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Shining a Brighter Light into the Digital 'Blackbox':

A call for stronger sociological (re)engagement with digital technology design, development and adoption debates

Mike Hynes
School of Political Science & Sociology

ABSTRACT

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Technology permeates our lives having significant effects on how we communicate, live, work and play. Information Communication Technologies have allowed individuals stay connected to family, friends and work colleagues and has brought about broad societal benefits. But technologies are not limited to having positive impacts and consequences; they have led to widespread job loss in particular industries with consequential negative social costs, others to the development of globally destructive weaponry and increased environmental harm. This paper has three aims. Overall, it is a call for stronger sociological (re)engagement in crucial digital technology debates and its significant and frequently disruptive nature upon society. Thus, it begins with a review of key literature with respect to traditional technology development processes. A theory is presented on the phenomenon of 'fake news' and how digital communications and the unrestrained 'wild west culture of the Web 2.0 revolution' have facilitated a state where fact and fiction wrestle for online attention and popularity. The paper concludes with a brief look at areas of particular concern with regards to contemporary technology development and a call for sociology to reposition itself centrally in debates about new digital technologies that are fundamentally changing societies, communities and lives.

Introduction

Technology pervades our everyday lives, and in contemporary societies its design, development, adoption and use has significant effects on how we communicate, live, work and play. It has been a force for some good and has been part of an era of progress and development unrivalled in human evolution, shaping lives in countless ways. It can be said that technology has markedly shaped society as we know it today. We are living longer and frequently healthier lives often because of new technologies. Information Communication Technologies (ICTs) have allowed us to remain continually connected to family, friends and work colleagues and has brought broad benefits to economies and entire communities in the developed and developing worlds. It is true to say that technology has helped more people live more comfortable lives than at any previous point in history, improved communications and ease of access to information, enhanced the convenience of travel, improved entertainment, and increased work efficiency and productivity. But it is also true that technologies have led to widespread job loss in certain industries,[1] been suggested to be undermining human flourishing and well-being,[2]

and led to the development of global destructive weapons and ever increasing environmental harm.[3] Not all technological innovation is desirable nor is its fast rate of development of the greatest economic and social benefit, and whether technologies develop in a right or wrong direction largely depends on who controls it and for what purpose the technology is put. There is a need to view technological development much more as a social activity with social aims needing appropriate social controls and not as technical advance for its own sake, lacking any social dimension. However, many view new digital ICTs, in particular, as somewhat of a 'blackbox', affording it levels of autonomy that allow it impact on society unhindered and unimpeded by rigorous social inquiry, scrutiny and control. We must be mindful of technology's impacts and contest its design, development, direction and adoptions processes where appropriate, and not leave these crucial decisions to engineers, scientists, futurists, and the powerful corporate forces urging unrestricted development. An absence of critical rigorous investigation of technology development will have far-reaching impacts and consequences for society. For instance, in Ireland the costs of large-scale

technology projects such as PPARS[4] and eVoting machines[5] stand testimony to ill thought-out projects that paid insufficient attention to the social and cultural dimensions of technology development and adoption practices. If sociology concedes this investigative space we are allowing others dictate and drive explicit agendas and visions of society, unchallenged by the people whose role it is to understand and organise knowledge about social life.

This paper has three main aims. It is principally a call for stronger sociological (re)engagement in the design, development, and adoption of digital technologies which are having significant impacts on contemporary societies. The following section explores key literature and the rich tradition of sociological - and other closely related disciplines - engagement with technology design and development processes in the past. This is followed by a consideration of a particular area of concern that requires more rigorous sociological attention because of its broad political and societal impacts, and an issue that has received extensive recent attention. It focusses on one particular contemporary area of technology development and widespread adoption; online digital communications. News shapes our sense of the world, of what is important, and it provides the basis of our shared experiences and knowledge upon which democracy is built. Indeed, news has traditionally served as a common good, enabling people to connect to others and engage with the public issues they encounter in everyday life (Swart et al., 2017). But the circulation of 'false narratives', 'fake news', 'alternative facts', lies and conspiracy theories have weakened the knowledge many people rely on to make important political and life decisions. With a focus on the consumption of fake news, this section of the paper offers a theory on how the unrestrained 'wild west culture of the Web 2.0 revolution' (cf: Keen, 2008) has created a condition where fact and fiction tussle for online attention and reputation.[6] Fabricated stories posing as real news or serious journalism influences public opinion and digital communications, most notably the Internet, has changed the dynamics of information transmission leading to a news environment that mirrors and contributes to a highly polarised political system and a preference for opinionated rather than objective news. The paper concludes with a brief summary of some key areas of particular concern with regards to technology development, use and dominances in society and a call for sociology to (re)engage in this arena of inquiry and debate with more conviction,

vigour, and attention, and to better understand technology in all its glory and faults. Technology is not determinist in nature and does not shape society in and of its own right. Instead, it is developers, futurists, and venture capitalists that have been, heretofore, allowed a dominant role in developing any and all technologies as they choose, leaving the costs of such development for others to comprehend and, indeed, deal with. Technical progress influences our lives and the state of society and is a deliberate and highly organised social activity. It is not limited to positive effects and outcomes and Sociologists are often set the task of retrospectively explaining any negative consequences in historical and reactive ways. Yet current economic orthodoxies regard the potential and actual ability to innovate and development new technological artefacts as the bedrock of present and future economic success. Moreover, the sociological starting point in the study of technologies must be the identification of the interests that control and direct particular technologies, and how they come to be used in pursuit of particular ends. In seeking stronger social scientific engagement with this and other such contemporary technology issues and concerns it is helpful to reflect on others in the past who have taken a more critical approach to technology innovation, design, development and adoption processes.

Back to the Future: Learning from Earlier Engagements with Technology
The history of technology and its development is the history of the invention of tools and techniques and is as old as man himself.[7] While there were important social theorists in the past number of centuries who explored the subject, often reacting to the dynamism of Marx's analysis,[8] systematic attention to technology and its social relations, it is suggested, was absent for much of the 20th century (Weinstein, 1982; Westrum, 1991). While Woolgar (1991) notably announced a 'turn to technology' in the social studies of science in the early 1990s, there is evidence of important social scientific inquiry and engagement with technological development and impacts beginning some time earlier (MacKenzie and Wajcman, 1999; Pinch and Bijker, 1984; Russell, 1986; Del Sesto, 1983). Previous to this, the German philosopher Günther Anders wrote about the 'phantom world of television' (1956) and how the televisual experience substitutes images for experience in people's lives, and the French sociologist Jacques Ellul expressed the view that man was in danger of losing control to artificial and autonomous

technologies, subordinating ends to means, and the solution was to be more aware of the problem and more reflective about its development and use (Ellul et al., 1964; Ellul, 1963).

For some within the social sciences in the more recent past, there is a tendency to be more reactionary than proactive in confronting many of digital technology's unfavourable effects and costs, often viewing it in broad deterministic manner. Technological Determinism (TD) is a reductionist theory that suggests technologies drive the development of social structures and cultural values and seeks to understand technological developments as the key mover in history and social change. The term was first coined by Thorstein Veblen, an American Sociologist, in his book *The Theory of the Leisure Class* (1899) and it is the belief that the characteristics inherent in new technology manage the direction of its development and set the conditions for social transformation. This position is argued to be a widely held public and media perception of the relationship between technology and society (Hirst, 2012; Smith and Marx, 1994). Instead of considering technology as part of a larger spectrum of human activity, determinists view technology as the basis for much of human action.[9] Technology, and technological change, are suggested to be autonomous factors impacting on society from outside, and determinism focuses concern on how to adapt to new technology and not on how to shape its development, a basis of strong criticism for some (MacKenzie and Wajcman, 1999; Feenberg, 1992). Determinists believe improvements in technology drive the development of social and cultural conditions according to technology's own logic but if this is the case, Winner (1977) maintains, what began more than a million years ago as a human creation has taken on a life of its own, with technology evolving according to its own inner dynamic unrestrained by social arrangements, culture, and thought.

Smith and Marx (1994) uphold that the sense of technology's power as a crucial agent of change has a prominent place in the culture of modernity. For example, even those individuals who chose not to use computers must still have to accommodate their ways into everyday working and domestic life. Computers are now standard appliances and tools in supermarkets, banks, post offices, libraries, schools, airlines, hospitals, and of course at work; few elements of contemporary life remain unaffected by new or existing ICTs. Other technologies also impact on daily life such as the automobile, electricity, antibiotics, contraceptive devices and various types of weaponry, to mention but a few. The structure of such popular accounts conveys a vivid sense of efficacy of technology as the driving force of history and "taken together these narratives give credence to the idea of technology as an independent entity, a virtually autonomous agent of change" (Smith and Marx, 1994: xi).

Some deterministic techno-optimists claim that technology is an autonomous self-correcting system. This is expressed in the faith that technological innovations will automatically and without human guidance solve problems, albeit some problems already created by previous technologies (Mesthene, 1969). Such technological optimism and belief in continual progress permeates contemporary industrial societies, it is claimed (Huesemann and Huesemann, 2011). According to Mesthene (1969), technology induces social change in two ways; by creating new opportunities and by generating new problems for individuals and societies. In a direct response to Mesthene, McDermott (1969) takes issue with the notion that technology is a self-correcting system and the idea of 'laissez innover' which had been suggested would benefit all of mankind. McDermott believed that a small number of elite dictated the direction of technology and the majority of people, when "placed in a position where social behaviour is governed largely by the principle of blind obedience", were led (1969: 643).

Determinism is often referred to in conventional ways and it is common to find discussions of hard and soft determinism (Smith and Marx, 1994). Chandler (1995) viewed hard (or strong) determinism as an extreme stance; that a particular technology is either a sufficient condition or sole cause determining social organisation and development and that certain consequences are seen as inevitable, or at least highly probable. Criticism of hard determinism centres on the fact that it invariably puts technology in a position of absolute power over society, and the future direction it may take. This led people to a feeling of helpless to changes in the direction technologies were presumed to be driving society. Soft (or weak) determinism, more widely accepted, maintains that particular technologies are merely "enabling or facilitating factors leading to potential opportunities which may not be taken up in a particular society or period of time" (Finnegan, 1988: 38). It positions technology in a "more varied and complex social, economic, political and cultural

matrix" (Smith and Marx, 1994: xii). Both hard and soft Technological Determinism, it must be stated, give some limited scope for human input and choice; the disagreement is over how much.

Closely linked to determinism is the theory of 'cultural lag', a term coined by William F. Ogburn in his book *Social Change with Respect to Culture and Original Nature* (1922).[10] It refers to the notion that culture takes time to catch up with technological innovation, and social problems and conflicts are caused by such a lag or delay. It is predicated on the belief that habits, thoughts, values, and social arrangements often fail to change at the same speed as technological innovation (Volti, 2006). When the material conditions transform these changes are occasioned in the adaptive culture. But changes in the adaptive culture do not synchronize precisely with the change in the material culture and this delay is the culture lag (Woodard, 1934). Cultural lag can be viewed as a critical ethical issue because failure to develop broad social consensus on the appropriate application of technology may well lead to breakdowns in social solidarity and an increase in social conflict (Marshall, 1999).

There are a number of key advocates of determinism. One of the more radical technological determinist in the United States in the twentieth century was Clarence Ayres – a principal thinker in the Texas School of Institutional Economics - a follower of Thorstein Veblen and John Dewey. William F. Ogburn was also known for his technological determinism leanings. In his article *Do Machines Make History?* Robert L. Heilbroner (1967) argued that under capitalism (and only capitalism) technology has a unidirectional development due to the autonomous operation of the market. Heilbroner embraced aspects of determinism but did so under carefully stated qualifications. Karl Marx is occasionally understood to have been a technological determinist on the basis of such quotations as; "the windmill gives you society with the feudal lord, the steam-mill society with the industrial capitalist" (Marx, 1992: [1847]). The quote led to associate the 'basic Marxian paradigm' with a technological determinist perspective (Heilbroner, 1967). Technology and machinery play noticeable roles in his writing and his account of human history is highly structured and nomological (Bimber, 1990). However, this portrayal of Marx as determinist is regarded as inaccurate by some and a position difficult to sustain from his further works, it is argued (MacKenzie, 1984; Adler, 1990). Marx himself identifies three significant factors in the labour process namely; the activity of people, the subject of work, and the instruments of work (Tucker, 1978). Technology did not appear to hold primacy over any of these other elements. Indeed, the intentional use of technology by human actors in an important theme in Marx's work, one which is contradictory in nature to determinism (Bimber, 1990).

Marshall McLuhan's earlier works - such as *Understanding Media: The Extensions of Man* (1964) - is often referred to as a sub-set of determinism, or 'Media Determinism'. McLuhan remarked on the ability of media to 'massage' a message or content and he suggested that "the message of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs" (McLuhan, 1964: 8). Later he became more retrospect and "where he once saw the human being as a passive responder to media, he came to believe that individuals are active creators of their own environments" (Saettler, 1990: 274). McLuhan's (2003) concept of the global village is based on characteristics inherent to electric media including the elimination of time space barriers in the communication process. The ability to eliminate space in the communication process can create a new global sense of communication that is reminiscent of older oral traditions because people become more dependent on and involved with each other, and thus the characteristic of eliminating space constraints drives social change (McLuhan, 2003).

Determinism is still an important framework in modern popular media and the power of digital technology, for instance, to impose social change still appears to be commonly accepted. Debates on the significance of social media, and communications technologies more broadly, in generating protest and influencing certain parts of the media ecosystem have continued for a number of years (Hiler, 2002; Mungiu-Pippidi and Munteanu, 2009). Interest in theories about how and why new services like Facebook and Twitter might create or enable mass protest was generated by the revolutionary events in Iran following the June 2009 elections, for instance (Hirst, 2012), but some scholars doubt the significance of Twitter's role in such political upheavals (Honari, 2015; Rahimi, 2011; Morozov, 2009). The question of the influence of Technological Determinism for investigative journalism needs to be better understood and Mosco (2004) suggests that the idea of a social media revolution is a myth of the 'digital sublime'. Determinism manifests itself in the

working practices of journalists in their reliance on reporting with a 'bias of convenience' and from a perspective of the 'continuous present' (Hirst, 2012).

The accuracy of Technological Determinism representations, and the impact of technological development on studies of the social shaping of technology, demonstrates the often complex social nature of development processes (Smith and Marx, 1994; Bijker et al., 1987). Whilst acknowledging the power and influence technology has on the world, research adopting a socially-centred or constructivist approach shows repeated ways in which users not only subvert the uses for which technologies were intended but also reconstitute artefacts in social interaction (Poole and DeSanctis, 1990; Leonardi and Jackson, 2004). Freeberg (2004) suggests that constructivist studies of technology will lead to a realisation that there is no set path by which the development of technologies occur but rather an emergence of similar technologies at the same time leading to a multiple of choices. These choices are made based upon particular social factors and in examining them we will come to see that they are not deterministic in nature. Much of the criticism of Technological Determinism centres on the fact that people create and use technologies, not the other way around. Social constructivist have argued that even lowly users of technology can shape it by co-construction effects; how they use, adapt, hack the technology and how they can ignore, bypass and make technologies obsolete by consumer power.

The Social Construction of Technology (SCOT) is a constructivist theory inspired by the Sociology of Scientific Knowledge (SSK); and in particular by SSK's principle of symmetry. SSK maintains that successful theories are as much a product of their social context as unsuccessful ones. Theories do not succeed because they are true but rather because they are socially supported. Similarly, it holds that effective innovations cannot be explained by assuming they work better than failed innovations, the analyst must uncover the social context that promotes or fails to promote innovation (Pinch and Bijker, 1984; Bijker and Law, 1992). Research in this area has largely remained committed to an agency approach, although there have been some moves in the direction of a greater emphasis on structure; notably in Bijker (1995) and Klein and Kleinman (2002). The agency-centred approach views structures as either constraints on, or the products of, individual choices, while the structural approach sees actors as constituted by social

structures which are constituted by the actions of these actors (Clark, 1998). SCOT highlights the notion that technology is a site for social contestation, alternatives, choice, and conflict. The normative assumption of improvement and progress, which determinism advocates have, is displaced with a more sceptical view of the limits and importance of technology. The question becomes not what can technology do, but who does it serve?

Several areas of theory and research co-exist under the umbrella of the Social Shaping of Technology (SST) and most arose in the context of a broad-based scholarly assault on Technological Determinism (MacKenzie and Wajcman, 1999; Williams and Edge, 1996). SST emphasises the importance of human choice and action in technology development rather than seeing it as a politically and ethically neutral independent force with its own logic and motivation or; "a mysterious black box that cannot be analysed socially" (Lievrouw, 2002: 185). Central to this approach is the concept that there are choices inherent in both the design and trajectory of innovation programmes, although these choices are not necessarily conscious. Its argued that "different routes are available leading to different technological outcomes, and these choices can have different implications for society or particular groups within society" (Williams and Edge, 1996: 866). Moreover, it is argued that "all technologies are value-laden and are consciously directed by specific interests" (Huesemann and Huesemann, 2011: 240).

Another compelling area of research into technology design and development – Actor-Network Theory (ANT) - attempts to overcome the problem of linear causality (Law, 1992; Callon, 1999; Latour, 1999; Latour, 2005). It rejects both strong determinism and strong constructivist arguments and considers people, technologies, and institutions alike as actants that have equal potential to influence technological development (Callon et al., 1986). "If we abandon the divide between material infrastructure on the one hand and social superstructure on the other a much larger dose of relativism is possible" (Latour, 2000: 51). Technology and people alike are considered as interrelated nodes in constantly changing socio-technical networks which constitute the forms and uses of technology differently in different times and places for diverse groups (Lievrouw, 2002). ANT is valued for its seemingly anti-essentialist or relativist ontology (Lee and Hassard, 1999) and it

strives to resist explanations that appeal to the essential characteristics of actors, such as technologies (Harrisson and Laberge, 2002). However, it is criticised for giving technology the status of an independent actor, the myriad web of networks, and for failing to adequately account for pre-existing structures (Whittle and Spicer, 2008; Winner, 1993). ANT accounts typically fail to provide explanatory clarity, account for power relationship as opposed to influence, and downplays deeper structural forces or the structural perspective.

While Technological Constructivism models make a genuine attempt to move the debate away from the independent and powerful position technology holds in determinism approaches and apportion significant weight to agency, criticism revolves around its often narrow scope and its reluctance to address wider issues of context (Hamilton, 2016). The inherent structures and meaning of a technology may change once it is appropriated into society, and people use their artefacts differently in different social circumstances and under different conditions. A good case in point is the mobile phone. Text messaging was not considered a key feature in early mobile communications development but as phones became accepted and appropriated differently text messaging took on a new significance and importance. There are also interesting contradictions and interplay between gender, age, and culture in everyday communications and entertainment technology acquisition (Brüschke, 2012). Nonetheless, the constructivist argument is often about revealing choice and inviting a consideration of what technologies are desirable and what are less so and whether, in fact, alternatives do exists. Furthermore, hidden power relations tend to show who the technology is meant to serve, and the use of the technology also reveals scope for resistance as consumers are seen as co-constructors in its development.

The main criticism of Technological Constructivism came from Langdon Winner's influential critique of SCOT entitled *Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology* (1993), where he argues that constructivism is overly narrow and largely ignores the consequences of the technologies after development. The central emphasis of constructivism research remains the design and development of technology and little is revealed about processes of adoption, adaption, and acceptance into society. Although the stronger

structural focus in later research was an important step, a fundamental problem remains with the assumption that various social groups are equal and ever-present during the design processes. SCOT continually "fails to adequately attend to power asymmetry between groups" (Klein and Kleinman, 2002: 30), and some groups may even be prevented from participating in the design process altogether (Williams and Edge, 1996). This assumption of a cosy consensus within technology development is excessively agency-centred but the systematic asymmetries of power, and how power differs, are deeply rooted in the structural features of social life (Noble, 1986; Schot and Rip, 1997).

Other criticism centred on the issue that other affected groups, apart from the indicated relevant groups, are ignored and discounted in the process and constructivist models fail to adequately account for those options that never make it to the table (Wajcman, 2010). SCOT also disregards any possible deeper cultural, intellectual, or economic origins of social choices concerning technology. In *The Social Construction of Artifacts: A Response to Pinch and Bijker,* Russell (1986) identifies a number of weaknesses in the SCOT model. He argues that it is inappropriate to transfer the approach and concepts of relativistic sociology of science and he suggests another path; "to try and bring technological change as a distinctive dimension into an established, broadly Marxist, form of social analysis" (Russell, 1986: 343). Criticism of ANT relates to its local and contingent focus at the expense of broader social structures which influence the local (Reed, 1997) its stance on moral and political issues (Winner, 1993) and anxieties over its insistency on the agency symmetry of non-humans (Laurier and Philo, 1999; Sheppard, 2002).

In exploring the evolution and histories of innovation, other scholars have been detailed in their analyses and critical of the popular notion that technology advances by the efforts of a few heroic individuals who produce a series of revolutionary inventions owing little or nothing to the technological past (Basalla, 1988; Edgerton, 2011). The sociological approach to the study of innovation attempts to examine the way that social structure influences both the processes and products of innovative activity and can be found in areas as diverse as economics (Ramella, 2015), medical technology (Casper and Morrison, 2010; Cockerham, 2014), construction (Harty, 2006) and computer game play (Taylor, 2012), for example. What this literature has in common are their attempts to understand how a variety of social,

political and economic considerations shape technological development in different areas of research. Technology forms part of a seamless web of society, politics and economics and thus, the development of innovation systems are not merely technical achievements (Sharif, 2004). Media theorist Marshall McLuhan and the American Sociologist Lewis Mumford have also been important influencers on academics and others concerned about technology impacts and how it should serve society as broadly and best as possible.

There have been other contemporary engagements with modern digital technology's social, cultural, and environmental impacts (cf: Huesemann and Huesemann, 2011; Morozov, 2014; Bowers, 2014), and a small emerging sub-discipline defined by the term *Digital Sociology*.[11] Since 2012 a number of Sociologists have focused on defining this subfield of Digital Sociology and on promoting it as an area of research and teaching. Digital Sociology – the sociology of online networks, communities, and social media – is now quickly emerging as a significant field due to the proliferation of social networking sites and their impacts and consequences for society (Orton-Johnson and Prior, 2013). The sub-discipline encapsulates the concerns previously addressed by 'cybersociology' and extends into the modern era of mobile digital computer use (Lupton, 2012). Marres (2017) argues that the digital forces people to engage anew with fundamental sociological questions and we must learn to appreciate that the digital has the capacity to throw into crisis existing knowledge frameworks and is likely to reconfigure wider relations in society.

With the development of digital communications and the evolution of the Internet a social shift in how we interact and communicate has emerged, with offline human behaviour being replicated through popular social media platforms such as Facebook and Twitter. One of the earliest sociological essays to discuss the potential effects of the adoption of Internet technology was written by Paul DiMaggio and colleagues; titled *Social Implications of the Internet* and published in Annual Review of Sociology (DiMaggio et al., 2001). In this essay it was suggested that "Sociologists need to study the Internet more actively and, particularly, to synthesize research findings on individual user behaviour with macroscopic analyses of institutional and political-economic factors that constrain that behaviour" (2001: 307). Wellman (2001) argued that although technology does not change society, powerful forces are shaping the Internet suggesting the accelerating need for social network concepts and tools for engaging with the Internet and its societal impacts. New social structures are in the making, which can be conceptualised as the 'network society', powered by digital networking technologies characteristic of the Information Age (Castells, 2010).

Lievrouw (2011) states three levels in any media, which have to be considered as a departure point for social media analysis; technology, practices and social arrangements. This is a reasonable sociological position for media analysis that enables attention be focussed on to the whole picture instead of focusing on minor details or letting technological optimism delude our analysis capacities. New social media platforms disintermediate communication, make people more visible, and encourage public life to be measure, and its argued that such platforms are moving the discipline of sociology from "a situation where some people self-consciously do 'public sociology' to one where more Sociologists unselfconsciously do sociology in public" (Healy, 2017: 770). Moreover, it is argued that the discipline is at somewhat of a crisis point in terms of not paying enough attention to studying big, social transactional data that are stored in everything from social networking sites to large corporate databases (Savage and Burrows, 2009; Murthy, 2016). Indeed, much of a more critical analysis of digital technology has come from within the industry itself (cf: Keen, 2015; Lanier, 2014; Pariser, 2011). While much of what we have considered in this section relates to our theoretical understanding of traditional technology design and development processes, how does this relate to a sociological understanding of news in a digital communications networked society?

The Nature of News in a Networked World?
The impact of digital communications has had profound effects on most societies in the industrialised world over the recent past. At the beginning of the 20th century the communications and entertainment industries were largely insignificant, merely existing as small music halls and publishing houses for a select audience. Indeed, prior to the invention of the printing press around the 15th century books were largely written or copied by hand and made available only to monks and scholars, and very few were ever distributed (Febvre and Martin, 1976). It is generally argued that the broad espousal of the printing press, made possible by new printing technologies in the late

19th century, stands as a crucial event in the history of human civilization ushering in a period of significant modernity (Marshall, 1962; Eisenstein, 1980; Dittmar, 2011). The printing press made books, newspapers and broadsheets cheaper to produce and in greater numbers and its immediate effect was to multiply the output and cut the costs of such texts. It made information available to a much larger segment of the population than in the past. It heralded an information revolution that spread new ideas quickly with greater impacts, while also advancing critical scholarship and science.

By the advent of second half of the 21st century the term *mass media* heralded a new economic era made possible by rapid developments in ICTs and the merger of massive telecommunications and entertainment industries. While the printing presses had been implicated in many of the more profound effects on its era; similarly deep changes were underway in this new information age. At the beginning of this period newspapers were a powerful force for expressing ideas and providing information and played a vital role in creating awareness about important issues of public interest. They occupied a prominent place in society and provided an essential democracy function in holding governments and their agencies to account. The importance of newspapers has been recognised as tool for civic engagement[12] and, it has been suggested, have played an important role in creating an informed and knowledge electorate in the past (Robinson and Levy, 1986) as well as an important forum for public discussion and debate (Coronel, 2003). Because of its inherent ability to reach out to large numbers, it has been widely used to convey messages that shape public opinion and awareness, and was used to educate people at very little cost. Indeed, newspapers were said to be of such core value to a successful society that a timely and easily accessible news product would succeed despite, or perhaps because of, changes in reading habits and technology (Martin and Copeland, 2003).

But it would be foolhardy to suggest that newspapers have been a bastion of absolute truth and virtue over the decades and 'spinning the news' and concerns over control of content are not a contemporary phenomenon. In *Sociology of news production*, Schudson (1989: 280) suggests that "in general, historical studies of the press reveal significantly different patterns of newsgathering and newswriting over time that are rarely referenced or accounted for in contemporary

sociological studies of news". Studies of news production and related professional practices provide in-depth understanding of the nature of journalism in contemporary societies and have "productively shone a spotlight, *inter alia*, on the daily routines, bureaucratic nature, competitive ethos, professional ideologies, source dependencies and cultural practices of the news media" (Cottle, 2007: 1). That said, serious reputable journalism strives for honesty and truthfulness and when they fail to meet these standards they are frequently held to account by colleagues, watchdogs and governmental agencies. McChesney (2012) asserts that healthy journalism in a democratic country must provide the opinion of people in power and who wish to be in power, must produce the range of opinions and must regard the informational needs of all people. Moreover, "questions about values, principles, right and wrong behaviour, are an inescapable part of journalism, as they are of any other human practice" (Sanders, 2003: 11).

In addition to newspapers, radio and television news, books and magazines have all been used to broadcast essential information. But a decade-long structural shift away from print media has given way to an accelerating avalanche and imminent 'print apocalypse'.[13] With the ongoing decline in newspaper sales (Henry, 2007; Brock, 2013) and ever increasing competition in the television news market, consumers are now more than ever likely to source their news from the Internet (Newman et al., 2015; Biagi, 2017). The cultural and social implication of much of this content has not yet been appropriately investigated or explored and thus the consequences for society remain unclear.[14] As the number of television channels continues to increase, fewer and fewer of us are watching the same programmes. More than one set per household has further fragmented any impacts and allowed even more personalised private viewing to take place. Putnam anticipated; "this trend towards market segmentation allows plenty of choice and presumably enhanced consumer satisfaction, but it also undercuts televisions once vaulted role in bringing us together" (2001: 245).[15]

This and the following section are grounded in the conceptual understanding of 'mediated public connection' (cf: Couldry et al., 2007) particularly as it pertains to consuming and engaging with news content. Schudson maintained that "civic participation now takes place everywhere" (1989: 298-299) and the media, in general, has a crucial role to play in enabling or disabling important social connections. Couldry et al. (2007) puts

forward two assumptions in this regards which, in effect, provide a bottom line for most political science and political theory, and indeed media research. This first is the assumption that we, as citizens, share an orientation to the public world where matters of shared concern are, or at least should be, addressed: they call this 'public connection'. The second assumption is that public connection is principally sustained by a convergence in the media people consume. Taken together these two assumptions imply the notion of 'mediated public connection' (2007: 3).

In a widely cited paper, Horton and Wohl (1956) suggested that the mass media had created a new form of social interaction, a relationship of 'intimacy at a distance' in which audiences experienced the illusion of primary relations with actual media communicators.[16] While many other forms of public communications may also engender common public connection sentiments (cf: Jenkins, 2006) what makes news worthwhile for conceptual investigation is that as a cultural form it is unrestricted to a particular period in life, place, or organisation (Swart et al., 2017). News prompts public connection and civic engagement in public affairs increasing social capital, and these represent key creators of healthy, strong democracies (Putnam, 2001; Benjamin, 1984). While media effects on social capital and participation are contingent upon individuals' motivations for using such media (Shah et al., 2009), it is not the media *per se* that can affect individuals' social capital and engagement, but the specific ways in which individuals use it (de Zúniga, 2009). The link between news media use and citizens' engagement in politics is one of the most prominent issues in the field of political communication (Holt et al., 2013).

Despite recent difficulties and a decline in print media circulation, news continues to form a key part of the daily routine for many people. Indeed, however indifferent they may appear to be, young people in particular often absorb a great deal of political information from the media inadvertently or in the course of other activities, albeit in fragmented form (Buckingham, 1999). The struggle for citizenship is partly a struggle over the means and substance of cultural expression, particularly those which are made available by the electronic media (Gilbert, 1992), so the need to investigate and engage with news content of all type becomes more essential. Furthermore:

> [T]he mediated public sphere remains, as Habermas' revised model prescribes, a key element in any normative model of how participation in democracies might work. We must however study the contexts for public-related talk and media consumption that are actually available to citizens in their daily lives (Couldry et al., 2007: 39).

The Internet and mobile communications now offer all forms of news and information and people are accessing this throughout the day and night, and across multiple platforms and devices. But the norms on social media platforms are continually shifting and, as a result, people are constantly changing how they interpret social media content (Howard et al., 2016). Until the Arab Spring, much of the scholarly research on the political impact of digital media over the last decade supported the perspective that long-term democratic entrenchment might come from truth-based online advocacy, constituent mobilization, and crowd-sourced social monitoring (Howard, 2010; Fung et al., 2013). Moreover, countries that do not have a civil society equipped with digital scaffolding are much less likely to experience popular movements for democracy (Hussain and Howard, 2013). As Castells affirmed; "the shift from traditional mass media to a system of horizontal communication networks organised around the Internet and other wireless communications has introduced a multiplicity of communication patterns at the source of a fundamental cultural transformation" (2010: xiii).

A recent study suggests that informational use of social media sites exerted a significant and positive impact on individuals' activities aimed at engaging in civic and political action (Gil de Zúñiga et al., 2012), but in what form is this information taking, who is providing it, and is it reliable and trustworthy? The Internet has surpassed many of the traditional means as the main news medium, and this may have some troubling implications for what we traditionally understood as news. The future of this new information age may well be dominated by unintended consequences and it could be decades before we see the real and full effects of this change. Media researchers and social scientists are grappling with a degree of difficulty in understanding many of these recent trends and questions about the contingency and precariousness of what is publicly circulated as truth has become central to media and communications research in general. New media may well need a new theory. But the rate of

changes in this field and the necessary interdisciplinarity of the research subjects are limiting factors. To understand new media "it is necessary to understand complex behaviors – of markets, individuals, and technologies – that have, in fact, a long process of evolution" (Holmes, 2009: 687).

Why We Need to be Worried about 'New' News

The concern with online news content is that while all media can be controlled or manipulated to spread disinformation in certain circumstances, the way we are now consuming our news is leading to even more diffusion, confusion, contradictory, and often trivial news content realising undue relevance and significance. Social media is leading the way in this respect and the consumption of news is becoming more individualised as a result.[17] A good example of mishap with regards to news content and newsworthiness, brought about by a preference for online digital communications, was the recent Facebook news trending difficulties.[18] While some embarrassment was caused when it was revealed that this trending news module was curated and tweaked by humans, once the company eliminated its human editors and left the algorithm to do its task unhindered the results became an embarrassment.[19] Critical concerns about censorship and news manipulation at Facebook were compounded by its decision to censor the historic photograph of nine-year-old Kim Phúc running injured from a napalm attack during the Vietnam War.[20] Furthermore, the company was also accused of abdicating its responsibility to clamp down on fake news stories promoted through its platform and counter the echo chamber that defined the 2016 US election.[21] But how and why has this situation come about and why is this issue one for online digital communications?

There is no suggestion that media untruths are a recent digital age phenomenon. Indeed, fake news quiet correctly could be called propaganda and there is extensive social sciences literature on the subject and its link to the state, both dictatorial and democratic (cf: Jowett and O'Donnell, 2014).[22] But the widespread availability of digital communications and online silo debates and discussions are amplifying the problem of false narratives and extremism (Howell, 2013; Sunstein, 2009). Digital communication technologies are creating and re-enforcing echo chambers and social media bubbles[23] of particular interests and aspects of news (Yates, 2016; Flaxman et al., 2016). Personalised news and services limit the diversity of media content people are exposed to and thus

have an adverse effect on the democratic discourse, open-mindedness and a healthy public sphere (Pariser, 2011; Sunstein, 2002). Online social networks are suggested to be strongly polarised and segregated along political lines at present (Conover et al., 2012) and these platforms are designed to prioritise engagement between users familiar with each other. To revise an old adage 'online birds of a feather tend to flock together', and false stories shared by and between individuals have the potential to become fact for many within and outside these groups. The spread of misinformation is often supported and amplified by ideologically-driven, self-described 'alternative news' websites. Moreover, there is evidence that 'social bots', i.e. software-controlled profiles or webpages, also play a key role in the spread of fake news (Shao et al., 2017).

One recent study, which examined the content, connectedness, and use of these websites, suggests the intentional use of disinformation tactics over an extended period of time (Starbird, 2017). Interestingly, this study found that one of the main conspiracy stories promulgated by 'alternative news' websites is that news emanating from traditional media sources is false, and disinformation from these sources was designed not to spread a specific ideology but to undermine trust in information generally. More alarmingly, the report suggests that the aim of such disinformation strategies is to spread confusion and 'muddled thinking' as a way of controlling a society (Starbird, 2017: 10),[24] a claim that needs closer sociological attention and investigation.

Another instance of this phenomenon was a case study put forward by the New York Times (Maheshwari, 2017). The study focused on a tweet by Eric Tucker, a 35-year-old co-founder of a marketing company in Austin, Texas who posted an image of a number of buses and connected this, incorrectly, to an anti-Trump protest in the city on the same day. Although he had only 40 Twitter followers that morning his false story was quickly picked up by a number of conservative websites and blogs and ultimately alluded to by Donald Trump himself in a tweet later in the day. The story continued to be shared amongst likeminded groups and individuals and conferred as 'fact' even though Eric Tucker had withdrawn the allegation and the bus company involved had denied the story.[25]

The Internet, and in particular Web 2.0, has changed the nature of information, news and, indeed, creative work. The promise of Web 2.0 was

the web would quickly evolve from its earliest phase as an experiment in static page publishing to an expanded set of interactive tools aimed at building upon the power of collective and individual engagement (O'Reilly, 2005). Instead of merely reading a Web 2.0 webpage, a user is invited to contribute to the site's content by commenting on published articles or creating a user account or profile on the site, which enables increased participation. Such online user-generated content and participation has grown steadily and the popularity of Web 2.0 was acknowledged by Time magazine in 2006 when it named *YOU* as Person of The Year. That is, Time selected the multitudes of users who were participating in content creation on social networks, blogs, wikis, and media sharing sites and eulogised:

> [i]t's a story about community and collaboration on a scale never seen before. It's about the cosmic compendium of knowledge Wikipedia and the million-channel people's network YouTube and the online metropolis MySpace. It's about the many wresting power from the few and helping one another for nothing and how that will not only change the world but also change the way the world changes (Grossman, 2006).

Thus, all things that Web 2.0 set out to represent - participation, collaboration, collectivism, online communities, amateurism - all become unarguably good things. But as Nicholas Carr (2005) questioned; is this really so? Is there a counterargument to be made? Might, on balance, the practical effect of Web 2.0 on society and culture be bad, not good?

Newsworthiness?

In his influential article *the amorality of Web 2.0*, Nicholas Carr (2005) argued that the promotors of Web 2.0 venerated the amateur and distrusted the professional. The democratisation of online content has led to what he termed 'the cult of the amateur', which was undermining and, indeed, corroding the truth, souring civil discourse, and belittling expertise, experience and talent. Such online activities have grown in recent years. For instance, one survey found that 37 per cent of Internet users had contributed to the creation of news, commented on it, or distributed it via popular social networks (Pew Research Center, 2010).[26] Carr further suggested that perhaps nowhere is this love of amateurism more apparent than in the promotion of blogging as an alternative that what is

now termed 'mainstream media'. The tech entrepreneur Tim O'Reilly spoke of the blogosphere as 'harnessing collective intelligence' and:

> [t]hat the world of Web 2.0 is also the world of what Dan Gillmor called 'we, the media,' a world in which 'the former audience', not a few people in a back room, decides what's important (O'Reilly, 2005).

But in pointing to the limitations and flaws inherent in the blogosphere Carr discussed its superficiality, its emphasis on opinion over reporting, its echolalia, its tendency to reinforce rather than challenge ideological extremism and segregation (Carr, 2005).

In his book *The Cult of the Amateur*, Andrew Keen (2008) develops this theme further when he writes about the 'Wild West culture of the Web 2.0 revolution' really only delivering superficial observations and shrill opinion of the world around us rather than deep analysis and considered judgement. He suggests that the information business is being transformed by the Internet into "the sheer noise of a hundred million bloggers all simultaneously talking about themselves" (Keen, 2008: 16). The Internet and Web 2.0 has afforded everyone an equal voice and the words of an intellectual, with many years' experience and knowledge of a particular subject or topic, count for no more than that of an amateur. Professional journalists, critics, editors and other purveyors of information and knowledge are being replaced by amateur bloggers and reviewers:

> In a flattened, editor-free world where independent videographers, podcasters, and bloggers can post their amateurish creations at will, and no one is being paid to check their credentials or evaluate their material, media is vulnerable to untrustworthy content of every stripe (Keen, 2008: 19).

Such situations, and even newer news creation environments, continue to be well supported and the crowdfunding of individual and small scale amateur journalism over major investment in progressive and professional journalistic work and investigation is growing (Jian and Usher, 2014).[27] Closely related to this, the concept of *citizen journalism* is largely based upon public citizens playing an active role in the process of collecting, reporting, analysing, and disseminating news and information (Bowman and Willis, 2003). While the term *journalism* refers to the profession, *citizen*

evokes qualities of civic-mindedness and social responsibility and where the audience employ the press tools they have in their possession to inform one another. This combined term best describes this particular form of online digital journalism because it underscores the link between the practice of journalism and its relation to the political and public sphere (Deutsch Karlekar and Radsch, 2012). While citizen journalism has occurred in some significant forms in the recent past and there are clearly opportunities for meaningful citizen participation in the news (cf: Wall, 2017), concerns have been expressed that it remains unregulated, has the potential to be overly subjective and haphazard in both quality and coverage, and lacks journalistic ethical standard oversight (Lewis et al., 2010; Hermida and Thurman, 2008). The evidence of one particular study highlighted the inadequacies of such media self-regulation mechanisms and of media legislation in general underlining the need to correct existing legal deficiencies by clarifying the status of such journalism, its rights and liability (Yagodin, 2014).

The prevalence of distracting or false information may well be creating a new type of censorship and allowing people to forgo critical thinking in favour of having their feelings and opinions reinforced. As Brendan Nyhan of Dartmouth College commented; "right now, it pays to be outrageous, but not to be truthful" (The Economist, 2016). The growth of online news reporting raises issues of the quality of Internet journalism and it is important for the established media to hold on to standards in the face of constant deadline pressures. It is easy to lose sight of the difference between news and rumour if the focus is solely on beating the competitor into reporting the news (Lasica, 1997). Moreover, the news is fragmented in the online environment and this fragmentation means that, without help, finding the particular information the individual is most interested in can become a difficult and time-consuming task (Gunter, 2016). The ease of access to Internet publishing means that virtually anyone with a little know-how can post anything on the Web. Fundamentally, we need to ask ourselves the question; are the millions of connected amateurs smarter than trained and skilled experts in their fields?

Fake news has emerged as a substantial problem for democracies worldwide, and the Internet's impact on professional journalism has been highly disruptive (Borden, 2013; Rosen, 2009). It has dismantled the trust that news organisations have built over many years and "in its wake lie a more fragmented and shattered public space than the one that came before" (Pariser, 2011: 63). Disinformation, rapidly circulated over various social media platform and other forms of networked digital communications, weigh-ladened with false narratives, lies and conspiracy theories, undercuts the knowledge that many rely upon to make informed decisions. The mediated public connection related to our shared public concern about the wider world is being undermined by this fragmented and shattered public space. Moreover, while dishonesty in politics is nothing new; in this toxic online news environment the manner in which some politicians now lie, and the havoc they may wreak by doing so, are troubling:

> Helped by new technology, a deluge of facts and a public much less given to trust than once it was, some politicians are getting away with a new depth and pervasiveness of falsehood. If this continues, the power of truth as a tool for solving society's problems could be lastingly reduced (The Economist, 2016).

President Trump is the logical outcome of this convergence of politics, entertainment and the Internet in which such an individual can succeed unchecked, turning hate speech and fabrications into a type of show business, buoyed by the support of 'alternative news' websites.[28] He is aided in this by the sheer volume of online user-generated content, often re-transmitted through social media platforms inactions, that overpower our senses and spread confusion and falsehoods dressed up as real news.

The science of misinformation in applied form is still at its genesis and the expansion of the study of social and cognitive interventions that minimise the effects of misinformation, in addition to the identification of social factors that sustain a culture of truth and the design interventions that help reward well-sourced news, needs to be priority (Lazer et al., 2017). But the problem with contesting fake news is that the economics of social media favour gossip, novelty, speed and 'share-ability' over the truth (Yates, 2016). News and trivia that help reinforce existing prejudice are more likely to be shared and 'liked' amongst likeminded groups and individuals thus generating more revenue and exposure for the creators. Well researched and thoughtful news, comment and opinion are often less likely to be widely shared and Rosen (2009) suggests that social media challenges

the gatekeeping function professional journalists have long enjoyed. Furthermore, additional problems emerge when trying to retracting fake news from online social media platforms. Currently, such capability is poorly supported by the technology itself and there is no obligation on service providers to provide such a service or facility; unlike newspapers, magazines and other broadcasters who can be held to account for misleading news or other untruths. Indeed, a group of Dartmouth researchers studied the problem of the 'backfire effect', which is defined as the effect in which "corrective information in news reports may fail to reduce misperceptions and can sometimes increase them for the ideological group most likely to hold those misperceptions" (Nyhan and Reifler, 2010: 323). Misinformation can be very difficult to correct and may have lasting effects even after it is discredited (Nyhan and Reifler, 2015). The truth may well be losing an information war for the attention and trust of the online networked community.

However, it is suggested that the idea of fake news must not become established as the 'pantomime villain' in lazy accounts of 'post-truth' and that it should not be allowed to conceal the fact that contemporary problems with the news and the circulation of public information go much broader than 'the fake' (Ball, 2017: 127). It may well be the case that there is not only an awful amount of news but also there is a lot of awful news lacking in integrity, reliability and validity. A significant volume of literature has emerged suggesting that economic pressures have threatened traditional gatekeeping based on reporter judgment and professional editorial standards that define the quality of news organisations (Bennett, 2004) and digital communication technologies have open news gates to more event-driven news raising interesting questions about how to theorise and measure changes in gatekeeping (Livingston and Bennett, 2003). Within an ever-changing landscape of online news content alternative journalistic practices and 'experts' have emerged and contemporary culture has succeeded in altering our perceptions of newsworthiness, forcing us to redefine what is news (Weldon, 2009).

Conclusions

In his book *Here Comes Everybody*, the influential writer on the effects of Internet technologies Clay Shirky, writing about the unsettling nature of new forms of social interactions enabled by such technologies suggested; when society is changing, we want to know whether the change is good or bad, but that kind of judgment becomes meaningless with transformations this large (Shirky, 2009). The ubiquitous Internet is quickly changing our social behaviours and, he maintained, new forms of social interaction enabled by technology were changing the way humans form groups and exist within them; a revolution in social organisation has commenced. But, he stresses that revolutions don't happen when society adopts new technologies, they happen when society adopts new behaviours and while technology is the precondition, the fundamental change lies in our behaviour. Such challenging claims are worthy of a continuing response and further investigation from within the discipline of sociology.

Over the recent past we have tended to speak of new and innovative technologies as being highly 'disruptive' to society. It is hard to locate areas that go untouched by the implications of user-generated and openly accessible content – and these implications spread out across social and cultural spheres (Beer and Burrows, 2007). But the absence of more robust sociological inquiry into the nature of new digital technology needs, design, development and adoption has allowed these technologies have significant and frequently unforeseen negative impacts upon society and the way we live. While one such concern has been discussed, i.e. the consumption of fake news and its link to the changing nature of news, many other important issues related to new digital technologies are awaiting sociological study and investigation. Filter bubbles and algorithms used by search engines and Internet service providers often determine not what *we* are looking for but rather what the code suggests we are looking for (Pariser, 2011; Flaxman et al., 2016; Zuiderveen Borgesius et al., 2016). The new sharing or gig economy - examples such as Airbnb and Uber - are fundamentally changing the nature and conditions of labour with the potential for significant impacts and consequences for existing service industries and livelihoods (Bernhardt, 2014; Friedman, 2014). Automation and other technological advances may well be challenging our innate capabilities and decision-making processes, and undermining human flourishing and meaning as we adapt to new labour markets in a world of increasingly automated workplaces making this a key defining challenge we face into the future (Carr, 2015; Danaher, 2017). There is also need for a stronger gender perspective in this new era of global digitisation (Lott, 2015; Antonio and Tuffley, 2014), and there are real and genuine concerns over technology's increasing negative cultural and

environmental effects and costs (Huesemann and Huesemann, 2011; White, 2017; Bowers, 2014). One of the central questions and challenges for sociology is a reoccurring one; should states, or other such entities, reassert power with regards to digital technologies and seek to regulate and control its development and adoption to prevent its more socially and environmental destructive impacts and outcomes? Indeed, Sociologist must bring their attention to bear on key issues of inequality, power, institutions and agency to the overall study of new and existing ICTs with much more vigour.

Harari (2016) suggests that human nature will greatly be transformed in the 21st century because intelligence is now uncoupling from consciousness. Our unparalleled ability to control the world around us through the use of technology is turning us into something new and, while we may be at the height of our powers we also may have reached our limits. Whether we espouse an optimistic or pessimistic view of this new world and our ability to influence any or all levels of control, sociology needs to (re)position itself at the heart of such critical debates. In his highly influential work on social change in America nearly two decades ago, Robert Putnam suggests that there are serious challenges to the hope that computer-mediated communication will breed new and improved communities (Putnam, 2001). Changes brought about by digital technology are frequently disruptive and therefore need to be shaped and regulated by political processes so that such technological progress happens under a sound governance framework. Such control will make sure society as a whole benefits from the improvements that digital technology can enable, and protect against any harm inflicted on the population, the natural environment, and social structures. Sociologists must stop being technophobic and nervous about opening the digital blackbox and exposing and analysing code to closer scrutiny, or being simply techno-consumers, using ICTs but not critically examining them. It is time for Sociologists to roll up our sleeves and stick our nose in where it *does* belong.

Acknowledgements

Notes

1. A Ball State University study suggests that automation has already proven to be a major driver of job loss this millennium. The paper notes that the decade 2000 to 2010 marked America's largest decline in manufacturing jobs in its history (Hicks and Devaraj, 2015).
2. In *The Glass Cage*, Nicholas Carr explores the impact of automation from a deeply human perspective. Drawing on psychological and neurological studies that underscore how tightly people's happiness and satisfaction are tied to performing work in the real world, Carr reveals that shifting our attention to computer screens can leave us disengaged and discontented (Carr, 2015).
3. In *Techno-Fix*, Michael and Joyce Huesemann argue there are many negative environmental consequences resulting from the technological exploitation, control and modification of nature (Huesemann and Huesemann, 2011).
4. The PPARS project was intended to provide a new payroll and human resource management system for the 130,000 staff in the health service in Ireland. But it ran into major problems and ended up only covering less than one-third of all staff. Its roll-out was suspended in October 2005 amid a public outcry over its cost, which included the payment of €60 million to outside consultants.
5. Purchased in 2002, the eVoting machines were intended for use in local, general and European elections, and in referendums. But an independent commission found two years later that the lack of a paper trail and security issues meant they could not be used. The machines remained stored at some considerable cost to the state before been scrapped in 2012.
6. The production of 'fake news' stories by certain organisation, agencies and websites are deserving of particular attention in their own right. These often seek to mislead rather than entertain readers, often for financial or political gain. Prominent among fraudulent news sites include false stories created by individuals in countries such as Russia (European Parliament, 2016), Macedonia (Tynan, 2016), and the United States (Murtha, 2016).
7. While acknowledging that technology and their development is as old as humankind, the focus of this particular research and review will be on the 20th and 21st centuries. It is, therefore, not meant to be a comprehensive history and review of technology in general.

8. See Gunderson (2016) for a good overview of the history of sociological investigations of technology.
9. Strongly related to Technological Determinism, the technocracy movement in the US was a social movement which arose in the early 20th century before becoming overshadowed by other proposals for dealing with the crisis of the Great Depression in the 1930s. The technocrats proposed replacing politicians and businesspeople with scientists and engineers who had the technical expertise to manage the economy, and represented a type of technological elitism.
10. Ogburn's interest in social change led him to develop his theory and to ask simple questions like; why do cars run off the road? He maintained that when the automobile was first developed roads had been designed for horses and wagons and were narrow with sharp curves and corners. As the speed of vehicles increased these roads were unable to handle the power and swiftness of new models of automobiles. The period required for society to adapt - for roads to be developed capable of handling the increased speed of the automobile - was what he described as technologically driven cultural lag.
11. For a good understanding of claims surrounding a 'digital turn' in sociology see (Housley, 2017).
12. In his writings in the mid-1800s Democracy in America, Aleix de Tocqueville clearly saw the importance of mass communications in the form of newspapers for civic engagement. He stated; "only a newspaper can put the same thought at the same time before a thousand readers… …so hardly any democratic association can carry on without a newspaper" (Tocqueville et al., 2000: 517-518)
13. Phrase taken from an article in *The Atlantic* (Thompson, 2016)
14. One recent survey showed that the Internet now rivals television as people's main source of news in most of the 36 countries investigated, and that under-35s have a particularly strong preference for online news. But despite this, many aspects of how people get news online remain poorly understood and as a result we lack information about how online news audiences take shape (Newman et al., 2017).
15. Putnam further suggested that television 'in the wild', so-to-speak, is represented mostly by programmes that are empirically linked to civic disengagement and that those programmes are also most closely associated with civic isolation.
16. Such communicators comprised of entertainers, talk show hosts, and journalists.
17. Rather than having a print publication that hosts many stories and viewpoints, social media exposes people to stories that are being shared by their social connections who often share similar viewpoints, beliefs and values. Consequently, news consumption is becoming more individualised, biased towards a person's pre-existing viewpoints, and less impartial. The public, therefore, simply satiates themselves with information as entertainment or as support for their own prevailing beliefs.
18. A study conducted by Pew Research Center in association with the John S. and James L. Knight Foundation found that a majority of Facebook users (63%) now say that platform serves as a source for news about events and issues outside the realm of friends and family (Barthel et al., 2015).
19. An investigation by the Guardian Newspaper (Thielman, 2016b) of leaked internal guidelines showed human intervention at almost every stage of its news operation, akin to a traditional media organisation. Facebook reacted by eliminating all jobs in its trending module, the part of its news division where staff curated popular news for Facebook users. The fully automated Facebook trending module was then left to its own devices and pushed out a false story about Fox News host Megyn Kelly, a controversial piece about a comedian's four-letter word attack on right-wing pundit Ann Coulter, and links to an article about a video of a man masturbating with a McDonald's chicken sandwich (Thielman, 2016a).
20. Facebook initially defended its decision to remove the image saying; 'while we recognise that this photo is iconic, it's difficult to create a distinction between allowing a photograph of a nude child in one instance and not others'. Following widespread global criticisms from news organisations and media experts across the globe, Facebook reversed its decision stating 'because of its status as an iconic image of historical importance, the value of permitting sharing outweighs the value of protecting the community by removal, so we have decided to reinstate the image on Facebook where we are aware it has been removed' (Levin et al., 2016).
21. In a statement on Facebook its chairman, CEO and co-founder Mark Zuckerberg stated; 'personally, I think the idea that fake news – of which it's a small amount of content – influenced the election is a pretty crazy idea'. However, in a follow-up statement, he seems to shot himself in the foot somewhat, by saying it was 'extremely unlikely' fake news on Facebook had an impact on the election, but also boasting that Facebook was responsible for two million people registering to vote, indicating that they did indeed have some effect on the election outcome (available at www.facebook.com/zuck/posts/1010325390191 6271).

22. A number of social scientific investigations and studies into the subject of propaganda can be found at http://blogs.bl.uk/socialscience/propaganda/.
23. Media bubbles are a product of class and cultural position and those of a higher social status are likely to have more socially diverse acquaintance networks than those in lower income and status groups (Savage et al., 2013)
24. In her report, Kate Starbird describe this type of disinformation as an extension of Leninist information tactics as outlined by Pomerantsev and Weiss (2014).
25. The buses in this case were hired by a company called Tableau Software, which was holding a conference in the area with more than 13,000 delegates.
26. Since that survey, the widespread adoption of simple sharing tools such as Facebook Like and the promotion of these services by mainstream news organisations have increased virality even further.
27. Even from within the Web 2.0 industry there is recognition of the problems such untruths are causing. Jimmy Wales, the co-founder of Wikipedia, is at present attempting to launch a new online publication which aims to fight 'fake news' by pairing professional journalists with an army of volunteer community contributors. However, those who donate to pay for the professional journalists will become supporters, who in turn will have a say in which subjects and story threads the site focuses on. And it is intended that the community of readers will fact-check and subedit all published articles.
28. Evidence suggests that of the 'fake news' stories shared before the 2016 US election the majority were heavily tilted in favour of Donald Trump (Allcott and Gentzkow, 2017) prompting some to suggest that he would not have been elected president were it not for the influence of such untruths (Parkinson, 2016; Dewey, 2016)

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