behaviour—buying, selling, sharing, recycling, participating, and clicking—shapes markets [23]. In the following, we review the trajectory of consumer citizenship from the igniting spark of the World Fairs, through the building blocks of the emerging data economy, to the 'voting rights' of data citizens, examining how they are evolving in a contemporary world governed by data giants, with special attention to both direct and indirect 'data democracy'.

2. The trajectory of the mobile consumer society

The Chicago Century of Progress exposition (1933) was a prelude to a new era (of Art Deco, principles of streamlining, and international style), while the New York World's Fair (1939) was a summary of the new era's promised "world of tomorrow" ([24]; 81); both can be seen as a response to the trauma of the Great Depression (1929–1933). The idea that it is necessary to create needs and regulate demand was a pillar of the New Deal, Roosevelt's response to the Depression; consequently, advertising and industrial design, emerging during the period, competed with commercial agents, politicians, and scientists in demand creation and the making of a better America [6]. Both the new professions aimed to prove that science and technology, art and business, could march side by side towards a better material and materialistic future, led and funded by modern large-scale industry [24,25]. News of developments reached backwater Finland: the Chicago Century of Progress exposition was lauded by Finnish newspapers, with the *Ilta-Sanomat* anticipating the widespread use of artificial lighting, the disappearance of windows, and a revolution of color. "From the first days of the exposition, crowds gathered in front of these buildings, whose forms defied all convention. And eventually they recognized their value" (July 11, 1933).

Through their abundance of goods, the World's Fair served numerous major corporations and a business-based mindset. In the spirit of functionalist architecture, homes were referred to as machines, and ways to extend Fordist mass production to residential construction were discussed.[2] Automotive giants General Motors (GM) and Ford presented themselves as "cultural innovators" and creators of expectations at the

[1] The term 'dividual' was coined by Gilles Deleuze in 1992. With this term he describes an elementary form of 'the control society'. Contrary to Foucault's 'disciplinary society'—in which the individual never ceases passing from one closed environment to another—the control society is continuously in flux and individuals are nonexistent.

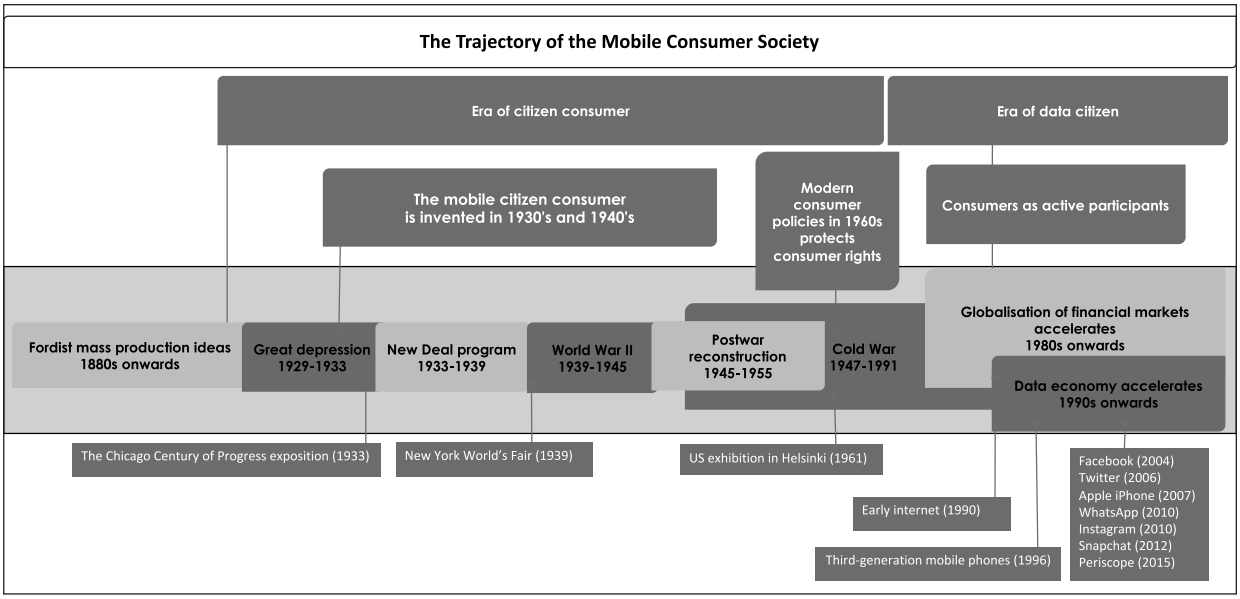
[2] The World's Fair was a laboratory of the future, which the newspaper predicted would shorten the service life of buildings, as construction technologies would quickly become obsolete. After his visit to Ford's factories, Alvar Aalto reported to a Finnish audience on the efficiency of the assembly line and the benefits of standardization.

World's Fairs [6]; 111), while representatives of the new profession of industrial design, such as Raymond Loewy, Henry Dreyfuss, and Norman Bel Geddes, were the stage managers and directors. According to Bel Geddes—who had moved from designing custom-made cars for Hollywood stars to become GM's ideological spokesman—an industrial organism requires four kinds of design: social relations, machines, usability, and artistic realization. Bel Geddes was at the helm of GM's Futurama exhibit at the New York World's Fair and a key supporter of both streamlined sociotechnical foundations for modernity and the belief in the power of design ([6], 130). As GM's Highways and Horizons exhibit (1939–1940 in New York) promoted: "The city of 1960 – with its abundant sunshine, fresh air, fine green parkways – [is] all the result of thoughtful planning and design" (quoted by Ref. [24]; 93).

Streamlining reflected the popular interest in speed records and explicit styling features that came to symbolize speed in the 1930s. This was whetted by Bel Geddes' science-fiction-type renderings of technological utopianism in his 1932 book, *Horizons*, and reflected the era's creation of Flash Gordon, Buck Rogers, and Superman. This was bound up with an emphasis on adventure, experiences, and the American entertainment society—all elements deliberately stressed at the World's Fairs. Colorful entertainment created an image of democratic leisure time in an America striving for well-being and happiness for all. The bad times of the Depression were in the past; the current human task was to conform, as was made clear by the slogan of the 1933 World's Fairs: "Science Finds, Industry Applies, Man Conforms". In other words, a consumer was mainly seen as the end user of industrially produced novelties. By suggesting that the World's Fairs' audience was passive, however, we are referring to the views of major actors and big companies. We recognize that a kind subjective work was done by the spectators when interpreting and making sense of 'never before seen novelties'. Still, contrary to the digital economy where, we suggest, two-way communication in the consumer-production circle is more obvious, the voice of the audience was less recognized or it was recognized only in an aggregate level of demand.

The Second World War interrupted progress until the 1950s, when world expositions became stages for Cold War battles, and many themes from the 1930s were raised to the power of 2 [26]. The US exhibition held in Helsinki in 1961 was titled "Industry at the Service of the Consumer", and tangibly raised the needs of the consumption society in the Finnish consciousness. President Kennedy greeted the Finnish nation by saying, "We want to show you how we and others can use industry and commerce to contribute to a better life for the whole of humanity" (*Kuvaposti*, 22/61).[3] Top talent from many US fields of business attended the exposition, "the country's highest authority in the freezing industry" gave demonstrations, and Finns also had the opportunity to see the vehicle of the future: Ford's Levacar could travel on its rails at speeds of 300–800 km per hour [27].

Demand management of the New Deal (and the emerging system of national accounts in the post-war period) meant that households were increasingly perceived as part of the machinery of the national economy, which could be managed through advertising and state budgets.[4] As we suggest below, a similar faith in an economic machine controlled in accordance with management thinking has again gained strength in the data economy (e.g., Ref. [28]). According to John Kenneth Galbraith, it was a duty, especially of mothers, to consume enough of the right things, although he later admitted that he had overestimated the ability of corporations and the government to guide the development of the economy [65]. The transition from an industrial age, depicted as his *New Industrial State* (1967) to what he called the *Age of Uncertainty* (1977) had been wrought amid the oil crisis.



In the 20th century, the emergence of consumer citizenship was also promoted by other development trends such as political consumer activism (e.g. Refs. [3,29]),—whose precursors were products of cooperatives' activities back in the mid-19th century—and, later, the struggle against water and electricity monopolies [2]. It was, however, in the 1960s that the consumer policies seen today, stressing education and legal rights, appeared on a massive scale.[5] Rapid technological development, a strong growth in supply, and the impersonal nature of markets had created a broad range of problems for consumers, paving the way for modern consumer policies highlighting education, consumer rationality, and legislation. In line with the Kennedyesque

[3] Most of the kitchen inventions were purely fanciful [26], but that is not how the Finnish press painted them: "Have a guess what this row of buttons is. … This complex equipment is used by American housewives to cook roasts for their families. It looks intimidatingly modern, but it must be efficient." (*Kuvaposti*, 22/61).

[4] A similar faith in controlled development started to characterize Europe only after WWII. It was descriptive of the times that a journal titled *Design of the Country* was published in Finland in the 1950s and '60s.

[5] The 1960s can be considered the decade of the consumer citizen's birth, at least in Finland (e.g., Refs. [27,60–62]).

consumer-political worldview of the 1960s, early Internet (Internet 1.0) in the 1990s was seen as an enormous database that facilitated the circulation of information produced by companies and authorities and that provided access to a large online selection of products and services for the purchasing public [30].

3. Towards a mobile information society

Future-oriented media discourse, lectures, and international fairs were crucial forums for elaborating and sharing early ideas of a 'mobile information society'. Central elements of a projected future society (e.g., technical standards NMT, GSM, and UMTS) were launched by Scandinavian telecom businesses. A few years after the introduction of the World Wide Web, Nokia Design distributed sketches of the smart phone and by 1996 the first conceptual images of so-called 'third-generation mobile phones' started to spread around the globe (e.g. *Wired* 9/1999). Along with Finnish Nokia, Swedish L.M. Ericsson, British BTCellnet, and German Siemens started to make futuristic videos demonstrating the benefits of next generation phones. At the turn of the millennium the introduction of smart phones provided the freedom to communicate where and whenever you wanted. Yet telecom business continued to follow the example of the car industry of the 1920s–30s, in which the consumer appeared as the recipient (and end repository) of a stream of novelties.

Nokia was one of the first players in the telecommunication industry openly speaking about 'preparing the market' for portable life-management tools (or 'digital remote life-enrichment devices', 'digital imaging devices', or 'media phones'). It was increasingly acknowledged that a "capacity to invent new industries and reinvent old ones is a prerequisite for getting to the future first and a precondition for staying in front … a firm must unlearn much of its past before it can find the future … the challenge is to pierce the fog of uncertainty and develop great foresight" ([31]; 21). In the mid-90s, Hamel was a frequent visitor to Nokia, then the world's leading mobile phone manufacturer,[6] when he and Prahalad were completing their business classic, *Competing for the Future* (1994), which portrayed Nokia as a winning company building gateways to the future. Yet, as interdependence between companies' brand values and stock market values grew, financial expectations made it more and more difficult to publicly question the elements of leading visions [32].

On the cover of *Wired* magazine (9/1999), Jorma Ollila, Chairman and CEO of Nokia, showed off a pocket-sized Internet. A few years later, speaking at a press conference in Barcelona, he characterized the evolutionary path:

Today's launch signifies a remarkable breakthrough in this industry. History has proven that advances in the way we communicate can give rise to entirely new communication cultures. Much like the transition from radio to TV, the evolution from text messaging to multi-media messaging marks a whole new era of mobile communications, combining images with sound and text. (Nokia Press release: Nokia announces 6 new products and strong support for MMS, November 19, 2001).

At the same time, the instrumental, workmanlike image of mobile phones was smoothly changing; Nokia advertisements in *Vogue* and *Onboard* presented the future mobile phone user as the opposite of the typical 'organizational man': a sporty androgyne dreaming of release from the pinstripe suit. In the 1990s the 'internet in the pocket' was, however, more visionary thinking than real.

A century earlier, Thomas Edison and Henry Ford played similar roles to Nokia's Jorma Ollila, with an emphasis on publicity and the creation of expectations. For Edison, the management of media publicity was a central element of the innovation process and the normalization of needs, while Ford wanted the group of potential motorists to be broadened from the small group of rich daredevils, currently the advertising target, to encompass workers and women. Edison, Ford, and their contemporaries shaped the notion of the consumer as primarily the recipient of new technology. Likewise, early visions of a mobile information society were influenced by how information technology (the computer) was publicly perceived in the 1990s. In one Finnish version of the information superhighway, for instance, there was no room for home IT activists, entertainment users, rebel consumers, or even communicators. Households were perceived as the end point of IT diffusion—the resting place of technology.[7] No future was envisaged for consumer interaction or versatile visual information in computer games. The attitude to consumers was fatherly and patronizing. Official reports included few references to the consumer and then only as a passive recipient, it is 'the audience' who must be protected from technology via norms, legislation, and control [33]. Just as with the World's Fairs, images of the consumer were dominated by the views of engineers, designers, and advertisers.

Interestingly, in today's business literature Nokia provides a cautionary example of blindness to the potentiality of mobile phones [9,15,16]. By the time Apple launched the iPhone in 2007, consumers were no longer seen as passive recipients of information but as active participants within various digital networks. The old concept of consumers promoted by the unidirectional 'information superhighway' (frequently spoken of by US Vice-President Al Gore in the 1990s) was challenged. Accordingly, Time magazine's person of the year in 2006 was You: "Yes, You. You control the Information Age society. Welcome to your world" (Time January 2, 2007).

During the last ten years, a data economy based on the wide use of smart phones and other hand held devices has sprung up: "Our phones and cameras are being turned into eyes and ears for applications; motion and location sensors tell where we are, what we are looking at, and how fast we are moving. Data is being collected, presented and acted upon in real time" ([9]; 40). Importantly, however, data become valuable, at least in economic terms, only through travelling and circulating, leading to the integration of different data flows [9,15,34].

The wildest demo videos at the turn of the millennium featuring the smartphone of the future depicted it as a new kind of 'remote control for life management' serving as an assistant, much like a secretary who can translate, make flight reservations, and remember birthdays. At the time, those promises seemed exaggerated, yet many such visions are now day-to-day reality. Applications such as Snapchat, WhatsApp, Periscope, and Instagram offer us real-time participation in something very flimsy and transient. Even digital assistants exist: the speech-controlled Apple Siri is already working inside mobile phones. Google Now, Microsoft Cortana, and Facebook M are competing to assist us in our daily actions. One of the most impressive secretaries is Amazon's black Echo speaker; Alexa, Amazon's cloud-based voice service, can order a pizza with it or tell you how many goals your favorite ice hockey player scored last night.

4. The consumer's role in the data economy

The data economy of the 2000s, wherein the consumer's actions and digital tracks have become sources of economic value formation, has proved an excellent match to new ways of thinking [19,35–37]. In the European union the General Data Protection Regulation GDPR has been seen as a 'step towards a default ownership of personal data' [38]. The

[6] According to Vice-President of Nokia: "Hamel was at that time the only consultant who obtained wide popularity among all the people at Nokia." (Anssi Vanjoki, personal exchange, 15.12.2004).

[7] This conclusion was confirmed by a close reading of *Suomi tietoyhteiskunnaksi – kansallisia linjauksia* ("Making Finland an Information Society – National Policies"), from 1994, and the 13 associated rationale memos [33]. They spoke of a benevolent technological determinism. Maximization of competitiveness was at the heart of the faith in reforms.

world's five largest companies by stock value (Google's Alphabet, Apple, Amazon, Facebook, and Microsoft) operate in a field that is only about a decade old, wherein the citizen-consumer is envisaged as an essential part of the data giants' machine-learning neural networks, a sensory organ, and the core of a large resource base [39,40]. Business related to personal data is expanding, especially in the areas of health care [41,42], finance [10], and geographical information, with the five US-based economic giants head and shoulders above the rest as the most active operators and platform maintainers [15]. In critical contexts, they are referred to simply as GAFAM.

Traditional marketing techniques (pre-digital era) all approached the consumer as an individual subject. The new marketing technologies construct impressions of consumers out of clustered data points of disembodied interest, behaviors, geographical positions, and opinions: "Markets are, as a result, not broken up into individual consumers but increasingly constructed out of components extracted from anonymous and aggregated consumer data" ([18]; 108). Uber is a good example of an algorithmic system connecting the world's largest pools of data about driver supply and passenger demand for personal transportation. The secret of Uber has been its capacity with regard to 'audience building' and 'match making' but also its new logic of work.

Economies of scale and scope are significant in buying, selling, brokering, packing, unpacking, and storing data. Because of its sheer volume, diversity, and rate of accumulation, the body of data travelling at ever increasing speeds within networks is often referred to as Big Data. Today, value formation and the greatest concentration of money occur at data-integration junctions, reminiscent of wealth aggregation around the railway hubs of Chicago and St. Louis in their time [12]. Data integrations take place when different sort of data are contrasted, for instance in peer to peer networks or by data aggregators such as Google or Facebook. In future we shall see increasing numbers of data brokers or data aggregators offering combinations of data and generalizable information produced through different algorithms based on, for example, information gathered from a peer group. PatientLikeMe, with 600,000 members, is a prime example of a case where an informal community has transformed into a commercially successful platform.

The strength of companies such as Google is that they hold a near monopoly in many markets simultaneously (search, advertising, and analytics) and can track numerous aspects of life [15]. Amazon has moved to grocery (AmazonFresh), Google to transportation (driverless cars), Apple and Microsoft to the wellness business (Apple watch, Microsoft Health), and Facebook to banking and payment systems (FB chip).[8] When data giants integrate data from multiple sources and facets of life, they transcend borders between business sectors. In the health-care and insurance businesses of the future, genetic data may be supplemented by everyday data much more critical to a person's health, from a person's history of consumer choices, through expenditure of time and money, to histories of physical activity [41–43]. For instance, Google's 'sensory activity' entails monitoring people's Web searches, genetics, health, media use, and spending data stored 'in the cloud'. Kevin Kelly [39]; one of the founders of *Wired* magazine, has explained the overarching idea of Google's AI projects as being to understand the world through 'sensory observations': empirical evidence and correlations.

The data economy is said to be bringing a decided shift in the consumer's role towards more active agency [8–11]. However, this depends on whether personal data markets or personalized digital assistants are considered to abuse or serve the consumer. In the process of becoming the content provider—the sender and distributor of messages—the consumer has been given a new role as a sensory organ in the global neural data network. In his novel, *Nineteen Eighty-Four*, George Orwell described a two-way telescreen that offered upper-level Party members information on citizens and monitored their words and deeds. Are we being offered digital assistants or home spies, sent behind enemy lines to gather information that may benefit an enemy power? In Orwell's vision, Newspeak was a way to standardize thinking and hence restrict linguistic creativity. A slightly similar process is under way with the emoji, a pictorial symbol wherein cultural ties and interpretations are openly minimized (in accordance with the Unicode character standard developed for computer systems).

The future is a battleground for ideas. So far, the development of the data economy has mostly been accelerated by American data giants. Their primary economic interest lies in opportunities to influence, on the basis of data analysis and probability computation, the small day-to-day choices made by millions of people. Thus, the diagnostic gaze is focused not on fixed individuals (*individi*) but on 'dividualized' consumers (*dividi*) [19], and on correlations between individual moments. In a world of 'social physics' [44], an individual consumer is only one electron in a group of electrons. According to Jeremy Rifkin [28]; we must realistically admit that there is no protection of privacy anymore—it was merely a historical curiosity that lasted for some 200 years and now must go as a new cooperative data community gains ground.

The concept and idea of the 'data economy' has been launched forcefully both by data giants and various international bodies (e.g., Refs. [36,45]. For policy makers, the hype that comprises this sort of publicity can be considered "a resource as well as a pitfall, and understanding better how hype patterns take shape may considerably increase the actors' capacity to cope with hypes fruitfully" [46]; 1626). This applies as much to the car industry of the 1930s as the data economy of the 2010s. Businesses mobilize concepts that have widespread currency and generic appeal (for example, health and well-being) and deal with abstract and necessarily disembodied versions of skill and technique. It is important to recognize that there are systematic differences between the generic associational work of business promotion and localized instances of integration of related skills, material, and ideas by individual consumers [47]; 13; cf. [48]. The inflexibilities related to localizing explains the relatively slow domestication of many novelties.

5. The future of the data citizen: 'direct vs. indirect referendum'

The citizen-consumer used to 'vote' by buying and using products and services; data citizens 'vote' by, among other means, posting, clicking, liking, googling, navigating online, and tweeting. The loudest and most active data citizens have the most votes, and the right to vote is not limited by such factors as age or nationality.[9] The 'indirect referendum' of the data economy takes place less visibly, and is not criticized with the same force and magnitude, as the ostensibly direct, 'populist' voting seen in social media [49]. Indeed, rather than just every fourth year as in elections, voting is taking place all the time, often without the conscious choice to do so. The vote-counting takes place in a complicated ecosystem wherein diverse data sources, machine-learning networks, and economic interests meet. The outcome might be a description of various market segments, brand communities, or citizen profiles.

In the future, the service promises of credit-rating agencies, insurance companies, and health-care providers will be increasingly

[8] What is now happening in the data economy happened before in railroad companies, as integration produced larger entities, and components like railroad infrastructure relinquished their relative autonomy to the competitive and cooperative networks of which they were part. Most of these structures had become internalized as managerial and operational hierarchies within the seven railroad giants by the end of the 19th century.

[9] A good example of the volume of a data referendum is the few hours of social-media outrage that led the Finnish Minister of Finance to repeal a decree by the Ministry of Finance on commemorative coins to be released to celebrate 100 years of Finnish independence in the spring of 2017.

based on data pertaining to our day-to-day existence, including facial expressions gathered by means of billions of sensors and turned into customer profiling by black-box algorithms and other methods [50]. Data giants will sell the raw material in their databases, which, in turn, will be studied via methods such as sentiment analysis, topic modeling, and neural-network analysis (e.g., Ref. [51]). Consumer markets will no longer be controlled through one-directional advertising propaganda wherein an individual consumer could simply be a recipient of messages; already, the control is executed through models and derivatives that describe and approximate average reality and consumer collectives. The consumer is also becoming a passageway to all the (raw) materials that can be monitored by the Internet of things, and the flow of materials will be encouraged by novel models of businesses wherein solutions instead of goods are ways of creating value. The database is the factory of the future. Circulation of data creates new markets and disrupt old information monopolies. In future the fight is increasingly between American GAFAM giants (Google, Apple, Facebook, Amazon, Microsoft) and their Chinese cousins BAT (Baidu, Alibaba, Tencent) [52]. No European major players exist. Even Russia (Yandex) and Japan (Rakuten) beat Europe in this competition.

The integration of mass-produced consumer data is based on a range of different, both deliberately generated and accidental (perhaps even random) practices of quantifying and summarizing people's day-to-day lives [50]. As with sentiment analysis, can we also talk about the sentiments and moods of entire nations? And how could the 'votes' of individuals be summarized into general-level data that could be traced for use by, for example, insurance companies? Perhaps we could even speak of 'voting paradoxes' associated with data citizenship, in reference to the analyses by Nobel Prize winning economists, Kenneth Arrow [53] and Amartya Sen [54]. In their so-called impossibility theorems, they showed it to be impossible, or at least anything but trivial, to derive an unambiguous social welfare function or a preference order from individual preferences.

6. The citizen-consumer becomes a data producer

In the early stages of the consumer society, the consumer was mainly a recipient of goods and services with a place in the grandstands of the Century of Progress. If we cut a few corners, we can say that the consumer's freedom of choice and rational decision-making abilities were acknowledged with the modern consumer ethos which developed in the 1960s. The neoliberalism of the 1980s further strengthened this kind of economic thinking. In the 1990s, however, the notion of the citizen-consumer received new emphasis. The consumer/producer dichotomy was increasingly questioned: for example, in marketing and innovation (see Refs. [7,22,55,56]). New business models in the service-oriented businesses and the sharing economy also started to strengthen consumers' roles as producers, while their part in the value creation cycle was recognized in the notion of the circular economy [63,64]. Starting with Web 2.0 and augmented by social media, the consumer started to appear as a 'prosumer' and co-innovator [9,23]. Table 1 illustrates this change.

Media scholar Bolin [57] has developed more thoroughly the difference between the two types of audience represented by consumer feedback in pre-digital and Web 2.0 eras. In Bolin's terms the data economy integrates two types of logic and conceptualizations of 'audience' which were quite separate in the pre-digital era [57]. Identity work and the meaning-making of the consumer were the focus in the cultural view, whereas political economy focused more on profits made through statistical analysis of aggregate audiences. In the digital era some of the work involved in consumption (meaning-making, sharing, etc.) became accessible to the media industry. The digital economy has radically transformed the consumer-production circuit by making social and textual work (cf. subjective) more eminent. The Internet, social media, and digital devices that follow us everywhere have changed the economic nature of consumer activism. The citizen-consumer has, for instance, become a content producer for 'hybrid media' and a distributor of news [58]. Meanwhile, business activists argue the need for audience building and matchmaking [15,59].

Table 1
Technological changes influenced the evolution of citizen-consumer.

Technological change	Evolution of citizen-consumer
The rise of car industry	Freedom to move Consumers vote with their money
Information highway	Consumers as passive recipients
Internet	Freedom to communicate
First smart phones iPhone	Consumers as active participants
Data integrations and aggregators (e.g. social media platforms)	Consumers as producers (prosumers) and co-innovators

The first steps of modern (commercialized) consumer-citizenship were taken back in the early stages of industrialization, when the roles of the producer (as waged worker) and consumer started to diverge. In the 20th century, the expanding supply of commodities and services established the consumer as a passive recipient, a visitor to world fairs who was part of the audience during the Century of Progress. In the 1950s and 1960s the Western citizen-consumer began to be perceived as a rational chooser in a world full of options, a kind of data processor reminiscent of a computer. Towards the end of the century, the citizen-consumer became more of a co-producer in production and innovation processes. Ideas such as 'crowdsourcing' and the 'sharing economy' are manifestations of this thinking wherein consumer feedback matters. Furthermore, both the sharing and the circular economy partly reinstate a world where producer and consumer are not discrete, by combining the roles (sharing) and suggesting that the consumer is important to value creation.

It is generally said that in the data economy the data citizen is the most important source of value generation. There is a tradeoff: the consumer gets to take part in data creation and has a new global window, meanwhile becoming a sensory organ for a global intelligence network run by data giants. An important issue is whether the critical consumer movement will remain in touch with reality. Another interesting question concerns the future of democracy and civil society. If the assumption of information-hungry and competent digital citizens is wrong, data-economy promises relating to the almost limitless expansion of frictionless data circulation will not be kept. So far, as Intel's anthropologist Dawns Nafus has correctly emphasized, "free data is free for the taking but useless unless it can be re-contextualized and re-interpreted" ([8]; 221).

7. Conclusions

In this article we have given a simplified account of historical continuities and discontinuities in a process in which 'citizen consumers' have transformed to 'data citizens', a source of value generation, more recently sensory organs for a global intelligence network run by data giants. We have concentrated on the commercial rather than the political side of consumer citizenship, identifying two crucial periods: the 1930s–40s when the mobile citizen-consumer was invented, designed, and promoted by the US car industry; and post-1990 when an even greater sense of mobility was introduced by cell phones and the Internet.

In the early 20th century, the expanding supply of commodities and services established the consumer as a passive recipient, a visitor to world fairs who was part of the audience during the 'Century of Progress'. In the 1950s and 1960s the Western citizen-consumer began to be perceived as a rational chooser in a world full of options, a kind of information processor reminiscent of a computer. Towards the end of the century, 'business visionary speech' start conceiving the citizen-consumer as co-producer and co-innovators. Current 'data citizenship'

is a product of the Internet, social media, and digital devices. This reflects four related developments: firstly, the collection of massive scale data by various sensors and tracking tools; secondly, the swift speed of data circulation from one domain to another; thirdly, the trend of seemingly ordinary citizens collecting, analysing, and sharing data on their everyday life; and fourthly, the increasing domination of the evolution of the data economy by economies of scale and scope. Most notably, the data created in the digitalized life of consumers has become the prime source of economic value formation. With these steps the scale and scope of the data economy has expanded radically during the past few decades. As a consequence, an almost seamless global digital platform with various data feedbacks has emerged.

So far, the development of the data economy has mostly been accelerated by American data giants. In the future the fight is increasingly between American GAFAM giants (Google, Apple, Facebook, Amazon, Microsoft) and their Chinese cousins BAT (Baidu, Alibaba, Tencent). Their primary economic interest lies in opportunities to influence, on the basis of data analysis and probability computation, the small day-to-day choices made by millions of people. Thus, the diagnostic gaze is focused not on fixed individuals (*individi*) but on 'dividualized' consumers, and on correlations between individual moments.

Following from these developments we suggest that citizen-consumer used to 'vote' by buying and using products and services; data citizens 'vote' by, among other means, posting, clicking, liking, googling, navigating online, and tweeting. The loudest and most active data citizens have the most votes, and the right to vote is not limited by such factors as age or nationality. The 'indirect referendum' of the data economy takes place less visibly, and is not criticized with the same force and magnitude, as the ostensibly direct, 'populist' voting seen in social media. The vote-counting takes place in a complicated ecosystem wherein diverse data sources, machine-learning networks, and economic interests meet.

The data economy has changed the scenery of information circulation; nowadays citizen-consumers communicate with each other via the Internet, producing data that have become very powerful tools both in politics and markets. Furthermore, the data economy has changed how markets operate in several fields, transforming car sharing, home renting, and other forms of sharing and circulating into new forms of economic activity. It has combined private persons and companies in new ways, turning consumers into prosumers. One can argue that this change has given consumers and citizens powerful new channels through which to make choices and exert influence, but also that it has made the consequences of such choices harder to understand and predict.

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