Third Edition

Technology & Society

Social Networks, Power, and Inequality

Anabel Quan-Haase

OXFORD

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Preface

A key motivation for writing *Technology and Society* was a mixed sense of euphoria and concern. As I continued to adopt various technologies and test new applications, I felt excited to be witnessing a time of rapid technological transformation—the era of *digital tools, artificial intelligence, algorithms, robotics,* and *apps*. News stories on Reddit and *HuffPost* featured stories on new apps and technological developments in health care, education, and agriculture, and my Twitter feed seemed to increase in volume daily. I often had the sense that things were happening faster and that if I was not tethered to my various devices, I could miss out on important events, news, or opportunities. This anxiety has been referred to as FOMO, the fear of missing out. How could I best organize my day and my technology habits to keep up with this ever-increasing flow of information? Harvey referred to this fundamental change in lifestyle as a time–space compression in his 1989 book *The Condition of Postmodernity*, which describes, among other things, an acceleration of social and capitalist dynamics resulting from digital communication. Key questions that emerged for me included: What does the time–space compression consist of? What are its social and health implications? And how can I keep up with transformative changes resulting in an increase of messages, the speedy circulation of news stories, and new social norms around communication?

There is no doubt that we have witnessed an unprecedented proliferation of technology in everyday life. For example, most Canadians have a smartphone and access information on the go. Newer household technologies like Amazon's Alexa are being adopted at rapid pace and are becoming seamlessly integrated with more traditional technologies like fridges, heating, and entertainment systems to create the *Internet of Things* (IoT), a networked system that supports daily activity. This opens up many questions around the role of virtual assistants like Alexa in the home. Is she another family member? Or is she simply an algorithm that follows instructions? And what about the risk that private information is transmitted outside the boundaries of the home via Alexa? Can I trust her?

The purpose of this book, then, is to slow down and step back for a moment to make technology the object of sociological inquiry and to try to uncover the intricacies of our socio-technical existence. The book makes readers aware of the pervasiveness of technology in our everyday lives and encourages an understanding of how technology interacts with and is embodied in society. Technology is both the driving force behind societal change at micro- and macro-levels as well as the output of our technological imagination. It is this dichotomy that we want to present. The focus of the book is on the high dependence on all things technological, combined with the problems, social issues, and socio-political realm in which these technologies are embedded. As Canadian scholar McLuhan so eloquently pointed out, technology is not neutral. It affects our society and we need to be able to discuss and scrutinize these effects. This book provides the necessary background to start such an analysis by defining the parameters around technology.

The book as a whole has three goals. The first is to examine how technology and society intersect. The book investigates how technological change is interlinked with inequality, power, and social networks. It is about connecting issues of relevance at both local and global, micro- and macro-levels. In exploring these connections, this book raises and attempts to answer a number of central questions: How is technology leading toward social change? What is the nature of this social change? Who is being affected by the technologies? Are various social groups being affected differently? Do values and cultural practices affect technological uptake and the meaning we give to its use? How are people using the technologies in different regions? Does the global digital divide continue to exist?

The book's second goal is to draw on readers' own experiences as a means to make sense of the link between technology and society. What is unique about this book is its focus on experiential learning, which emphasizes gaining meaning from direct experience. Aristotle was among the first to recognize the value of experience in gaining knowledge: "For the things we have to learn before we can do, we learn by doing" (as cited in Bynum & Porter, 2006). The book serves as a bridge, then, between abstract, theoretical thinking and real-life events and experiences. Throughout the book, on-the-ground examples are used to demonstrate the relevance of concepts and ideas. These real-life examples also demonstrate the relevance of studying technology in its specific social context, be it historical, geographic, regional, linguistic, age-based, or ethnic. Technology is about context. To better understand the contextual nature of technology, the book strongly encourages students to bring their personal experiences and voices to bear on the material. The book also includes interactive activities at the end of each chapter as a means to encourage students to formulate critical questions through active engagement with the material. This helps to put the concepts and theories in perspective and give them meaning, immediacy, and relevance.

The final goal of the book is to encourage curiosity and to apply the gained knowledge to new situations. The book should give readers an urge to do something about the material: share it, post it, comment on it, and make a difference in the world. Technology has become such an intrinsic part of our everyday lives in the West that we need to care about these social problems and the questions that open from the critical analysis of text, theory, and experience. For example, *Iron Man* actor Robert Downey Jr., after learning about the potentials of robotics and AI to tackle the climate crisis, decided to start a new movement to reduce carbon footprint.

What is difficult about any study of technology is stepping back and looking at technology as critical observers. But doing so allows us to examine technology in many different ways: technology as a technical device, as a social force, as an agent for warfare, as a tool for health care, as a device for fun, or as a force behind job losses and deskilling. Can we actually step back as critical observers? It is hard to imagine a world without technology. Indeed, technology has been a part of human existence since the Stone Age, when humans used stones, bones, and sticks as tools for survival. But studying technology can help us become more aware of its role in our personal lives, in the lives of other social groups and their struggles, and in our society as a whole. Moreover, systematic analysis of design, implementation, and use allow us to develop theories of the intersection of technology and society, what we call the *socio-technical*. This type of analysis provides us with the necessary background knowledge and methods to embark on social, socio-political, and cultural studies of our own socio-technical existence. As a result, this book provides a solid understanding of technology's role in society and gives students the tools they need to embark on a critical and in-depth inquiry of our technological society.

Overview of the Book

Technology and Society: Social Networks, Power, and Inequality is aimed at students in undergraduate courses on technology in a range of disciplines in the social sciences (in particular, sociology and anthropology), arts and humanities, communication studies, and information science. This book is set up also for complementing the curriculum in engineering, natural sciences, and law. This book is also appropriate for management or business classes because of its focus on technology design, innovation, and labour in digital contexts. The book does not require any previous knowledge of technology or statistics. Theories and concepts are explained in great depth, and the glossary provides definitions of new and specific terminology. *Technology and Society* relies on current interdisciplinary work from sociology, the history of technology, science and technology studies (STS), communications, and related fields.

The chapters are organized to help students understand and learn the material. Each chapter starts with a set of learning goals, continues with a general overview or introduction to guide the readers through the material, and ends with a conclusion, a set of study questions, and further readings. This new edition also includes interactive activities that help students link the theories and case studies to their own everyday lives. What distinguishes the book from other similar works is its focus on contemporary examples and case studies. The book brings concepts and theories to life by showing how they relate to current discussions in the media and in academia with regard to policy, changes in the law, and pressing critical issues of our digital age. Through its comprehensive list of further readings and additional/supplemental Web content, the book encourages readers to seek out further resources, to obtain additional current information, to deepen their knowledge of topics, and to explore new topics of their own interest. Next, we present a short overview of each chapter to give readers an idea of some of the topics covered.

Chapter 1: The Technological Society

Chapter 1 investigates the contentious question of how to best define *technology*. The chapter outlines and critically discusses several approaches. Considering the depth and pervasiveness of technology in our society, this introductory chapter stresses the relevance of studying the intersection of technology and society—what is often referred to as the **socio-technical perspective**. The chapter includes a discussion of how technologies lead to large-scale, widespread social change and issues, such as social and economic inequality. The key argument is that social change occurs not as a result of technology alone, but as a blending of micro-, meso-, and macro-level processes. In addition to established approaches to understanding technology, the chapter also covers three of the main contemporary perspectives surrounding the use of technology in modern society. The first is simulation, which is geared toward the development of tools that can resemble or outperform human faculties. The second perspective is augmentation, which attempts to integrate machines and humans into new hybrid actors with added capabilities. The third perspective is automation, the use of AI and robotics to support, substitute, and supplement all human activities. These perspectives highlight the many points of intersection of the human and the technological, raising important questions about the ethical, moral, and societal implications of such endeavours.

Chapter 2: Technology in Society: A Historical Overview

To comprehend fully how technology and society intersect in our modern society, we first need to take a look at the history of technology. The aim of Chapter 2 is to provide a broad overview of this history by tracing the roots of technological development, discussing key periods of technological innovation, and outlining our present-day high-tech society. Technology is the strongest force of change in society and, as such, its development, transformation, and diffusion directly shape many aspects of society, such as work, community, and social relationships. We examine these technological transformations over time and demonstrate the impacts they have had on past societies. This chapter further attempts to link technologies, inventors, and historical moments to provide an in-depth examination of the socio-political context in which technologies emerge. Chapter 2 shows how technology is ingrained in society, affecting all aspects of our lives, and outlines the merits of taking a sociological perspective when studying the history of technology.

Chapter 3: Theoretical Perspectives on Technology

Chapter 3 covers a plurality of theoretical perspectives, which seek to shed light on the nature of the relationship between technology and society, as well as on those elements of society most affected by technology. First, the chapter contrasts the utopian and dystopian approaches, which each highlight a different side of how technology transforms society. Second, Chapter 3 also reviews the key premises underlying the theories of technological determinism and social determinism and discusses their strengths and weaknesses. Third, the chapter introduces the field of Science and Technology Studies STS as an alternative framework, which stresses that artifacts are socially constructed, mirroring the society that produces them. Then the chapter reviews three prominent approaches: social construction of technology (SCOT), actor network theory (ANT), and technological affordances.

Chapter 4: Techno-Social Designing

The topic of Chapter 4 is the impact of social factors on the design of technology. Users of technology are often oblivious to the complexity underlying technological design because not much knowledge is available on how this process unfolds. The aim of this chapter, then, is to uncover these often hidden creative processes by examining developers' visions and the challenges experienced in research and development (R&D), including the pressures that exist in R&D teams and the ways that innovation occurs in these teams. As well, Chapter 4 introduces the term *technopole* to describe specialized cities dedicated solely to technological innovation. Vancouver is presented as an example of a technopole that combines a highly educated workforce with video gaming and economic interests. The chapter also examines in more detail the inner workings and the outer pressures of software development, which is one type of R&D that has come to occupy a central role in the world economy.

Chapter 5: The Adoption and Diffusion of Technological Innovations

Chapter 5 investigates how technology diffuses in society. The chapter provides an overview of the key concepts, theories, and research findings in the diffusion of innovations literature and discusses them in relation to the diffusion of specific technologies. The aim of the chapter is to examine key adopter groups, how they differ, and their salient characteristics. Everett Rogers's classic model of the diffusion of innovations, the stages of the innovation-decision process, and his categorization of adopter groups are elucidated in great detail to provide students with the necessary foundations in the field of diffusion of innovations.

Chapter 6: Technology and Inequality

In Chapter 6, issues specifically linked to digital inequality are covered to provide an overview of the social, economic, and cultural consequences that result from a lack of access to the Internet. The chapter covers the historical developments of the digital divide concept, examines the complexity of its measurement, and considers its relevance to policy in Canada and the United States. A key argument is that inequalities in the use of digital technologies reflect not only problems associated with access to networked computers, but also differences in skill level among users. Another central term covered in this chapter is the *global digital divide*, which describes the gap in access to the Internet that exists between developing and developed nations. Many developing nations continue to falter in their efforts to become digital, having to overcome numerous barriers of access, skill, and infrastructure. China is discussed as a prime example of a newly industrializing nation that has struggled to join the information society and in the process has developed an ambivalent relationship with the Internet.

Chapter 7: The Labour of Technology

The complex interrelation between technology and labour is the topic of this chapter. The focus here is on the changes in the nature, context, and structure of work that result from new technologies and the associated power imbalances. Historically, these changes occurred as early as the Industrial Revolution when machines replaced skilled workers, creating social upheaval, dissatisfaction, and unrest. We use this historical context to help readers better grasp current trends regarding how digital technologies facilitate new forms of production that are based on principles of collaboration, sharing, and open source. We discuss key concepts of the Web 2.0 mode of work, including *prosumer, produsage*, and *perpetual beta*. Instagram is used as an example to illustrate current trends in how users become producers of content. Most users would not consider this work; rather, they view it as art, pleasure, fun, or leisure time. But these new forms of work do have consequences for the new economy and for labour relations. The chapter ends with a discussion of the platform economy and its many promises and challenges. The main point of this chapter is that technology is not neutral, but rather becomes an active force that changes the nature of work itself, working conditions, and the structure of society as a whole.

Chapter 8: Genders and Technology

The book would not be complete without a critical engagement with the topic of gender and technology. Often gender is ignored in the design, adoption, and use of tools and apps, despite the fact that an analysis of gender provides rich insights into fundamental differences between how people approach technology. The chapter looks at historical and contemporary theoretical and methodological approaches to the study and critique of gendered technologies. Of particular interest is the relation between household technologies and physical and mental labour. The chapter aims to discern the similarities and differences in how people of different genders adopt and use digital technologies. This analysis reveals that there is a gap in terms of digital skills, perceptions of competency, and uptake of digital tools. Based on these differences, the chapter goes on to examine the role of women in the IT industry and provides an overview of current interventions, such as Ladies Learning Code, aimed at increasing gender equality in this field. Finally, the chapter investigates how the gendered body becomes reintegrated into the digital world in the form of images, discourse, media depictions, and user-generated content.

Chapter 9: Community in the Network Society

Chapter 9 examines how the notion of community has changed as a result of the introduction of new technologies in society. The chapter starts with a brief overview of *Gesellschaft* and *Gemeinschaft* as two of the most central concepts in the study of the structure of society. What follows is a critical examination of the debate about how industrialization, urbanization, and globalization have affected community. The community-lost, community-saved, and community-liberated perspectives are reviewed to contrast competing theories on the nature of these changes. The chapter also considers the recent concerns expressed about the impact of the Internet on the patterning of social relationships and presents various competing perspectives. Chapter 9 concludes with a discussion of how information and communication technologies have affected the public sphere and the opportunities and constraints for *real* participation.

Chapter 10: Technology-Mediated Social Relationships

In Chapter 10, we briefly outline the early beginnings of mediated communication and address how they impact society. Then, we review recent trends in how people form and maintain personal connections via digital media. While most discourse focuses on the benefits of mediated communication, scholars have also warned about the potential negative effects on people's social life. Can personal relations maintained online provide as much social support as those maintained in person? The chapter then focuses on how social media have redefined our notion of friendship and the implications of these changes for community and social networking. What follows is an analysis of the breakup 2.0, investigating how people form and terminate romantic relations by using social media. The chapter ends with an exploration of the concept of virtual mourning and how people renegotiate online the meaning of death.

Chapter 11: The Surveillance Society

The topic of Chapter 11 is surveillance and how it has become a central concern of our digital age. The goal of this chapter is to define the multifaceted term by contrasting different perspectives available in the literature. The chapter then provides an overview of the concept and architecture of the Panopticon and its means of exerting control and imposing disciplinary action. The chapter discusses the new modes of surveillance made possible by recent technological developments, which show how technologies have changed not only the practices of surveillance, but also the very nature of surveillance, reducing individuals' privacy rights to a large extent. We end the chapter with a review of innovative methods of countersurveillance that aim at increasing awareness of the pervasiveness of surveillance in our society and provide means for personal resistance.

Chapter 12: Ethical Dimensions of Technology

The goal of the final chapter is to summarize the three key themes that run through the book. The first theme stresses the need to take a socio-technical perspective that allows for an in-depth examination of the social context of technology design, use, and implementation. The second theme demonstrates how innovation is associated with economics and as a result has consequences for our understanding of inequality and power relations. The last theme shows the many ways in which technological developments lead toward social change, impacting community, social networks, and social relations. The final chapter also embarks on a critical examination of the ethical and moral dimensions of humans' engagement with technology. The following themes are explored: the neutrality of technology, technology as human destiny, and technology as progress. Through this discussion, the chapter emphasizes the unexpected consequences of technology with which society must, ultimately, come to terms.

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Anabel Quan-Haase
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Abbreviations

ABS plastic	Acrylonitrile Butadiene Styrene plastic
ADHD	Attention Deficit Hyperactivity Disorder
AI	artificial intelligence
ANT	actor network theory
APPS	applications
AV	autonomous vehicles
BCE	before Common Era
BLM	Black Lives Matter
CANARIE	The Canadian Advanced Network and Research for Industry and Education
CAP	Community Access Program
CBC	Canadian Broadcasting Corporation
CE	Common Era
CEO	chief executive officer
CIA	Central Intelligence Agency
CIO	chief information officer
CF	cystic fibrosis
CGE	Compagnie Générale d'Electricité
CLW	China Labor Watch
CMF	Canada Media Fund
CNNIC	China Internet Network Information Centre
CRTC	Canadian Radio-television and Telecommunications Commission
CSIS	Canadian Security Intelligence Service
CSR	corporate social responsibility
DARPA	Defense Advanced Research Projects Agency
DIY	do-it-yourself
EA	Electronic Arts
EDF	Électricité de France
FCC	Federal Communications Commission
fMRI	functional magnetic resonance imaging
FTTH	fibre-to-the-home
FVEY	Five Eyes
GDP	gross domestic product
GDPR	General Data Protection Regulation
GERD	gross domestic product expenditure on research and development
GMF	genetically modified foods
GMR	giant magnetoresistance
GPS	Global Positioning System

GSS	General Social Survey
GUI	graphical user interface
HCI	human–computer interaction
IAI	Israel Aerospace Industries
ICTs	information and communication technologies
ICT4D	information and communication technologies for development
IM	instant message
IMF	International Monetary Fund
IoT	Internet of Things
IRA	Internet Research Agency
IRL	in real life
ISP	Internet service provider
IT	information technology
ITAC	Information Technology Association of Canada
kWh	kilowatt-hours
LDC	least developed countries
LGBTQ	lesbian, gay, bisexual, transgender, transsexual, queer
MALE	medium-altitude, long-endurance
MB	megabyte
MMIWG	Missing and Murdered Indigenous Women and Girls
MMOs or MMOGs	massively multiplayer online games
MTurk	Mechanical Turk
NGO	non-governmental organization
NN	net neutrality
NPOV	neutral point of view
NSA	National Security Agency
NYPD	New York Police Department
NYSE	New York Stock Exchange
NTIA	National Telecommunications and Information Administration
OECD	Organisation for Economic Co-operation and Development
OFFSET	OFFensive Swarm-Enabled Tactics
OLPC	One Laptop per Child
OMG	oh my God
PC	personal computer
PEOU	perceived ease of use
PKR	protein kinase RNA-activate
PU	perceived usefulness
R&D	research and development
RAM	random-access memory

RIM	Research in Motion
ROI	return on investment
SCOT	social construction of technology
STEM	science, technology, engineering, and mathematics
STS	science and technology studies
TAM	Technology Acceptance Model
TB	terabyte
TRC	Truth and Reconciliation Commission of Canada
TV	television
UNDP	United Nations Development Programme
VOD	video on-demand services
VR	virtual reality
VSD	value-sensitive design
WELL	Whole Earth ’Lectronic Link
WSIS	World Summit on the Information Society
UAV	unmanned aerial vehicles
UI	user interface
UK	United Kingdom
UN	United Nations
USB	universal serial bus
USSR	Union of Soviet Socialist Republics
WEEE	waste of electric and electronic equipment
WHO	World Health Organization
WWW	World Wide Web

1 The Technological Society

Learning Objectives

- to understand the challenges in defining and studying technology;
- to obtain an overview of historical definitions of technology and their strengths and limitations;
- to learn about the complexity of defining technology as not merely material substance, but rather as a complex assemblage;
- to critically engage with everyday technology use and resulting potential ethical implications; and
- to examine contemporary perspectives of technology that emphasize automation and blur the boundaries of machine and human elements.

Introduction

This introductory chapter highlights the relevance of investigating the intersection of technology and society. It is easy to dismiss technology as a mere object, without considering how it is woven into our everyday lives. Technology provides a means for us, its users, to get things done. Without giving it much thought, we leave our homes every morning with our cellphones (sometimes more than one), laptops, smart watches, headphones, and other gadgets. Only when our technology fails us do we realize the depth of our dependence and the many complex ramifications of living in a technological society. There is frustration and sometimes even a sense of panic when we forget our cellphone at home (or worse, when we lose it!). Our cellphones' digital address books have become an extension of our memory, storing hundreds or even thousands of names, phone numbers, and email addresses (have you counted yours?). Snapchat, Instagram, and Facebook pictures, posts, and updates are digital footprints of our e-identity, our digital selves. They can take us back in a flash to our "old" selves; often unrecognizable even to our current selves. This ubiquity of and dependence on technology raises questions about its use as a means to enhance, complement, or even substitute human faculties and the ethical implications this close interlink has for our society. As long as technology works smoothly, it is simply part of our daily life, part of what keeps society as a whole functioning. But when it fails, or when its use crosses ethical boundaries, we realize that it is actually another "actor" with its own agency, even if non-human, in a complex web of relations. The developing story around the role of Facebook in influencing users' opinions and in propagating fake news is an example of an ethical dilemma not only for users, but also for Facebook (which owns Instagram, WhatsApp, and Oculus VR). In fact, the company has struggled following the controversy, and many now talk about an ethical crisis that Mark Zuckerberg did not foresee and affects the entire computer science community (Zunger, 2018; Scola, 2019).

The aim of this initial chapter is to introduce readers to the topic of *technology* by critically discussing and comparing its various definitions. In addition, the chapter introduces and contrasts three approaches to technology that define our current times. The first is **simulation**, which is geared toward the development of tools that can resemble or outperform human faculties. The second perspective is **augmentation**, which attempts to integrate machines and humans into new hybrid actors with added capabilities. Finally, **automation** is the move toward employing technologies such as **robotics** and artificial intelligence to fully automate many processes and activities previously performed by humans. These perspectives highlight the many points of intersection between the human and the technological, including full substitution, raising important questions about the ethical, moral, and societal implications of endeavours such as augmentation, simulation, and automation. It also raises questions about the need for more intense public debate and scrutiny around ethics and for the teaching of technological literacy across the lifespan. The average citizen tends to dismiss debates around technology because it is often viewed as a black box, intransparent and impenetrable; however, technological decisions deeply affect all of us. This makes it increasingly necessary to remove the fear around opening the black box and asking the hard and important questions around the ethics of technology.

The Social and Ethical Dimensions of Studying Technology

The study of technology has typically been approached from a material standpoint, consisting of the examination of tools and tool use. Early scholars paid little attention to the social and ethical implications of technology, as illustrated in the definition of technology as material substance, discussed later in this chapter. The focus on how the social, ethical, and technological come together and influence one another became an object of academic study in the **Marxist tradition** around 1850 with its focus on **inequality**, which spurred interest in understanding how machines affect labour. For instance, the textile industry introduced machines to simplify and speed up work processes, resulting in the employment of non-skilled workers at lower wages (Berg, 1994). Marxist scholars examined how the growing use of machinery was a central factor in deskilling –i.e., the elimination, reduction, or downgrading of skilled labour because of the introduction of technologies within the workplace– and how it increased tensions in labour relationships. At this time, then, a transition occurred, away from the study of technology itself—as merely an object—toward an interest in how technology changes social structure and brings about social change. Now, examining the social side is essential as our society moves toward greater technological integration in many domains including health, education, transport, work, and commerce, what Ellul (1964) has described as a **technological society**. The concept of a technological society does not describe technology merely as a tool that exists as an extension of our human endeavours. By contrast, it is far more complex than that. An example of how the social, ethical, and technological shape one another is discussed through recent controversies around Facebook's role in influencing its users' opinions and behaviours in Box 1.1. The case study demonstrates how in a technological society a technology like Facebook is not a simple tool that has one purpose; rather, Facebook is a tool that has many ramifications. It was designed originally with the intent of facilitating new forms of socialization, yet it has been repurposed as a political tool.

Box 1.1 Facebook Faces Controversy around Ethics and Data Breaches

Facebook, the largest social networking site in the world, had 2.38 billion monthly active users in 2019, which represents a 14 per cent increase from the previous year (Statista, 2019). As many as 23.68 million Canadians have a Facebook account, many logging in daily (Statista, 2019). Users' engagement on the site is often perceived as a pastime to fill dull moments (Quan-Haase & Young, 2010). When news first broke in 2017 about Facebook potentially having swayed voters during the US presidential election, Zuckerberg, Facebook's CEO, described it as a "pretty crazy idea" (Solon, 2016). What seemed ridiculous to Zuckerberg was how a site that is purely "social" and used primarily as a pastime could possibly affect politics. Yet, as more information around Facebook's role in the 2016 US election emerged, it became apparent that Zuckerberg had been largely naive around the agency exerted by his tool. As Facebook's controversy evolved, the story suggested a different viewpoint. Three key issues came to light:

- **Russian propaganda**: Links are suspected to Facebook pages, news, and accounts potentially controlled by agencies in Russia with the aim of influencing public opinion in the US. Specifically, the **Internet Research Agency**, often referred to as a "**troll farm**," has been identified as a source of **misinformation** with direct links to Russia. After a review of activities on its site, in 2018 Facebook suspended 70 Facebook accounts, 138 Facebook pages, and fake news associated with the Internet Research Agency. Despite the emergent evidence, Russia has denied being involved in this kind of information war.
- **Fake news**: Facebook has been accused of circulating fake news and making it difficult for users to identify truthful information from misinformation. The problem is linked to people's curiosity and their tendency to click on sensationalized headlines, also referred to as **clickbait**.
- **Cambridge Analytica**: Through a third-party app, Cambridge Analytica was able to access information about 85 million Facebook users. As this information

continued

included psychological profiling, political ads could be micro-targeted to users' own political views and personality. This reflects the unlawful use of personal data for unprecedented targeted political advertisement.

More detailed analysis of fake news on Facebook and other social media sites revealed that the Internet Research Agency had not only targeted the US election, it also targeted Canada: oil infrastructure and Prime Minister Justin Trudeau. Analysis of the data revealed that the Russian troll factory was particularly interested in swaying public opinion through Facebook posts about the construction of pipelines and fracking. The information war was not restricted to Facebook. It also included retweets of news headlines, references to oil spills, and links to blog posts. An example of a post is: "Uh oh! Progressive fans of Justin Trudeau might be in for MAJOR buzzkill (Hint: Keystone, Trump, OMG!)" As it became evident that fake news and targeted ads did impact public opinion and are also able to influence political outcomes, Zuckerberg could no longer ignore the agency his tool exerts. His views have changed and he realizes that Facebook needs to do a lot more to protect user privacy. He also realizes that Russia took advantage of loopholes in the operations of Facebook. The crisis has sparked some positive social change. For example, Facebook is modifying many aspects of how its platform operates, from its goals to its relation to third parties to the kind of data it shares. Most important, Zuckerberg is increasing transparency and public scrutiny. He has created a committee of senior academics who will study the platform and its relation to public opinion, politics, and key social behaviours; Facebook will have no say in the studies nor be able to veto the outcomes. This is a good start for a company filled with secrecy and run by opaque, unknown algorithms (Chen, Quan-Haase, & Park, 2018).

Box 1.1 shows how the technology we trust and use frequently can influence our lives, opinions, and behaviours in unexpected ways. Facebook's business model focused on users' experiences and how to use and commoditize their data, not realizing that the data could be used for other, less positive purposes such as spreading fake news and causing political influence. The effects of fake news can go beyond the political realm, however, and impact other areas of life, such as the health and well-being of communities. Vogel (2017) argues that misinformation poses a threat to public health globally. For example, consider the misinformation surrounding autism and its link to vaccinations (Keenan & Dillenburger, 2018). Many parents are opting to not vaccinate their children as a result of believing that vaccinations can increase the risk of autism, even though there is no medical evidence to support this belief. One of the problems in the spread of health misinformation online is that while people are overloaded with medical terminology and complex research studies, they lack the skilled guidance of medical professionals to separate the relevant or accurate medical evidence from the misinformation (Ioannidis et al., 2017). Furthermore, it is difficult to undo the damage done by misinformation after a person has "[clung] to long-held health myths" because social media users often avoid sources of information that challenge their views (Beng, 2018). We are much more likely to seek information that supports our beliefs rather than information that challenges us. In agreement, Vogel (2017) found that researchers' and institutions' corrective information on health topics was not effective. However, Beng (2018) notes that success rates improve when people are encouraged to scrutinize information sources from the onset or are provided with new contextual information in the corrective information. How to correct false beliefs is still a research area in its infancy.

Misinformation about health specifically can affect entire societies. For example, a disease outbreak caused by anti-vaccination propaganda could harm even those who did not buy into anti-vaccination initiatives, as was the case in 2014 and again in 2019 when the United States experienced two of the largest measles outbreaks in decades (Vogel, 2017; CDC, 2019). Vogel (2017) found that this outbreak was traced to "parents who found scary information on the Internet and opted not to vaccinate their children" (p. E1567). Because vaccine misinformation is accessible to anyone with an Internet connection, "social media platforms have a significant impact on vaccination attitudes" (Amith & Tao, 2018, p. 2). This demonstrates the relevance of studying and better understanding technological society and its many facets and intersections with everyday life. In the case of Facebook, the social media site has the potential to influence health decisions, harvest vast amounts of personal data, and use this data to target users with political messages, influencing their political views and potentially even voting behaviour.

Historical Definitions of Technology

Defining technology is no easy task. In the 2009 movie *Star Trek*, Scotty suggests that "transwarp beaming" is "like trying to hit a bullet with a smaller bullet, whilst wearing a blindfold, riding a horse" (Abrams, 2009).[1] Defining technology presents a similar challenge, and scholars have proposed many different definitions of the concept. In this section, we will review five definitions, from the narrowest to the broadest, which view technology as (1) material substance, (2) knowledge, (3) practice, (4) technique, and (5) society.

1. Technology as Material Substance

Until the nineteenth century, the study of technology was primarily the focus of the technical fields or applied sciences; little work on technology was done in, for example, the social sciences or humanities. Within this very materialistic approach, technology is viewed as "a radical other to humanity" (Feist, Beauvais, & Shukla, 2010, p. 8), an entity that exists outside of the social realm. This approach sees technology as a passive object, a tool created by humans to be used under our control (Feist et al., 2010).

Examining technology as only **material substance** disregards the complex interplay of technology and society. This tunnel vision limits our understanding of technology and does not allow for an examination of social change resulting from technology. This view has been largely discredited and a number of alternative definitions have been proposed.

2. Technology as Knowledge

In the same way that technology is closely interlinked with science, it is also closely connected to knowledge. At the most basic level, "[t]echnology is based upon, utilizes, and generates a complex body of knowledge, part of which may reasonably be called specifically technological knowledge" (McGinn, 1978, p. 186). In contrast to scientific knowledge, technological knowledge stems from human activity, often in relation to an **artifact** (Hershbach, 1995). *Artifacts*[2] are all objects that have been modified, modelled, or produced according to a set of humanly imposed attributes, such as tools, weapons, ornaments, utensils, and buildings. Technological knowledge is therefore focused on the ability to create, use, or transform objects to facilitate certain activities or achieve specific goals (McGinn, 1978). This distinguishes technological knowledge from scientific knowledge, which can be applied to the design and building of artifacts but is not directly linked with practical applications (see Chapter 2). Scientific knowledge, in contrast, is abstract and consists of our understanding of the natural world. Consider calculus: As a branch of mathematics, it provides an understanding of limits, functions, derivatives, and integrals, and at the same time we can observe its value in real-world applications. For example, calculus helped provide the foundation for practical **inventions** like the steam engine (Restivo, 2005).

The metaphor of technology as knowledge can, however, be limiting. First, it does not consider that the knowledge required to create, use, and transform objects is a different entity than the object itself, even if the object was invented based on this knowledge. Second, the metaphor disregards the impact that technology has on society by limiting technology to expertise, skill, and know-how. **Layton's model of technology** and knowledge is useful to examine next because it overcomes some of these limitations.

While also using the metaphor of technology as knowledge, Layton distinguishes between the technology itself and the knowledge available about the technology. At the centre of Layton's model of technology is the process of technological development in which "technological ideas must be translated into designs" which then "must be implemented by techniques and tools to produce things" (1974, p. 38). From this viewpoint, technology is not a single entity but, rather, embodies three different elements:

1. *Ideas*: Ideas are at one end of the spectrum, representing the thought processes that precede the tool, which is often referred to as the **technological imagination**. Ideas about what objects are useful motivate design and development.
2. *Design*: Design is in the middle of the spectrum, mediating between the abstract idea and the object. Design is the step that is required to go from idea to tool development and is where craftsmanship is needed.

3. *Techniques*: Technique describes the actual artifact and lies at the other end of the spectrum. The artifact is made up of material substance and allows humans to complete tasks.

Layton's model of technology has two advantages. First, the definition of *technology* goes beyond a pure consideration of artifact. The model explicitly distinguishes between the artifact and the knowledge from which it arises. Second, the model also incorporates design as a middle stage that lies between the idea of a tool and the artifact itself (discussed in Chapter 5). This creates a link between how we envision tools and their realization, which are often two different things. One disadvantage of the model, however, is that there is no explanation of how technology and technological knowledge are linked to society. In this view, while the technology is distinguished from the knowledge that surrounds it, the conceptualization draws on knowledge and design in isolation from culture, economics, power, etc. That is, as in other theories of technology as knowledge, the **sociotechnical** is largely disregarded.

3. Technology as Practice

A third set of definitions have broadened the meaning of technology. Canadian scholar Ursula Franklin (1992) defines *technology* in the context of the real world. For her, technology is not limited to material substance or artifact. Nor is it just "the sum of the artifacts"; instead, it is "a system" involving organization, procedures, symbols, new words, and most importantly, a mindset. Technology needs to be understood as practice embedded in the everyday activities of humans.

Franklin's (1992) view is rather pessimistic in that the "real world of technology seems to involve an inherent trust in machines and devices ('production is under control') and a basic apprehension of people" (p. 25). Franklin (1992) criticizes society's simplistic view of technology, namely that people create problems and are unpredictable, while machines provide solutions to problems and are always controllable. Hence, technologies are always idealized because any problems that arise from them can be easily blamed on people; that is, on those who designed, produced, or consumed a given technology. Franklin (1992) believed that a technology perceived as being able to "liberate its users" often ends up enslaving them by creating dependence. For instance, a smart phone allows users to listen to music on the go and, consequently, creates a barrier between users and their external environment. Franklin (1992) argues that these tools have contributed to a world of "technologically induced human isolation" (p. 46).

Instead of conceptualizing technology as an external force that functions outside the everyday realm, viewing technology as practice places technology within people's everyday lives. This is the strength of this approach: it emphasizes how technology becomes normalized within society over time and thereby points out how technology is a structuring force in how we live, play, and work. Simply put, we do not question our routines but, rather, take them for granted as part of our everyday lives. When we put on our running shoes and tie our laces, this is a *normalized* behaviour. We do not realize that shoes are an invention (as the Bata Shoe Museum in Toronto documents) and that shoelaces are a complex technology that developed over centuries (Tenner, 2003).

The limitation of Franklin's view is that technology is analyzed primarily as a negative force. This viewpoint asserts that it is technology that determines how social change occurs in society and neglects to examine human agency (see Chapter 3's discussion of technological determinism). Such an interpretation limits how we view technology because it does not allow for people's capacity to make decisions about which technologies they want to use, how they want to use them, and how these technologies affect their lives.

4. Technology as Technique

A different approach to defining *technology* comes from scholars who look at the problem from an action-oriented point of view. These thinkers aim to identify the essence of technology by distinguishing between *technology* and *technique*, which is a translation of the German word *Technik* (Hanks, 2010). **Technique**, then, describes an abstract concept and not an object. Martin Heidegger (2010) describes *technique* as a human activity and further divides it into **goal** (*Zweck* in German) and **mechanism** (*Mittel* in German). The goal is what humans want to achieve with the technique. It can be either something concrete, like an activity, or something more abstract, like a state of existence. The mechanism provides the means to realize the goal—this includes materials, procedures, know-how, and societal norms. Heidegger argues that the activity of technique and its products have an impact on every aspect of life.

Jürgen Habermas also describes technology in terms of the realization of goals. He sees technology as **strategic action** because it provides the means for the realization of human endeavours (Simpson, 1995). Habermas (1984) identifies a strategic action as a social action that is "oriented towards success" and that has considered "the aspect of following rules of rational choice and assess[ing] the efficacy of influencing the decisions of a rational opponent" (p. 285).

The emphasis on technology as goal was also present in Jacques Ellul's study of technology, where he defined *technique* as a standardized means for attaining a predetermined goal in society (Merton, 1964). Ellul also described technique as a mechanism characterized by efficiency: "the totality of methods rationally arrived at, and having absolute efficiency (for a given stage of development) in every field of human activity" (1964, p. xxv).

Ellul (1964) was interested in examining the lasting effect of efficient techniques, and in this context he viewed technique as the "defining force of a new social order in which efficiency is no longer an option but a necessity imposed on all human activity" (p. 17). His critique of technique focuses on the intricate link between technology and its social, psychological, moral, and economic consequences, which are not necessarily in agreement with human ethics. According to Ellul, technology imposes the principle of efficient ordering on society at the expense of other considerations.

In these conceptualizations of technology as technique, technology is examined in relation to human activity. Technology is no longer "just a tool"; it becomes a mechanism for achieving human needs and wants through efficient systems. While these thinkers take our understanding of technology a step further and acknowledge the lasting impact of technology on society, they do not elaborate on the mechanisms by which social change occurs. Again, technology continues to be an agent, a force external to society.

5. Technology as Society

When we define *technology* as material substance, knowledge, practice, or technique, we limit our ability to analyze the technological in society. Definitions of *technology* need to be broader to allow for a comprehensive examination of its close interplay with society. Narrow definitions limit our ability to see the realms in which technology has left a mark. Simpson (1995) provides a comprehensive definition, stating that technology encompasses knowledge, mechanisms, skills, and apparatus that are geared toward controlling and transforming society. In this perspective, technology goes beyond merely being machinery or practice—it becomes an agent of change that can control and alter humanity.

Jean Baudrillard goes even further by arguing that technology does more than effect change in society: "[i]t doesn't push things forward or transform the world, it becomes the world" (Baudrillard & Gane, 1993, p. 44). Baudrillard is not the only one to argue that technology and society become one and the same entity. For Herbert Marcuse (1982), technology is part of larger social processes, in which the technical apparatus and tools of industry, transportation, communication, and aeronautics are only one factor. Marcuse stresses the relevance of social and economic factors that drive technology and link technological developments to consumerism. He believes that the introduction of new technologies brought about new standards as well as cultural and social change, which were not purely the effect of technology but "rather themselves determining factors in the development of machinery and mass production" (1982, p. 138). This critique is perhaps one of the most relevant analyses of the technology–society link because it highlights the complex interdependence between cultural and social change and technological developments.

Like Baudrillard, Marcuse points to diminishing critical thought in society as the clamour for material goods increases. The radical view that technology is equal to society points out that our technological society cannot exist outside the framework of technology. Technologies are not only ubiquitous in our daily lives (e.g., transport, communication, food provision, and consumption), but even our way of seeing the world is mediated by technology. There is no escaping it. However, this view does not allow us to study how technology intersects with society. In order for us to be able to study technology, we need to define it as something separate from society itself. If our definition of technology argues that it has become so intertwined with society that the two are in fact a single unit, this precludes any kind of serious investigation of how they influence each other.

Making Sense of These Definitions

It is important to understand the range of existing definitions of technology because this will provide the basis of our discussions of how technology intersects with society in the remainder of the book. Each of the five different definitions of technology reviewed has its merits, helping us understand one aspect of technology. Nevertheless, it is equally important to realize that no single definition can fully capture the meaning of such a complex concept. Hall and Morley (2019) have argued that we have to recognize the rich technological bases of modern cultural production, which enable us to endlessly simulate, reproduce, reiterate, and recapitulate. But there is all the difference in the world between the assertion that there is no one, final, absolute meaning of technology and the assertion that meaning does not exist (Grossberg, 1996).

The definitions of technology as material substance, knowledge, practice, and technique are all rather limiting and do not show sufficiently how technology links to society. On the other hand, the definition of technology as society is broad in scope and directly attempts to understand how society and technology come together. The problem, though, with broad conceptualizations (like Baudrillard's) is that they fuse society and technology into one and the same thing. This makes it impossible to study how the two are linked and also neglects to include the technology–society interdependence.

The definition of technology that we will adopt in this book is simple and draws on elements from the five definitions discussed above.

> Technology is a sociomaterial assemblage of material objects, embodying and reflecting societal elements, such as knowledge, norms, and attitudes, that have been shaped and structured to serve social, political, cultural, and existential purposes.

Despite its simplicity, the definition has four advantages: (1) it separates technology from society sufficiently enough to allow for an investigation of the technology–society interdependence; (2) it does not include technology as an element of society; rather, it sees technology as serving social purposes; (3) it views technology as embodying and reflecting knowledge, social norms, **social structures**, political interests, and so forth; and (4) it also integrates the concept of **sociomaterial assemblage**, which describes a complex coming together of diverse material and social elements. Orlikowski (2007) describes how sociomaterial assemblages are "fleeting, fragile, and fragmented, entailing uncertainty and risk, and producing intended and unintended outcomes" (p. 1445). This definition will guide our inquiry throughout the book.

We conclude that *technology* has multiple definitions as it is a word that, applied in different social, historical, and cultural contexts, means different things. As a result, providing a comprehensive definition is an effective way to distinguish the uniqueness of technology by trying to separate it from society while also considering how the social factors affect technological and scientific developments. Doing so leads the way toward a more in-depth understanding of how technology intersects with other social realms. In the next section, we explore three contemporary approaches of technology that move the discussion of what technology is a step further.

Contemporary Discussions of Technology

In addition to the above definitions of technology we have discussed so far, there are also contemporary approaches that are directly influenced by computational advancements, mobile technologies, and the digital age. These contemporary definitions show how the evolution of technology leads to changes in how we define technology, as well as to changes in the value and relevance we ascribe to technology in society. We discuss the three most prominent approaches here to show how radically different the notion of technology is in **simulation**, **augmentation**, and **automation**. These approaches question our view of technology as an external force outside the human realm because technologies either become another actor in a social system, as in the example of driverless cars, or they are seamlessly integrated with the human mind and body.

Simulation

Artificial intelligence (AI) started as a discipline in the late 1940s, when computing was still in its infancy, with the aim of developing tools that could resemble or outperform human intelligence. While debate continues today as to what it means to have an intelligent machine, the general goal in AI is to simulate in any way or form human faculties, often including emotionality.

Alan Turing (1950) was the first to discuss the idea of a "thinking machine" and to propose ways in which we could test whether machines can "think" or at least simulate thinking. His most central contribution to the field was the idea that AI could be achieved through computation instead of machinery. Early attempts to simulate human faculties had focused on building complex machines that physically resembled humans. However, according to Turing, what determines whether a machine qualifies as intelligent is the extent to which it can imitate the capabilities of the human brain.

Turing (1950) argued that machines have the ability to imitate human cognitive processes to such an extent that it is impossible to distinguish between human and machine. He devised the **Turing Test**, or imitation game, for two purposes: (1) to test a machine's potential to show intelligent behaviour and (2) to assess a human's ability to differentiate between human and machine intelligence. In the Turing Test, three players—an interrogator, a human, and a machine—are visually separated from one another and the goal of the game is for the interrogator to discriminate between machine and human through a series of queries using natural language. If the interrogator cannot distinguish machine from human, the machine has successfully passed the test. In June 2014, there were claims that the first computer had passed the Turing Test during a competition at the University of Reading in the United Kingdom. The program simulated a 13-year-old Ukrainian boy named Eugene Goostman and appeared convincingly human to 33 per cent of judges at the event. However, some people question whether "Eugene" acted within the parameters of the test by openly limiting conversation topics beyond the expected knowledge of a teenage boy, as well as holding conversations lasting only about five minutes, which provided less time for judges to search for non-human elements. The Turing Test has had a profound impact on the field of AI and computing in general, as it demonstrates the complexity of distinguishing what is profoundly human and what is in essence technological.

Even though computers can perform complex tasks mimicking humans or even outperforming them, John McCarthy (2007), one of the founders of the field of AI, argues that computers and humans are still fundamentally different in the way they solve problems: "Computer programs have plenty of speed and memory but their abilities correspond to the intellectual mechanisms that program designers understand well enough to put in programs" (para. 17). Hence computers can easily perform certain types of tasks—those based on algorithms—while other human abilities, even those that a two-year-old can easily master, cannot yet be programmed. Underlying this complexity is the lack of understanding in cognitive science about exactly what makes up human intelligence and how to program these components. In addition, McCarthy argues that a fundamental difference between humans and computers is that "[v]ery likely the organization of the intellectual mechanisms for AI can usefully be different from that in people" (para. 15).

Not surprisingly, the early dream of creating a machine that resembles humans has been largely abandoned even though it continues to persevere in science fiction. (*A.I. Artificial Intelligence*, *The Terminator*, and *Sleeper*). Instead, much effort is now devoted toward building machines that can perform complex tasks that humans have difficulty with or are unable to perform because of limited memory and computational resources. These intelligent machines do not need to resemble humans in their appearance or in their emotionality.

One of the most successful recent developments in AI is **intelligent agents** or **chatterbots**, which are computational systems based on **algorithms** that can process complex and large amounts of data (Russell & Norvig, 2003). While there is much debate around whether Web-based agents can qualify as intelligent, some chatterbots have reached a high level of sophistication and usefulness. Joseph Weizenbaum in 1966 developed a prototype of a chatterbot, which he named ELIZA, that could convincingly simulate a Rogerian psychotherapist (Rubin, Chen, & Thorimbert, 2010). ELIZA was designed on the premise that patients direct the conversation, and as a result the chatterbot primarily relied on external input to hold a conversation. (To interact with ELIZA, go to www.masswerk.at/elizabot/eliza.html.)

More sophisticated bots are autonomous, that is, able to act in more complex ways. An example is the chatterbot Mitsuku developed by Steve Worswick. Mitsuku was a runner up in the 2017 Loebner prize competition, which awards prizes to the most human-like chatterbots. Mitsuku is a Web-based chatterbot and engages daily in interactions with the global community. An AI chatterbot developed by Microsoft, Xiaoice, is very popular on Weibo, a Chinese social networking app. Dubbed the "the girlfriend app," as millions of users have told the bot, "I love you" (Al-Heeti, 2018). As Xiaoice can recall information from previous interactions, she can engage in meaningful question-and-answer style conversations creating a sense of real connectivity (Markoff & Mozur, 2015). Both Mitsuku and Xiaoice demonstrate advances in computing as they can act much more autonomously than ELIZA, who relies almost completely on external inputs to carry on a conversation, although neither of them can pass the Turing Test.

The most recent application of chatterbot technology has not been in the realm of socialization, but medical diagnostics. Symptom checkers such Ada,

"Chatterbot" Mitsuku.

Steve Worswick (http://www.mitsuku.com)

Babylon, and Your.MD are apps that through a series of queries and user-generated responses can aid doctors in their diagnostics. These symptom checkers are appealing to users for three reasons:

1. diagnostics can happen in real time anywhere; there are no time gaps because no appointments are needed;
2. there is no anxiety or uncertainty around what a specific symptom could mean because the user gets a diagnosed immediately, and;
3. users can start a treatment without delay, preventing the medical condition from getting worse.

To evaluate how well symptom checkers work, a study tested 23 symptom checkers for their diagnostic competence (Semigran, Linder, Gidengil, & Mehrotra, 2015). The study found that symptom checkers provided the correct diagnosis first in only 34 per cent of cases and concluded that they had problems in both triage and diagnosis. Overall, symptom checkers tend to suggest users seek medical treatment in conditions where self-care is reasonable. Modern AI systems show the current technological limitations in building intelligent machines and more fundamentally demonstrate that the question as to when a machine can be considered intelligent is very difficult to answer. Intelligent systems are becoming more prevalent because they can act autonomously without the need for human input and they are also emerging as social companions able to counter loneliness. However, as the shortfalls of chatterbot tools like the symptom checker demonstrate, their diagnostic accuracy is still low, despite their appeal.

Augmentation

More recent discussions of technology have focused less on AI and more on ways to create augmented environments and bodies. Whereas AI is based on principles of simulation and replication between human and non-human entities, augmentation is based on principles of connectedness and responsiveness (Viseu, 2002). In augmentation, actors do not change their physical appearance and body shape, as is the case in simulation. In this approach, "[r]ather than building self-contained machines or leaving the body behind, machines and humans are coupled together into new hybrid actors with added capabilities" (Viseu, 2002). The physical body is augmented by connecting it to digital components with computational and communicational capabilities.

Augmentation can occur in many ways. An example of augmentation is **wearable computing**, where portable computers aid in the decision-making process by providing additional information, enhanced **surrounding awareness capabilities**, and real-time data streaming. A cellphone is a wearable computing device because it augments our capacities to communicate by bridging space and time constraints and allows us to access data on demand (Klemens, 2010).

While the aim of artificial intelligence is to *recreate* the human experience, augmentation attempts to *intensify* human qualities. One such example of augmentation is the **cyborg**, a merging of human and machine through seamless connectivity. Clynes and Kline introduced the term in the 1960s to describe the ways that long-distance space travel would require astronauts to transform their human qualities to robot-like qualities, which are fully automated. These transformations would allow astronauts to master the challenges presented in extraterrestrial environments. For Clynes and Kline (1960), the main objective of the cyborg was "to provide an organizational system in which such robot-like problems are taken care of automatically and unconsciously, leaving man free to explore, to create, to think, and to feel" (p. 27). Science fiction writers then adapted the cyborg concept, which became a part of our popular culture as presented in books, movies, and television programs. A cyborg—a robot-like machine with human characteristics—is featured in the movie series *The Terminator*, in which Arnold Schwarzenegger plays Terminator, who has superhuman strength and is indestructible by contemporary weapons. The latest Terminator model, the T1000, is superior to its predecessor model in many ways. It consists of a mimetic polyalloy, which is a kind of liquid metal that can emulate anything that surrounds it, giving the cyborg enormous flexibility and superiority. Interestingly, the cyborg also displays feelings that allow it to blend in well with humans, unlike the first Terminator, which was devoid of any human-like emotions.[3] Society's fascination with the idea of cyborgs has only increased, and the 2019 release of *Terminator: Dark Fate* explores the increasing intersection between humans and cyborg technology.

The cyborg dream is no longer just science fiction. The first attempts to link human and machine occurred in the 1980s when computer science Professor Steve Mann started using a wearable computing system that he called the **WearComp**. This system integrates wires, sensors, and computers with the aim of increasing users' memory, enhancing their vision, and allowing them to stay perpetually connected to data (Mann & Niedzviecki, 2001). As a result of the device, Mann experiences the world as an amalgamation of the physical environment that surrounds him and the digital world that streams in front of his eyes at all times through his Web interface (Mann & Niedzviecki, 2001). This divided existence shows that "Mann inhabits a different world than you or I, a 'cyborgspace' that he claims is inevitable for all of us" (Dewdney, 2001, D7). The cyborg experience is an example of an artifact built to augment reality through the merging of human and machine.

Significantly, the cyborg concept is moving from the annals of science fiction into the mainstream with the development of a number of man–machine systems that are geared toward practical goals, such as dealing with medical conditions. Such a prototype is the **C-Leg** system, which allows individuals with an amputated leg to walk again.

Futurists predict that augmentation and the coming together of human and machine are inevitable. One of the more controversial possibilities is **transhumanism**, which is characterized by the "surpassing of the biological limitations of our bodies, be they our lifespans or the capabilities of our brains" (Dewdney, 1998 , p. 2). Transhumanism is the product of a quasi-religious movement dedicated to the belief in the "futuristic technological change of human nature for the achievement of certain goals, such as freedom from suffering and from bodily and material constraints, immortality and 'super-intelligence'" (Schummer, 2006, p. 430). According to Schummer (2006), transhumanists have "an existential interest in nanotechnology, as a means for the ends of personal and/or societal Salvation" (p. 432). The transhumanist position toward nanotechnology raises pertinent ethical questions about the role of technology in transforming and prolonging the lifespan of the human body. Moreover, transhumanism aims to use scientific discoveries to enhance human faculties. The Kurzweil Accelerating Intelligence blog (www.kurzweilai.net/) showcases recent technological discoveries and inventions that have the potential to radically transform the human body. For instance, findings are reported from a study that shows how mice learn faster and remember better after PKR (an immune molecule that signals viral infections to the brain) is inhibited. From a transhumanist perspective, PKR is seen as a potential smart drug that boosts our cognitive capacities.

Developments such as the cyborg C-Leg illustrates the advancements in augmentation and the ways that science and technology can become a part of the human body, making it increasingly difficult to delineate the boundaries between what is human and what is technological.

Automation

Automation describes the design and implementation of machinery to a process or procedure with little or no human intervention (Groover, 2010). Changes in labour and labour relations resulting from automation have been a reality since the early beginnings of the Industrial Revolution (see Chapters 2 and 6). Yet automation today has very different characteristics and is shifting the workforce in novel ways. For one, automation has reached many domains that just a decade ago would have been unthought of being performed by machines. That is, automation is no longer limited to production processes such as weaving and car manufacturing but is today highly integrated into all aspects of the economy including the service sector, health care, and even education. Machine-learning has accelerated in such a way that automation is perceived as superior to humans even in areas that seem surprising. An example is the automation of medical diagnostics such as screening for cancer, a domain that just a decade ago would have been considered impossible to automate. In the UK, the prognosis is that 50,000 people will be diagnosed through AI at an early stage of prostate, lung, or bowel cancer, saving many lives (Cowburn, 2018).

Many narratives of automation present its merits without sufficient consideration of either ethical aspects or the long-term consequences (Noble, 1984). In particular, discussions of automation in the 1950s tended to view machines as better alternatives to human labour. At the heart of this was differences of opinion between workers and their unions and management and owners of shops. Management saw numerous advantages in integrating machinery into the workflow of assembly lines. A key advantage stressed by management was that machines did not complain about unfair work conditions and low pay. Machines did also not get sick or report work-related injuries, or need time off from work for a vacation. Management also stressed the problems arising from human error, a factor that does not need consideration in automation. Yet an abundance of research revealed that automation was neither cost-efficient nor problem-free as often assumed (Noble, 1984). Rather, the costs and problems that arise from automation are different in nature. Labour unions have fought automation vehemently with the aim of saving thousands of jobs, yet the fundamental notion that machines are superior to human workers continues to prevail today.

Tesla, an American multinational corporation based in Palo Alto, California, is known for its exclusive electric vehicles such as the Model 3, Model S, and Model X. The automaker runs multiple production and assembly plants with its main car manufacturing facility being in Fremont, California. The increased demand worldwide for Tesla vehicles has put enormous pressure on the company, as they aim to increase production from 50,000 vehicles in 2016 to 500,000 vehicles in 2018 to 1 million in 2020. Elon Musk, Tesla co-founder and CEO, approached the manufacturing challenge by turning to automation. However, automation did not bring the desired increase in production he had expected. In fact, the statistics looked grim as fewer than 10,000 Model 3s were produced from January to March, well below the expected targets of 5,000 a week during that period (Tangermann, 2018). As pressure from clients and investors increased, Musk had to come to terms with the limits of automation and accept that it was a mistake to think that robots would be far superior to a skilled workforce (as seen in his Twitter exchange with Tim Higgins).

While the original goal was to design the most robotic-reliant assembly line in the world with superhuman speed, it turns out that car assembly is a complex process that robotics alone can't quite handle yet (Tangermann, 2018) and Musk revised his plan by hiring a skilled workforce to support the automated assembly line.

Automation is recognized as a disruptive force. Often the term **disruptive technologies** is used to describe the transformative effect of these technologies, as they "have the potential to disrupt the status quo, alter the way people live and work, and rearrange value pools" (McKinsey & Company, 2014). Disruptive technologies are those that not only create social change, but exercise radical change, change that is transformative in nature. Box 1.2 discusses driverless cars as a disruptive technology that automates driving and opens up new ethical dilemmas for

Box 1.2 Driverless Cars and New Ethical Dilemmas

Driverless cars (also referred to as **autonomous vehicles**, AVs) are being developed in parallel in many places around the world (Wolmar, 2018). Probably the most well-known North American project is the one spearheaded by Google that has been in operation since 2009. Google's Koala car has no steering wheel or gas pedal, as it is truly autonomous. Several technologies work together to yield automation: artificial intelligence gathers data from Google Street View and combines it with input from video cameras inside the car, a **Lidar sensor** on top of the vehicle, radar sensors on the front of the vehicle, and a position sensor attached to one of the rear wheels that helps locate the car's position on the map (Davies, 2018). The cars rely on Lidar technology to navigate traffic. A robot relies on the Lidar laser mapping to render a 3D image of streets, people, and objects in its surroundings. Specifically, light reflection provides data on exact location and distance to objects. The photo that follows shows how a streetscape is using Lidar 3D mapping technology to make driving decisions. These visualizations are difficult to interpret by the human visual system, but are machine readable.

Self-driving cars are seen as revolutionary for several reasons. First, they make roads safer by reducing traffic related deaths and injuries. Second, they reduce gas emission through more efficient driving and selection of shortest routes. Third, they increase quality of life and well-being by reducing overall stress linked to long commutes in heavy traffic. The many benefits are heralded as a new era in transportation. Cities in China are testing driverless buses on a large scale and the sharing economy company Uber has tested driverless vehicles in the US. Yet ethical dilemmas remain. When an Uber driverless car crashed in 2017, killing a pedestrian, many questions around accountability remained. Who is to blame for a crash? There was an operator in the car during the drive test but the operator did not foresee the crash. Was the software not designed properly? The Lidar map did show the pedestrian, but why did the car not make the decision to stop?

AP Photo/Ben Margot

Luminar Technologies CEO Austin Russell monitors a Lidar 3D map on a demonstration drive.

Driverless cars it turns out can stop within milliseconds, an ability that human drivers don't have. As long as driverless cars blend into traffic and seamlessly navigate thousands of miles, there is enthusiasm in large-scale adoption. Questions of culpability, especially surrounding accidents, are much more difficult to answer than in cases where human error is involved.

law makers, technologists, and society at large. This case study demonstrates how rapidly technologies are developing and becoming integrated into our cities. It also demonstrates the many repercussions that disruptive technologies have, both positive and negative. Finally, it demonstrates the difficulties that exist when it comes to making ethical decisions and in particular in determining who is to blame when an automated system fails.

Automation is inevitable in many domains of life. And as automation evolves, more domains of life will see change as a result. Automation can be beneficial when it alleviates workers from repetitive, physically demanding work. But it can also displace workers, a trend that unions have been fighting for a long time.

This section has discussed simulation, augmentation, and automation as recent technological developments that both illustrate how our perspective of what technology is continues to evolve and also reveal the ethical, moral, and societal implications of these endeavours. In Box 1.3, we discuss six challenges present in any inquiry of the relationship between technology and society. Learning about these challenges is important because they influence how we approach the study of technology and what we can learn.

Box 1.3 Challenges in the Study of Technology and Society

The study of technology and society presents numerous challenges. The first of these stems from the complexity of the concepts themselves, as each is broad and difficult to define and measure. In addition, there are numerous challenges in how to approach research problems in the area. The six most prevalent challenges are as follows:[4]

1. *Rapid technological advances*: Technology evolves at a rapid pace. Not only do existing technologies transform, often becoming more complex, efficient, and fast, but there are also moments in history where technological revolutions have occurred. The key technological revolutions usually discussed include the discovery of fire, the invention of the wheel, the invention of the printing press, the discovery of electricity, and the dawn of the digital era. However, there is no definitive list of technological revolutions. We could include many other technological developments in our list, such as early tool use, navigation, metallurgy, functional magnetic resonance imaging (fMRI), etc. The point is that technologies evolve quickly and a single invention can lead to an infinite number of further developments.
2. *Unprecedented social change*: New technologies lead to unprecedented social change in many realms of society, affecting many aspects of social, cultural, and economic life, including how we work, live, communicate, and travel. Studying these changes is difficult because we cannot easily capture new forms of behaviour, thought, attitude, and belief with existing frameworks and methodologies. Thus, to assess the full impact of technology on society, researchers need to develop new theories and forms of measurement that complement existing ones.
3. *Direction and type of effect*: Determining the direction of effect is a major challenge because it is difficult to determine the extent to which technology affects society or society affects technology. Some analysts have argued that a mutual shaping of society and technology occurs (Bijker, Hughes, & Pinch, 1999) that is complex and non-linear (Chapter 3 covers this point in more detail). Moreover, researchers in the field aim to uncover an effect, regardless of whether the type of effect is positive or negative. However, in many cases no directional effect can be observed because technology becomes normalized and is then a part of everyday life.
4. *Target group*: When examining technology, we must keep in mind the target group. Many social changes associated with technology are specific to a particular social group, social class, ethnic group, or religious belief, which is the root of technological inequality. For example, industrialization affected workers in different ways than it affected managers and owners. For workers, industrialization meant deskilling, lower wages, and inferior working conditions.

By contrast, employers saw advantages in streamlining work processes, reducing error, and increasing efficiency. Further, the use of machinery allowed employers to hire unskilled labour for lower wages. Hence, the particulars of a group have to be examined to understand how that group is appropriating the technology and how the technology has an impact on members' lives.

5. *Changing uses*: The uses of technology also change over time. The cellphone, for example, started out as a portable device to communicate one-to-one independently of location. It quickly transformed into a more complex tool, allowing users also to access the Web, take pictures, listen to music, store information, and play games. As a result, a single technology often mutates into a technology serving multiple purposes.
6. *Ethical dilemmas*: As technologies evolve quickly and become increasingly automated, we phase many ethical dilemmas that were not present in simpler technologies that had no agency. Addressing these ethical dilemmas becomes an important aspect of technological adoption and study and thus a central piece of the study of technology and society.

Conclusions

With advancements in science and technology, the level of interaction between society and technology continues to grow rapidly. The prevailing theoretical perspectives on this subject have supplied a rich foundation of debate and criticism in this area. Yet, as the technology–society relationship deepens in complexity and intimacy, our definition of technology also becomes more and more opaque. In society, the dominance of technology in everyday life has greatly altered conceptions of work and play. Such dominance has also profoundly affected and shaped notions of human existence in ways that earlier critics could not have imagined. Whereas early opponents of industrial technology were suspicious of hulking steel machines displacing the skilled craftsperson, contemporary critics are assailed with new ethical and moral challenges, as infinitesimal technologies enter the economic marketplace and the politico-cultural spheres of our consumerist society.

The philosophical and ethical implications of classifying and clarifying present and forthcoming technologies will arguably be intertwined with how contemporary and future generations of citizens and scholars view technology as a whole. Indeed, it will be interesting to see how members of Generation Z (those born between 1990 and 2010) will rationalize, critique, and characterize technology, especially when considering the indelible role of, and their dependence upon, technology in their lives.

Questions for Critical Thought

1. How is technology described in the definition of technology as practice? What are the strengths and limitations of this conceptualization?
2. Discuss what factors motivate managers and business owners to turn to automation. What are the limits of automation and why are they so often overlooked when designing fully automated factories?
3. When a driverless car crashes who is to blame? Why are driverless cars evaluated using different standards than human drivers?
4. Consider how chatbots are replacing humans for building intimate relations. What motivates people to turn to chatbots as companions?

Suggested Readings

Franklin, U.M. (1992). *The real world of technology*. Concord, ON: House of Anansi.
This book critically examines the relation of society to technology through the framework of practice.

Iafrate, F. (2018). *Artificial intelligence and big data: The birth of a new intelligence*. Hoboken, NJ: John Wiley & Sons.
The author provides an overview of how artificial intelligence has evolved over the decades and also highlights the most recent developments in big data intelligence.

Meyer, R. (2018). "Mark Zuckerberg: I'm not resigning, but Facebook needs experts." *The Atlantic*. Retrieved from https://www.theatlantic.com/technology/archive/2018/04/mark-zuckerberg-atlantic-exclusive/557489/.
The article provides an overview of how Mark Zuckerberg is managing the crisis Facebook finds itself in and discusses some of the changes he is making to how the company operates and its need for transparency and public accountability.

Yampolskiy, R. V. (2016). *Artificial superintelligence: A futuristic approach*. Boca Raton, FL: CRC Press.
This book explores the rapid developments in machine intelligence both as a possibility to new paths of superintelligence as well as a societal critique.

Online Resources

Babylon Diagnostics
https://www.babylonhealth.com/
This AI chatterbot supports medical diagnostics based on a set of user-generated responses to queries. These symptom checkers are not meant to displace doctors, but aid in the process of diagnostics through expediting and error reduction.

Computer AI Passes Turing Test in "World First"
www.bbc.com/news/technology-27762088
This BBC story provides an overview of the most recent attempt to pass the Turing Test and includes a link to a video previewing the event.

Waymo: Google's Self-Driving Car
https://waymo.com/
This is Google's new company which designs and implements its revolutionary self-driving car technology.

What Is Artificial Intelligence?
www-formal.stanford.edu/jmc/whatisai/whatisai.html
John McCarthy, the founder of artificial intelligence, provides a brief introduction to the topic.

Interactive Activities

Activity 1: Chatterbot Technology

To learn about the nature of interactions with chatterbots visit the US Army website and interact with their chatterbot SGT STAR.
https://www.goarmy.com/ask-sgt-star.html
Ask SGT STAR who he is: "Who are you?"
Ask more personal questions: "How old are you?" "Are you married?"
What are the advantages of interacting with a chatterbot like SGT STAR vs. reading information on the US Army on a website?
What are the ethical repercussions of implementing chatterbots on a large scale?

Activity 2: Implementing Driverless Cars

Imagine you work for the department of transportation for a large metropolitan city. Traffic is a major challenge for your department, as the city has grown quickly and commuters are very frustrated with the amount of time they are spending on the road in traffic jams. You are preparing a presentation to show the advantages of implementing driverless cars, but you also want to highlight the risks.

Make a list of advantages of implementing driverless cars and distinguish between advantages at various levels including economic, political, lifestyle, environmental, and social.

Make a list of the concerns that need to be highlighted before implementing driverless cars. Also consider concerns like job losses, accidents, and restructuring of the city.

2 Technology in Society

A Historical Overview

Learning Objectives

- to obtain a broad overview of the history of technology;
- to critically examine in a historical context how technology and society have mutually shaped each other;
- to provide an alternative view of the history of technology by taking a sociological perspective of technological transformations; and
- to learn about how digital tools and robotics have led to the development of a high-tech society characterized by automation, customization, and individualism.

Introduction

This chapter provides a broad overview of the history of technology by tracing the roots of technological development, discussing key periods of technological innovation, and outlining our present-day, high-tech society. The primary aim of the chapter is not to comprehensively cover technological developments over time, but to outline on-the-ground examples that illustrate how technology and society intersect. This chapter further attempts to link technologies, inventors, and historical moments to provide an in-depth examination of the socio-political and ethical context from which technologies emerge. This analysis will illustrate how we need to understand technological developments as complex processes instead of viewing them as purely material entities disembodied from any societal influence. This chapter shows how technology is ingrained in society, becoming a part of all aspects of our lives, and it outlines the merits of taking a sociological perspective of the history of technology.

Why Study the History of Technology?

Before we embark on historical details, we need to reflect on why it is important for us to understand the history of technology in our society. Technology is seen as a key mechanism of social change, moving society forward into new social, cultural, political, and economic milieus. For example, it is technology that makes it possible for humans to subsist in **megacities**, such as Greater Tokyo Area, with a population of 38 million in the metropolitan area, or Shanghai, with a population of 24 million in the metropolitan area. But megacities did not emerge overnight; in fact, there is no evidence of large human settlements in prehistoric times. The creation of megacities was possible only through the constant advancement of technology over centuries. This process occurred simultaneously with the evolution of advanced forms of construction, chains of mass distribution of goods, and new forms of social and political organization. In Box 2.1 we examine Amazon, in 2019 one of the most rapidly growing tech companies with a worth of about $948 billion USD, a company that has radically transformed chains of mass distribution and is disruptive to an ever-expanding range of industries (Macrotrends, 2019; Neate, 2018).

Box 2.1 demonstrates how the socio-historical context of the 1990s with the mainstreaming of the Internet, allowed visionary Jeff Bezos to radically transform on a global scale the mass distribution of goods (Turner, 2006). His company continues to constantly innovate and transform commerce in megacities and small remote communities alike. Amazon represents a transformative and disruptive enterprise because it not only changes the basics of how goods are distributed, but also disrupts many industries and reshapes urban spaces.

Scholars of the history of technology describe the history of tool use as following an **evolutionary model of technological development** because tools build upon existing knowledge, thereby making their development incremental.

Box 2.1 Amazon.com: An E-commerce Giant

Amazon is a stark competitor, disrupting commerce in a range of industries. Amazon combines a digital platform offering endless products with expedited delivery at customers' door steps; no need for shelving space in traditional brick-and-mortar stores. Amazon's founder, Jeff Bezos, started the company in 1994 out of a Seattle garage and his motto is "think big." Bezos has used a range of new technologies to bring mass distribution to new levels, including the automation of orders through its website as well as automation in product distribution. Through the use of almost half a million robots in 2019 for picking and packing products, Amazon's warehouses represent a highly automated work space (Vincent, 2019; Wasesa, Stam, & van Heck, 2017). The Kiva is Amazon's most valuable robot, moving products effortlessly and rapidly in its warehouses. Reports suggest the company has added about 15,000 robots yearly (Shead, 2018). The main impetus for adopting a **robot workforce** is efficiency during peak shipping including Cyber Monday, Black Friday, holiday shopping, and Boxing Day. Amazon's success relies on high customer satisfaction and a 24- to 48-hour delivery time through its Amazon Prime program, which has about 101 million subscribers (Amazon, 2018). The scale of the enterprise and need for speed in a society that expects instant retail a click away are driving a move toward

continued

David Paul Morris/Bloomberg via Getty Image

Are robots like this Kiva working on Cyber Monday to move products a disruptive technology in the retail industry? Or, are they an innovative technology making supply chains in megacities and remote communities more reliable, cost-effective, and fast?

robotics. Amazon continues to include robots into its retail chain as it considers using in addition to existing robots also drones and driverless cars to expedite delivery (*Business Insider*, 2019). Amazon has not just transformed retail in megacities like New York, Delhi, and Toronto, it has also changed shopping in remote communities such as cities in Canada's North like Iqaluit, where access to fresh produce and many other necessities of life is not just pricey but often unavailable (Frizzell, 2017). Amazon is developing **predictive analytics** that will expedite delivery further by using past purchasing data to accurately predict future purchasing behaviours (Ray Nichols, 2018). While the evolutionary process of technology is not straightforward, understanding that process and its link to social, economic, and political change is imperative.

Throughout history, inventors did not work in complete isolation, but instead drew upon earlier designs, often combining existing pieces into new forms. Basalla (1988), in *The Evolution of Technology,* provides a good explanation of how this evolutionary model unfolds: he compares the process of innovation to the way biological evolution occurs in the natural world. The comparison is based on the diversity of tools that exists in the world of manufactured objects, which he argues is similar to the diversity of life forms that exists in nature. Central to Basalla's argument is the idea that novel tools arise only from earlier ones and "that new kinds of made things are never pure creations of theory, ingenuity or fancy" (Basalla, 1988, pp. vii–viii). On 24 August 1995, Bill Gates launched Windows 95, an easy-to-use **graphical user interface (GUI)** developed by Microsoft, which propelled Windows into the mainstream computing market (Myers, 1998). The GUI comprises the application of graphical **icons** such as a picture of a "folder" to facilitate navigation. It also includes a pointer or cursor to control a computer. Yet development of the GUI spanned several decades, involved many researchers, and was incremental in nature. For example, Douglas Engelbart, who was a pioneer in computing and worked at Xerox PARC, was the first to come up with the idea of using a mouse-driven cursor to interact with hypertext in the 1960s (Myers, 1998). Engelbart's inspiration, however, came from a much earlier invention, a MEMEX desk-based information system from the 1940s. And, Smith coined the term "icon" in 1975 to describe a visual representation or pictogram on a computer screen that stands for an application or operation. What made Gates' Windows 95 different from previous GUI iterations was its unique blend of components, including "windows," "menus," "icons," a taskbar, and a "Start" button (Myers, 1998), which are all standard components of GUIs today. This example shows that the integration of existing ideas in new ways is often what catalyzes innovation.

The realization that technology develops in an evolutionary way, rather than in a revolutionary manner, may suggest that the study of technology is straightforward. Nonetheless, two key issues make understanding the history of technology difficult. First, there is a gap in time that exists between when an inventor first develops a new technology and when this technology is revealed and examined. Because social, cultural, and technological transformations are so extensive, people find it difficult to imagine what life was like in previous eras without their ideas being at least partly coloured by the technology and ideas we take for granted now. And the farther back in time one travels, the more true that is. The **Stone Age**, for example, began approximately 2.6 million years ago, while the medieval period ended only approximately 600 years ago. If we find it challenging today to relate to the medieval period, it is even more difficult to imagine events dating back millions of years.

The second issue that makes it difficult for us to understand the history of technology is our reliance on artifacts as evidence. Artifacts can be considered the basic components of **material culture** and are usually contrasted with elements encountered in nature, such as leaves, trees, caves, etc. Material culture refers to the interrelation that exists between an artifact and the social relations, cultural attitudes, and norms that are present in the society that uses the artifact.

We begin our examination of the history of technology with an overview of seven different time periods and the associated socio-political and cultural contexts: (1) the early beginnings of technological ingenuity, (2) ancient technology, (3) the Renaissance, (4) the Enlightenment and French Revolution, (5) the Industrial Revolution, (6) electronic times, and (7) the information society.

Table 2.1 Historical Periods and Key Technological Evolutions

Time period	Key Technological Changes
1. Stone Age (2.6 million years ago)	• Entails the use of primitive tools • Beginning of hunter–gatherer societies • More advanced stone tools start to emerge • Sees the transition from hunter–gatherer societies to horticultural and pastoral societies
2. Ancient Technology (500 BCE to 190 CE)	• Rapid changes in understandings about materials such as smelting of iron • The invention of key tools including the screw and the lever • Rapid advancements in knowledge and theories including the study of perspective effects • The emergence of basic research, as the recognition of the relevance of scientific inquiry
3. The Renaissance (14th to 17th century)	• The invention of the printing press • The commoditization of information through mass production and dissemination • A move from oral culture to print culture leading to the more rapid spread of ideas
4. Enlightenment and French Revolution (1715–1789)	• The publication of the *Encyclopédie*, the first universal and secular dictionary of human knowledge • Knowledge is created with the aim of informing the public • Greater relevance given to practical skills as equal in importance to the more traditional, academic disciplines • Technology transfer increases both within and across trades • Development of more advanced military technologies
5. The Industrial Revolution (1760–1840)	• Advancements in machinery and automated processes of production • Constitutes radical changes in the nature of people's work with the introduction of complex man–machine interactions
6. Electronic Times (1880–1970)	• The emergence of the mass media through cinema, radio, and television • The idea that electronic media shapes how we see the world
7. The Information Society (1980–present)	• The widespread and ubiquitous use of information and communication technologies (ICTs) including PCs, routers, and today broadband • The instant transmission of information through bits and bytes around the world • The creation of a networked society where connectivity is at the centre of influence • The collection and use of big data for predictive analytics

The Stone Age: The Early Beginnings of Technological Ingenuity

The earliest evidence of technology is traced back to the use of tools during the Stone Age, about 2.6 million years ago. There are two reasons why the study of early tool use in prehistoric times is significant. First, tool use suggests that humans reached an awareness of themselves as separate from the world around them, allowing for the development and use of external objects to accomplish tasks. This represents the earliest manifestation of human behaviour as intelligent and goal-oriented. Second, tool use is linked to human social and cultural evolution in terms of setting the foundation for a wide range of task-oriented behaviours, such as cutting, scratching, and manipulating (Plummer, 2004). These kinds of behaviours, even though simple, allow for complex interactions with the environment and other individuals and indicate the early beginnings of consciousness and thought. A set of socio-cultural behaviours directly results from tool use—users feel a sense of ownership over objects and, as a result, protect these from potential intruders. Therefore, even early tool use necessitates a sociological and cultural understanding of the relationship among tools, humans, and social systems.

In the Stone Age, communities would subsist on meat obtained by hunting prey and produce obtained by gathering berries and other edible plants; this is how the term **hunter–gatherer societies** was coined. Hunter–gatherers lived in **nomadic tribes** that were highly dependent on climate and food availability. During this period, stone tools started to emerge as the first key technological development. Plummer (2004) describes how Oldowan archaeological sites in Eastern, Southern, and Northern Africa provided the first concrete evidence of material culture. Beginning around 2.6 million years ago, stone cores were struck to make sharp-edged chips of stone known as flakes. Tool use at the time was limited to animal butchery and possibly preparing plant foods and working with wood. These materials developed from single all-purpose tools to an assemblage of varied and highly specified ones, demonstrating the high level of complexity involved in early tool development. Though there is an assumption that the hunter–gatherer lifestyle was deprived, lonely, and brutish, Late Stone Age societies had a rich social and spiritual life—as evidenced in cave paintings, rock engravings, and other existing artifacts.[1] The domestication of plants and animals, considered a technological invention, marked a radical departure from the hunter–gatherer lifestyle. This shift took place over the course of several thousand years during what scholars have termed the **Neolithic period**, derived from the Greek words *neo*, meaning "new," and *lithic*, which refers to "stone"—that is, the New Stone Age. Having conducted a careful investigation of the archaeological record in the Middle East, influential archaeologist V. Gordon Childe concluded that the move from hunter–gatherer societies to the reliance on tools for agriculture was the most significant change in human cultural and social evolution (Ratnagar, 2001). To denote the impact of the introduction of agriculture on human societies, Childe introduced the term **Neolithic Revolution,** often also referred to as the **Agricultural Revolution**.

The Agricultural Revolution did not occur concurrently around the world. Rather, agricultural development originated in, and spread from, several regions at different times (Smith, 1995). The first area to witness the domestication of plants and animals was the Fertile Crescent in the Near East, approximately 10,000 years ago. Agriculture then arose in eastern China some 8,500 years ago, followed by sub-Saharan Africa and the Americas between 4,000 and 5,000 years ago.

In each of these settings, the Agricultural Revolution began with the transition from hunter–gatherer societies to **horticultural** and **pastoral societies**. In horticultural societies, simple hand tools are used to plant and tend crops. Relatively small plots of arable land are cleared of wild vegetation and used to grow food. When the topsoil becomes barren, new plots are cleared and planted, and the old plots lie fallow until the soil's nutrients have been replenished. This shows that horticultural societies require some degree of planning and organization and are a precursor to the **green revolution**, a term that denotes an exponential increase in innovation and transfer of technology in the realm of agricultural production. The "father of the green revolution," Norman Borlaug, is credited with saving millions from starvation in the mid-twentieth century while also radically transforming the means of food production. His two big transformations were the introduction of semi-dwarf, high-yield, disease-resistant wheat varieties and the use of modern agricultural means of production. The social and economic consequences of the green revolution still remain a controversial topic to date, with many ethical repercussions. At the centre of the ethical debate lies the reliance on genetically modified foods (GMF), often characterized as unnatural with potential health consequences (Knight, 2009; Pascalev, 2003). Second, Borlaug's work has also received criticism because large-scale farming has substituted traditional subsistence farming in countries in the Global South, which yields enormous profits for US agribusiness and agrochemical corporations, leading toward new technological dependencies. Finally, another worrisome consequence is the reduction in biodiversity that comes from relying on a limited number of wheat varieties at the cost of the many unique local types (Doherty, 2018). This problem has caused concerns, with some farmers starting to revive biodiversity as a means to counter the unanticipated repercussions of the green revolution (Kim, 2018).

Agricultural innovations continue to today and new forms of farming are overcoming many of the problems present in modern forms of food supply. For example, Lufa Farms in Montreal has revolutionized urban settings by taking advantage of unused roof tops to grow fresh vegetables (Gutnick, 2018). The enterprise is not your average farm—not just because produce is growing on roof tops amid city life. The company is a startup that has integrated traditional agricultural production with new approaches to data science. It is a highly automated and efficient system that constantly collects data to self-monitor and calibrate. A key advantage of a high-tech farm like Lufa Farms is that it uses energy efficiently, has minimal environmental impact, uses no pesticides, and can locally grow fresh produce. This revolutionary model is highly innovative and starting to spread to other cities.

Conversely, in pastoral societies (8500–6500 BCE) animals are domesticated and bred for food. Pastoral societies tend to be more prominent in marginal regions where the soil is less fertile and populations must travel with animal herds to where grazing land is available. Generally, both horticulturalists and pastoralists find a more reliable means of acquiring food through the domestication of plants and animals.

In those areas where crops are readily grown, **agrarian societies** (8000 BCE) often come to replace horticultural societies. In agrarian societies, plows harnessed

Les Fermes Lufa/Lufa Farms

Prime Minister Justin Trudeau took a tour of Lufa Farms in Montreal, Quebec in 2017.

to animals are used in farming, which affords more efficient, larger-scale agriculture. Because the soil is being turned, fields remain fertile for longer periods of time, allowing people to remain in the same area for many years. In addition, food production increases substantially.

The Neolithic Revolution (10,000 BCE) witnessed unprecedented social change. With the advent of horticultural, pastoral, and especially agrarian methods of food production, larger populations could be sustained. Where permanent settlements were established around food sources, towns and later cities developed. For sociological inquiry, this is a turning point because settlements allow for the study of place as a social phenomenon and lead to the introduction of sociological concepts, such as identity, sense of belonging, **community**, and social structure. In such **sedentary societies**, economic and social complexity increased (Barker, 2006). Food surpluses allowed for trade and the payment of tribute or tax. In addition, as it was no longer necessary that everyone be involved in food production, settlements were able to support merchants, craftspeople, warriors, and religious and political leaders. Surpluses also led to greater disparities in wealth and consequently social status. The Neolithic Revolution thus marked the emergence of social roles, class, and work relations. Gender inequality also became more pronounced with the rise of agrarian societies, as the production of food became a more exclusively male responsibility. Women, who had contributed significantly to their families' nourishment as gatherers or small-scale gardeners, were not as involved in larger-scale agriculture using plows and draft animals. As a result, they developed new social roles and these roles became more specialized.

Ancient Technology: The Development of the Scientific Method

As technologies such as the smelting of iron and the invention of the screw and the lever emerged in Greece around 500 to 336 BCE and in Rome around 509 BCE to 190 CE, social organization changed radically. Technology facilitated certain forms of life—concentration in cities and improved food production—and helped in the creation of complex government structures. While Greece and Rome basically continued threads of technological progress that had begun in earlier times, the most important contribution to science and technology from that time period comes from the premise that thought forms the basis for practical action.

Indeed, Fowler (1962) starts his book *The Development of Scientific Method* with a comprehensive overview of ancient Greek philosophy, where he illustrates that it was the ideas and thought processes of the time that represented the early beginnings of technological innovations—not the tools themselves. Then, once the appropriate knowledge was in place, technologies developed as practical solutions to everyday problems. While ancient civilization may be known for its great thinkers, not all inquiry was abstract; in fact, certain ideas also had practical significance. For example, the study of **perspective effects**, which refers to an array of techniques designed to provide the impression of depth and symmetry, had an impact on building construction, first in Greece and then in Rome. Moreover, the Romans were innovators in building technology by using materials such as fired brick, tile, and stone. To shore up their construction, they also invented a new type of cement that was strong and that also set under water. The Romans designed seminal architectural features, such as the arch, the vault, and the dome, each adding considerably to the possibilities in construction. These techniques allowed them to build large structures, such as amphitheatres, aqueducts, and tunnels, some of which still exist today. The amphitheatres allowed for social interaction and were some of the first venues geared specifically toward mass entertainment. These developments had enormous social significance, as they allowed for new forms of social organization to emerge, such as the gathering of townspeople in social spaces for debate and entertainment, the development of more densely populated cities, and the emergence of increased traffic and trade.

Many of the ideas around science and technology that were formulated in ancient Greek philosophy remain influential in the twenty-first century. This is particularly true in the case of **basic research**, the idea of scientific inquiry not as specific practical applications, but rather as the development of knowledge about the world. The Perimeter Institute for Theoretical Physics in Waterloo, Canada, exemplifies this emphasis on basic research, with about half a billion dollars of public and private funding invested into examining the fundamentals of physics.

Applying the scientific method of inquiry to the study of social processes is not new; it emerged in ancient Greece and was further developed during the Roman era. The tension between basic and applied research continues to exist in the

The University of Waterloo's Perimeter Institute for Theoretical Physics is dedicated to studying fundamentals about the world around us and sparking innovation. It attracts international scholars with its dynamic research atmosphere and conducts outreach programs for youth, teachers, and the general public. Its architecture—pictured here—is part of its atypical, articulated facade and reflects its forward-thinking principles.

twenty-first century and is visible both in society's approach to funding research and in the mandate of universities, which seek to balance the need for technological innovations with programs geared toward acquiring and diffusing new knowledge that has no direct economic impact.

The Renaissance: The Awakening of the Mind through Technology

Historians often characterize the invention of Johannes Gutenberg's printing press in the mid-fifteenth century as ground-breaking. As a tool, its use reshaped history and helped bring about early elements of modernity, including mass production, mass distribution, and the notion of a mass audience. The printing press has also been linked to the spread of literacy and to the diffusion of new ideas throughout Europe, which were crucial in promoting the development of novel religious, scientific, nationalist, and secular thought. Indeed, the printing press proved to be an instrument of great political, economic, social, and cultural power by (1) enabling the spread of ideas, which circumvented traditional institutional bodies, such as the Roman Catholic Church; (2) codifying language; and (3) bringing about the commoditization of information (Chatfield, 2019).

Before the development of Gutenberg's printing press and prior to the onset of print culture, manuscript or scribal culture was the primary source of written texts.

In workshops, trained scribes would carefully and painstakingly copy texts to produce hand-copied books (Edmunds, 1991). These books, often of a religious nature, were expensive and time-consuming to produce because of the measured and methodical nature of scribes. As a result, books were accessible only to a select group of people who were literate and affluent and could read Latin or Greek.

Gutenberg's printing press combined his own innovations with pre-existing technologies into a new tool. Prior to Gutenberg, woodblock printing, which had originated in China, was the most popular form of printing in Europe. However, the methods originating in China lacked uniform standardization and required skilled craftspeople to develop individual wooden blocks. Inferior or worn blocks often distorted lettering and produced errors (Eisenstein, 1979). Gutenberg, who was a goldsmith from the German city of Mainz, developed Europe's first movable metal type by applying his knowledge of metallurgy—a process that had originated in Korea that same century (Füssel, 2005). Gutenberg split the text into individual components, such as letters and punctuation marks, which were cast in metal and assembled to form specific words. This yet again is evidence of how techniques develop in an evolutionary manner rather than following a revolutionary pattern, borrowing from existing techniques and adding new elements to yield new forms of production.

The printing press led to an era in which oral culture gave way to print culture. McLuhan (1962) proposed that the development of the printing press coincided with a change in how information was transmitted and received: from oral transmissions that relied upon "the magical world of the ear" (p. 18) to processing information from textual communications that emphasized visual cognition. Eisenstein (1979), one of the most influential scholars of the effects of print on society, agreed with McLuhan; she also saw print as revolutionary and as changing society. She argued that the shift from script to print "created conditions that favored new combinations of old ideas at first and then, later on, the creation of entirely new systems of thought" (p. 75).

The development of the printing press brought with it changes in how texts were used, distributed, and marketed, once again demonstrating the link between technology and society (Chatfield, 2019). Over time, the individualistic, producer-oriented approach of manuscript culture yielded to a consumer-oriented typographical print culture. This enabled the production of greater quantities of a single item within a much shorter time frame. Whereas manuscripts were primarily produced according to the literary interests of a single individual or institution, print texts could be manufactured according to the broad and diverse interests of a wider audience. The printing press altered the economics of the book industry by lowering the cost of purchasing books, which allowed individuals to assemble personal libraries, accrue new ideas, and educate themselves about subjects of interest. Although it was not an entirely error-free technology, the printing press brought about increased uniformity and encouraged the standardization of languages, as well as a surge in texts written in the vernacular (Febvre & Martin, 1997; McLuhan, 1962).

Without the printing press, it is arguable whether or not the dissemination of information via controversial texts and pamphlets during historical movements, such as the Reformation, the Scientific Revolution, and the Enlightenment, could have taken place. Some scholars, such as Haas (1996) and Johns (1998), have suggested that, as mentioned earlier, the printing press was more evolutionary than revolutionary, the product of a series of cultural, social, and technological changes occurring in European society during this period whose influences were gradual rather than immediate. Others have noted that the printing press's effectiveness was largely restricted to areas of Western Europe (remember that China had been using movable type 500 years prior to Gutenberg's printing press). Regions consisting of largely oral-based cultures or those that used non-phonetic alphabets in fact eluded the socio-cultural and political upheavals typically associated with the printing press in Western Europe (Briggs & Burke, 2009).

In conclusion, it is likely that the spread of new ideas about science, politics, and religion in Western Europe was the product of technological diffusion. The cultural, political, and economic conditions of mid-fifteenth-century Western Europe were ripe to absorb and transform this technology into a powerful instrument of change. In addition, the printing press allowed new ideas about technological developments to spread more rapidly, leading to enormous advances in science and technology.

Enlightenment and Revolution: Systematic Knowledge in Action

As the decades and centuries progressed following the invention and subsequent proliferation of Gutenberg's printing press, technologies continued to evolve, often faster than ever before. As technologies changed, their impact on society changed as well. And so did societal views on technology. The publication of Denis Diderot's *Encyclopédie* in mid-eighteenth-century France proved an important milestone during this period. A massive undertaking, the *Encyclopédie* was intended to be a universal dictionary of human knowledge. Upon completion, it comprised 28 volumes, which had been published over 21 years beginning in 1751. Though most often remembered for its contribution to the controversial **Enlightenment** movement, the *Encyclopédie* was also important for its presentation of technologies and technical processes, usually through detailed diagrams.

By presenting these alongside articles on the sciences and liberal arts, the *Encyclopédie* encouraged the reader to see the **mechanical arts**, the medieval concept for practical skills and technology know-how, as equal in importance to the more traditional, academic disciplines. Technologies are shown to be complex, requiring skill and intelligence to design and use (Smentek, 2010). The *Encyclopédie* thus helped to shift European attitudes concerning technologies and artisans' work specifically. The work of artisans was no longer dismissed as insignificant, but was perceived as a valuable skill that was worth studying and improving. This also led to the notion of **technology transfer** both within and across trades, that is, the idea that one artisan can learn through careful observation and study the best practices of another.

The latter half of the eighteenth century in Europe also witnessed dramatic political and social upheaval during the **French Revolution**. There is no doubt that technological advances are often closely interlinked with military objectives and war, and the French Revolutionary and subsequent Napoleonic Wars serve as useful examples. During and after the French Revolution of 1789, the development of new and improved military technologies made it clear that technology was to play an even more central role in warfare than it already had. While the early eighteenth century had seen relative stability in terms of the tools used in war (Cohen, 2017), this radically changed following the revolution.

Interestingly, most earlier analyses by historians of these new military technologies assumed that existing frameworks could be used to examine their implications. Generally, however, they underestimated the unprecedented threats posed by such military technologies as mines, torpedoes, and submarines, and the human price of their use in warfare. Consider the use of new weapons during the First World War: rifles, machine guns, mortars, artillery, poison gas, tanks, aircrafts, and submarines. In the four years of the war, the deployment of these weapons made it one of the deadliest wars in history, with 37 million individuals dying as a result. Warfare technology was further developed after the First World War and this led to an even higher death toll during the Second World War, with estimates ranging from 50 million to more than 80 million.

Today, of course, there are still many ethical questions surrounding the use of technology in warfare, for example, as discussed in Box 2.2, the increasing international reliance on **armed drones**.

Photo by Sean Gallup/Getty Images

Heron 1 and Heron TP (IAI Eitan) MALE (medium-altitude, long-endurance) unmanned aerial vehicles (UAV) developed by Israel Aerospace Industries (IAI), approximate cost $45 million.

Box 2.2 Military Technology and Armed Drones

Armed drones, also referred to as unmanned aerial vehicles (UAV), are considered to be a game changer in modern warfare. They are defined as a small unmanned aircraft controlled remotely. Until recently, armed drones have only been used in limited ways in warfare. But this is changing quickly as the Defense Advanced Research Projects Agency (DARPA) is looking into acquiring the know-how to deploy **drone swarms**—colonies of armed drones that act in a coordinated fashion—in war zones in urban settings. This DARPA program is called **OFFensive Swarm-Enabled Tactics (OFFSET)** and aims to develop cutting-edge technology in a compressed timeframe (Ehlinger, 2018). DARPA sees several advantages in the deployment of drone swarms including increased precision, speed, and reduced casualties. Fighter jets release armed drones at a good distance from combat and retrieve them after a mission is completed. As trained human operators monitor and control the drones from a distance, this reduces risk to military personnel (Stiles, 2017). The use of armed drones needs to be understood in the political context of "zero casualty warfare" (Rogers, 2000), where governments' war policies reduce to a minimum the casualties suffered by national troops. While much reluctance has been voiced around the deployment of armed drones on a large scale, the US military, who are at the forefront of drone development, has already received large orders to sell them. It remains unclear, however, what the ethical repercussions are of deploying armed drones in warfare and how they fundamentally change the meaning of war itself (Enemark, 2013). If an error is made, who is responsible? If a civilian is erroneously identified as a target, who can override the technical mistake? What legal and ethical frameworks regulate the use of armed drones? With the use of armed drones on the rise around the world, new thinking and legal parameters are needed to help guide the use of these technologies in warfare (Nissenbaum & Strobel, 2019).

Thus technological advances in warfare going back to the eighteenth century bring with them increased hegemony for highly developed societies, but also greater human detachment from the effects of war itself, as well as increased fatalities. The widespread use of armed drones is particularly concerning, opening up new ethical and legal questions and debates (Nissenbaum & Strobel, 2019).

The Industrial Revolution: Revolting against Technology

Beginning in mid-eighteenth-century England, the **Industrial Revolution** advanced technology in three key industries: textile, steam engine, and steel. The era of industrialization was significant for changing the production and distribution of goods and had a major impact on workers as well as consumers. The era brought with it radical changes in people's work processes, human-machine interaction, and worker–employer relationships. The introduction of machines coincided with an increase in the number of individuals being employed in various sectors, such as weaving in the textile industry (Berg, 1994). The enlarged pool of workers, now with the addition of an "unregulated" workforce of women's and children's labour, coupled with simplified technological processes associated with new machinery, drove down wages and led to an increase in the number of unemployed yet highly skilled craftspeople (Berg, 1994).

A new phenomenon also emerged during this time. Machines were no longer seen as neutral but were perceived as "actors" within a complex socio-technical system. In this system, technology was identified as the key force in producing social disparity and disrupting work conditions. To retaliate, workers directed their anger toward the machines that they perceived were taking away their jobs; the term machine breaking was introduced to describe workers' destruction of technology (Hobsbawn, 1952). These acts were organized by workers because they viewed the machines as threats to standards of living, employment, wages, and working conditions (Dinwiddy, 1979; Hobsbawn, 1952). Hobsbawn (1952) identified two primary motivations for machine breaking: (1) to put pressure on employers to improve wages and working conditions, and (2) to direct hostility toward the machines themselves, especially those perceived as labour saving. For worker groups without a tradition of trade or union organization, "machine breaking and violence proved effective methods of protest" (Randall, 1991, p. 149).

The Industrial Revolution was an era of unprecedented social change. Much of the upheaval taking place during this era was linked to the introduction of technological innovations in Europe. However, technologies alone do not lead to social change; we need to study their effect on society as parts of complex social systems (for more details see Chapter 3). That is, it was not technology that led to craftspeople losing their jobs, as machine breakers at the time concluded. It was, rather, the interplay between technology and the existing social system that radically transformed social structure. From a historical standpoint, the industrialization that took place in the late eighteenth century was only the beginning of large-scale change linked to technological innovations. This becomes clear when we look at some of the fastest expanding companies today, such as Amazon, and the integration of human and non-humans into a larger system of distribution, as discussed in Box 2.1 above. As more companies rely on robots in both the industrial and services sector, many have warned that workers may become superfluous. Elon Musk, a strong advocate for automation, which is a key part of his Tesla plant in Fremont, California, told a large audience that

> Over time I think we will probably see a closer merger of biological intelligence and digital intelligence. . . But there are many people whose jobs are to drive. In fact I think it might be the single largest employer of people . . . Driving in various forms. So we need to figure out new roles for what do those people do, but it will be very disruptive and very quick. (Kharpal, 2017)

This suggests that automation could potentially create large numbers of unemployment and disrupt the stability of the economy.

Next, we discuss how innovations in mass media, such as cinema and television, transformed the flow of information in society, created new forms of mass cultural production, and introduced new notions of entertainment.

Electronic Times: Hot and Cool Media

The Industrial Revolution was a time of upheaval as new technologies infiltrated the workplace, creating major disruptions for workers. The pace of technological development did not halt with the industrial era, however. Major changes were observed in the late nineteenth and early twentieth centuries in particular in what we now refer to as the mass media or the electronic media. The widespread use of mass media and their impact on daily life have only recently become topics of much public debate and scholarly attention. Earlier, users of mass media did not generally reflect much upon its effects on family life, civic engagement, the diffusion of information, and community. Marshall McLuhan (1962, 1964), a renowned Canadian media scholar, was among the first to draw attention to the effects mass media had on society, commenting on how these tools shaped our thinking processes as well as our understanding of the world. At the time, mass media encompassed radio, cinema, and television, and together they created a new era of electronic communication.

In order to help readers understand the close link between mass media and society, McLuhan used provocative, bold aphorisms that he termed **probes**. His probes are ideas that challenge us to think more deeply about the link between messages, media, and audiences, and are not to be taken literally but metaphorically. Perhaps McLuhan's most well-known probe is "**the medium is the message**," which expresses the idea of media having a direct effect on how people make sense of information. McLuhan (1962, 1964) argued that media have different characteristics, thus engaging the audience in different ways. The essence of "the medium is the message" is that most analyses on the effect media have on society examine how content affects individuals and fail to also study the effects of the medium itself on people's lives. For McLuhan, then, the medium was as important as the content, if not more so, because it framed how society interacted with information and also shaped the very structure of society. This understanding led McLuhan toward a deep exploration of both the relationship between media and society, as well as the effect that different media and their characteristics have on society.

Television, for instance, is an electrical device that provides information and entertainment to large audiences on a global scale. By 1970, many North Americans had a television set in their homes and the average person was watching TV nearly four hours a day (Bogart, 1972). Nielsen data show that in 2009 Americans continued to spend large amounts of time watching TV in the home, including time-shifted TV, Internet TV, online videos, and TV via cellphones.

McLuhan (1962, 1964) saw television as a unifying force that provides viewers with a sense of connectivity. To describe the social connections created by television, he introduced the notion of the **global village**. The global village represents the possibility that electronic forms of communication and media, such as television, can compress the rigours of spatial distance by enabling people to remain connected to activities going on anywhere in the world. McLuhan explains in an interview that "[t]he global-village conditions being forged by the electric technology stimulate more discontinuity and diversity and division than the old mechanical, standardized society; in fact, the global village makes maximum disagreement and creative dialog inevitable" (McLuhan, McLuhan, & Zingrone, 1995, p. 259).

To better understand the nature of electronic media, McLuhan distinguished between **hot** and **cool media** or "cold" media. For him, media could be differentiated in terms of the degree to which they engage a consumer. Books were categorized as being "hot" because they engage a single sense, in this case the visual system, providing readers with large amounts of information that is processed at lower sensory levels.[2] By contrast, television was considered to be "cool" because it requires greater effort to determine meaning. In addition to the cool–hot dimension, McLuhan also introduced the concepts **high**- and **low-definition media** to characterize how electronic media were processed by their audience. Crisply detailed and well-defined information, such as detailed images, that required little effort to be processed were referred to as "high definition" and were found in hot media. By contrast, "low-definition media," such as cartoons, provided users with less information and thus required a greater participation from the senses in order to be understood.

An implication of McLuhan's theories is that over time existing and emerging forms of media transform personalized experiences and societal structures. Previously popular media formats, for example, often give way to new technologies, which repackage older forms of content in a manner responsive and applicable to the changing information demands and experiences of their audience. For instance, contemporary entertainment technologies and media, such as cellphones and tablets, offer users a greater degree of mobility, reach, and instantaneity than their predecessors (Klemens, 2010). Looking at Nielsen longitudinal data we can observe two key trends. First, traditional TV time is declining in North America. In 2010, North Americans watched about 307 minutes of TV per day, while in 2018 that number is down to 270 minutes of TV per day (Statista, 2018). This is particularly the case among 18- to 24-year-olds, who only spent about 111 minutes per day watching traditional TV and spent more of their leisure time consuming digital media (more than a 50 per cent drop). Second, across all age groups time-shifted TV viewing via **video on-demand services (VOD)** like Hulu, Netflix, and Now TV is rapidly increasing. As a result, these new modes of content delivery have changed the nature of entertainment as well as societal expectations as to how content delivery works in the twenty-first century.

This section outlined the significance of electronic media or mass media in the history of technology. The developments in mass media that occurred at the end of the nineteenth century and the first half of the twentieth century transformed the flow of information in society, created new forms of mass cultural production, and introduced new notions of entertainment and connectivity. Some analysts stipulate that mass-produced cultural goods led to standardization and uniformity in content, and additionally destroyed individuality and multiplicity of choice (Gasher, Skinner, & Lorimer, 2012). In their view, exposure to standardized cultural goods—for example, movies produced in Hollywood—caused members of society to become a homogenous, uncritical, and passive mass with little willpower to resist the appeal and influence of the mass media. While some of these extreme views have been dismissed, there is no doubt that these technologies have had a large-scale impact on the production, dissemination, and interpretation of cultural goods. Perhaps the most fundamental social change is the link between mass media production and consumption and the emergence of a mass audience on a scale that did not exist prior to the media of mass communication. McLuhan, while reflecting on societal transformation, also stated that as a society we are slow in realizing the effects of technologies. He argued that people took a **rear-view mirror approach**, where "[w]e march backwards into the future" and a new social order is not perceived until it is already in place (McLuhan & Quentin, 2003, p. 68). This makes it difficult to foresee negative implications resulting from technological advances, as we are unaware of the occurring changes.

The Information Society: The Bits and Bytes Revolution

What does living in a high-tech society entail? To what extent do technologies impact who we are as individuals, as nations, and as a society? Sociological work has extensively scrutinized the effect of industrialization and urbanization on cities, communities, family structures, and work. To illustrate the kinds of societal changes brought about by current technologies (Haigh, 2011), we discuss here the ubiquity of smartphones in youth culture and their use for taking and sharing selfies. We examine smartphones as a form of entertainment that has become a force of individualism, personalization, and customization among youth. It allows young people to feel empowered and to make individualized decisions about their self-presentation in a private space away from the adult world. We then move to examine the current data revolution with its many potentials for social good as well as the critical voices and ethical ramifications of big data for average citizens.

Smartphones and Selfie Culture

Cellphones have been around for a long time; yet, smartphones are a newer kind of cellphone. Smartphone adoption is slow among older adults and they are used the least by those aged 65+ (Quan-Haase et al., 2018). By contrast, young people are heavy users, and many own a smartphone before they are teenagers. In the US, 94 per cent of 18-to-29-year-olds own a smartphone, while only 46 per cent of those 65+ own one (Pew, 2018). In fact, the smartphone has become central to young people's social life, influencing their self-concept, social networks, habits, and cultural preferences (Lauricella, Cingel, Blackwell, Wartella, & Conway, 2014). The smartphone is an example of a tool that evokes the principles generally associated with twenty-first-century technologies of the information society, including mobility, speed, multi media **interactivity**, ease of use, customization, and multi-purpose usage.

Smartphones no longer are seen as a luxury item; rather they are central to everyday life. Youth culture has embraced them. Among other things, smartphones have created a new culture of self-presentation, one where image production and interactivity are central to identity and social networking. Good examples are the widespread use of Instagram and Snapchat, both visual technologies that encourage selfie taking and sharing. Selfies are defined as spontaneous self-portraits taken with smartphones or other mobile devices (Murray, 2018), where the photographer is part of the image and storytelling (Zhao & Zappavigna, 2017).

Much of the research around selfie culture has focused on how young people present different aspects of the self. New insight is also developing around how teens with visual impairments are adopting various strategies to actively participate through sharing and editing images. In a study of 14 visually impaired teens, Bennett et al. (2018) found that these teens not only engage with photo-centric and ephemeral social media apps, but also are part of online communities that support individuals with visual impairments in participating. This work pushes back assumptions that visually impaired teens are not eager to be a part of the larger selfie culture. The researchers found that these teens were heavy users of photo sharing platforms, and in instances where they confronted barriers to access, they implemented workarounds for using the platforms. Visually impaired teens like to be independent and highly value posting Instagram-quality photos to their Instagram accounts.

As people spend countless hours online, updating profiles, uploading content, and interacting with content, they are generating vast amounts of data. In fact, they are producing with little awareness roughly 2.5 quintillion bytes a day (Domo, 2018). This phenomenon is often referred to as "data never sleeps" and has led to the development of a new a business model and way of looking at the social world—data science—and consists of the collection, storage, and analysis of big data for influencing many domains of life including decision-making, shaping public opinion, and government.

Big Data and Data Science

At the 2018 World Economic Forum, German's chancellor Angela Merkel stated: "Data will be the raw material of the 21st Century; the question 'who owns that data?' will decide whether democracy, the participatory social model, and economic prosperity can be combined" (Chu, 2018). As data become the new oil of the twenty-first century, commercial use of personal data has become the core business model of many technology firms and the administrative use of private data an integral part of all levels of governance and national and international security (Chen, Park, & Quan-Haase, 2018). The increasing reliance on data for decision-making, policy development, and governance is a positive change, as data can reveal where problems lie and immediate solutions are needed.

Big data create new opportunities for sociologists to study the social world, not only in terms of the unprecedented scale of the data, but also in terms of the unobtrusive nature of observations. Big data has gained new meaning and is no longer restricted to digitally collected information, rather it encompasses any and all information collected, stored, linked, and analyzed either online or offline. Big data are often described in terms of six characteristics (Quan-Haase & Sloan, 2017):

1. **Volume:** enormous amounts of data produced, collected, stored, and analyzed.
2. **Variety:** a wide range of multimodal data such as text, image, audio, geospatial data, videos, geospatial check ins, etc.
3. **Velocity:** the speed at which data is generated in real time.
4. **Veracity:** the accuracy, reliability, and quality of the data.
5. **Virtue:** ethical uses of big data.
6. **Value:** greater insight into the social world by opening hitherto unavailable avenues of research and/or augmenting existing work through access to new data sets (McCay-Peet & Quan-Haase, 2017).

Data science is defined as the field of study that designs comprehensive research methodologies to examine big data. While data science is often mistakenly confounded with statistics, much of the data available for study is unstructured and non-numeric (Saltz & Stanton, 2018). That is, much of the data available requires careful examination and scrutiny, such as selfies posted on Instagram. They can't be simply analyzed through an algorithm, but rather require a data scientist to get deeply involved with a topic and make sense of the data through careful observation and study.

The advantages of relying on big data are numerous and often highlighted by high-tech firms focused on data crunching, such as Cambridge Analytica already discussed in Chapter 1. First, big data can provide an overview of trends and developments. Big data has the ability to show how a social, political, or economic phenomenon is developing in real time, a form of study called **nowcasting**. This allows for immediate interventions. Second, big data allow policy-makers to develop sound data-driven policies. Data-driven policy moves away from ideology-based decision-making and develops policy based on facts and community needs. Finally, big data can help in a predictive way. This area of data science is referred to as predictive analytics, as discussed above in the Amazon example. Predictive analytics uses techniques ranging from data mining, statistics, modelling, machine-learning, and artificial intelligence to predict future outcomes based on past data. Predictive analytics can be beneficial for society.

Despite all the hype around big data and its potential to have positive societal effects, big data is also prone to problems, biases, and ethical concerns (Hargittai, 2018). The ongoing Cambridge Analytica scandal discussed in Chapter 1 and its aftermaths have drawn tremendous attention to privacy issues and current data management practices at corporate giants like Facebook, Google, and Twitter. The lack of transparency, accountability, and regulatory frameworks have increased privacy concerns of citizens and shown the significant work ahead toward developing much-needed regulations (Chen, Park, & Quan-Haase, 2018; Conger, 2019). This has led to much skepticism in the research community and to an outcry in the media regarding the ethical practices of big data analytics and a call for greater communication with research participants, and more care in the design of large-scale experiments (Sloan & Quan-Haase, 2017; Vaidhyanathan, 2019).

Time Acceleration and Technology Evolution

The last point examined in this chapter is the idea that we live in a period of rapid tool development, referred to as **time acceleration**. The development of tool use during the Stone Age occurred over several millennia with incremental change, whereas the development of digital technologies today is rapid and on a shorter timeframe than earlier tool development. Consider the DARPA program OFFSET, discussed above. Programs like OFFSET are meant to spur innovation in a targeted area through the injection of capital, human, and institutional resources on a large scale. These kinds of programs spanning the military, universities, and private corporations can intensify innovation on an unprecedented manner.

Moore (2018) stresses how time acceleration is directly linked to the shrinking of the lifecycle inherent in scientists' understanding and mastering of raw materials. For him, our expertise in materials allows technologies to develop and for our current high-tech society to emerge. Looking at the past with today's understandings, frameworks, and ethical standards shows that it took a very long time for the first stone tools to evolve. Moore stresses that stone tools developed slowly and that there is a 3.3 million-year gap between the development of the first stone tools and the building of a more elaborate structure such as Stonehenge in the UK. If we look at Stonehenge and its design, we learn that it took a long time to master stone as a material for construction (dark grey section in Figure 2.1). By contrast, it took humans less time to master metals, with early developments starting with the smelting of copper about 2500 BCE and the locomotive signalling a breakthrough in the early eighteenth century (light grey section in Figure 2.1). Semiconductors emerged first around 1947 and by the mid-1990s, the Internet started to diffuse more widely (tip in Figure 2.1). Finally, today's material cycle has shortened. Moore (2018) provides the example of **giant magnetoresistance (GMR)**, a technology used in hard drives for data storage and consisting of a quantum mechanical magnetoresistance effect present in thin

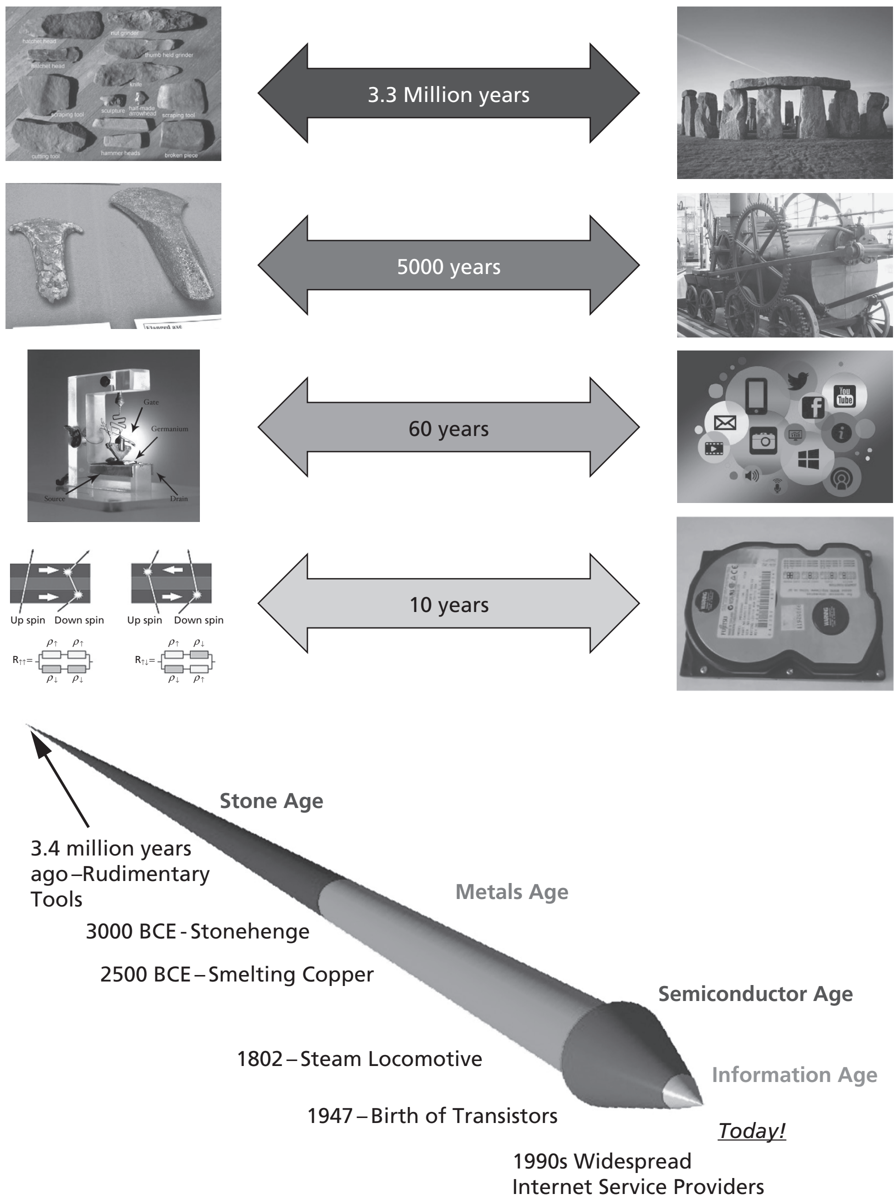


Figure 2.1 Time Acceleration

Source: Moore, R. (2018). Condensed Matter. Perimeter Public Lectures.

film structures composed of layers. The rapid development of GMR over a 10-year span is observed in the sheer amount of data that can be stored today. Floppy disks available in the 1980s allowed for about 1.4MB of storage, while today a small USB flash drive can store 1TB of information. This shows that our ability to master materials is speeding up considerably.

Technological developments occur within different time frames and these changes directly link to how society operates and is structured. As people grow older, they need to adapt to these technological changes—for example, adapting within a lifespan from a rotary phone to a smartphone. Some technological changes cause anxiety and a sense of inadequacy in older generations because they feel they cannot keep up with the speed of development and confront challenges in learning new digital tools (Quan-Haase, Williams, Kicevski, Elueze, & Wellman, 2018). Consider the rapid developments in big data and data science; the changes have been on such a scale that lawmakers, governments, and even tech firms are all struggling to understand the many social, ethical, economic, and educational implications (Chen, Park, & Quan-Haase, 2018).

Conclusions

This chapter provided an overview of technological achievements from the early stages of humanity to the present. Understanding the close relationship between the introduction of a new technology and social change is not a straightforward task. McLuhan argued that society tends to approach technological developments with a rear-view mirror approach, where we can't see the future and do not realize the emergence of new social structures until they are already in place (McLuhan & Quentin, 2003). Hence, we tend to look backward to make sense of how we have changed as a society instead of looking ahead toward how transformations are occurring and their impacts. A good example of rear-view mirror approach is the speed by which Amazon has increased its influence. Almost half of the world's big data and cloud-computing capacity is controlled by Amazon. Its disruptive nature has driven many traditional retailers out of business. Its business practices have been criticized for such things as tax evasion and poor working conditions. In fact, the head of the IMF, Christine Lagarde, expressed her concerns by stating that through companies like Amazon there is "too much market power—in the hands of too few" (Neate, 2018).

To counteract such an approach, this chapter presented on-the-ground examples showing how technological transformations intersect with cultural, political, economic, and social change. The examples demonstrate the relevance of in-depth examinations of technologies, inventors, and historical moments and how they intersect to create change. From this viewpoint, technology has transformative power and can shape society. Nonetheless, it is important to keep in mind that technologies alone are not the single causal factor in enabling societal change. We demonstrated how technology shapes society in a social context, where many factors come together to create social change. For example, Amazon has had to deal with a strong regulatory body in France, where the government is regulating the e-commerce giant with the aim of protecting local businesses, supporting supplier rights, and guaranteeing choices for customers (Lomas, 2017).

Questions for Critical Thought

1. Can we understand technological developments in the past by looking at them through today's lens? What are the biases that can emerge? How do we take them into account?
2. Discuss key characteristics of Amazon and its unique model of mass distribution of goods. What are the social and economic consequences of an e-commerce giant like Amazon? Focus on both positive and negative consequences for different social groups in society.
3. Outline key advantages of big data analytics and think of an example in the area of health care that demonstrates how big data can improve health care services.
4. Think of how you use your smartphone to take selfies and express your unique self. Do you think the technology functions as a means of empowerment? How does it transform your ways of socializing? Do you think this change is best described as revolutionary or evolutionary?

Suggested Readings

Jin, D. Y. (2017). *Smartland Korea: Mobile communication, culture, and society*. Lansing, MI: University of Michigan Press. Ecopy available at no cost at: https://muse.jhu.edu/book/52281.

This book examines the mobile landscape in the context of South Korea, with an in-depth look at the youth culture that emerges around the use of devices and applications.

Marwick, A. E. (2015). Instafame: Luxury selfies in the attention economy. *Public Culture*, *27*(1, 75), 137–160.

This article explores the new attention economy around selfie taking and sharing in the context of celebrity life.

Saltz, J. S., & Stanton, J. M. (2018). *An introduction to data science*. Thousand Oaks, CA: Sage Publications.

This book uses a wide range of practical examples to introduce the core ideas of data science to general readers.

Walsh, J. (2017). *Adolescents and their Facebook narratives: A digital coming of age*. London: Routledge.

Jill Walsh's text is of great relevance for furthering our understanding of contemporary youth culture as it takes place on social media and the new practices of self-presentation, socialization, and interaction that emerge.

Online Resources

Adoption Rates of Technologies in the US
https://www.weforum.org/agenda/2018/02/the-rising-speed-of-technological-adoption
This article from the World Economic Forum presents compelling visualizations of the adoption rate of various technologies in the US consumer market.

Amazon's Warehouses
http://amazonfctours.com/
You can schedule a tour of Amazon's high-tech warehouses, including in Brampton, Ontario, and learn about its operations, including how Kiva works.

Marshall McLuhan: The Man and His Message. CBC Digital Archives
www.cbc.ca/archives/
The Canadian Broadcasting Corporation (CBC) has put together a digital archive of McLuhan's interviews with the media, including radio and television programming.

Selfie City
http://selfiecity.net/
This website showcases and investigates the style of self-portraits (selfies) in five cities across the world.

Interactive Activities

Activity 1: Armed and Micro Drones

Watch the first two videos on armed drones and micro drones. Consider in your analysis what the unique characteristics of armed drones are and how this new technology can benefit warfare. Does watching the video on the deployment of drones change your perspective on the use of armed drones in warfare? In the third video, a former ex-drone pilot is interviewed, and he discusses some of the ethical ramifications of drone deployment. Can you think of some of the ethical implications? What kinds of policies and international laws need to be in place to regulate drone use in warfare? Why do you think these are important?

- Video 1: https://www.youtube.com/watch?v=CGAk5gRD-t0
- Video 2: https://www.youtube.com/watch?v=Cso9rIU-fhA
- Video 3: https://www.youtube.com/watch?v=Y_Lt88KXzIQ

Activity 2: Adoption Rate of Various Technologies in the US

Take a close look at the adoption rate of various technologies in the US:

> Desjardins, J. (2018). A brief history of technology. Retrieved from https://www.weforum.org/agenda/2018/02/the-rising-speed-of-technological-adoption

- What technologies have seen a slow adoption rate? What technologies have seen a steep adoption rate?
- Compare cable TV with cellphones. What do we learn?
- Compare automobiles with social media.
- What do you learn from looking at the visualization of adoption rates of various technologies in the US? How do you expect the adoption rates in the US to compare with those in Canada? How about with those in India?

3 Theoretical Perspectives on Technology

Learning Objectives

- to address the fundamental difference between utopian and dystopian views of technology;
- to compare and critically examine a wide range of theories on the complex interrelationship between society and technology;
- to learn about the field of science and technology studies (STS) and its unique socio-technical perspective;
- to analyze how video games are developed for children and what understandings of play influence their design; and
- to consider the value of the affordances theoretical lens for understanding the role of digital media in society.

Introduction

A wide range of theoretical perspectives have been proposed that seek to show the ways in which technology and society are linked, as well as the elements of society most affected by technology. The plurality of perspectives shows that there is no single approach for examining this complex interrelationship; rather, a range of divergent perspectives have been proposed that each shed light on a different aspect of technological society. A long-standing debate exists between those who see technology as having only positive effects—the utopians—and those who see technology as having mostly negative effects—the dystopians. In addition, early discussions in the field centred on whether technology determines society or society determines technology. In the literature, these two extreme views are referred to as **technological determinism** and **social determinism**, respectively. The core assumption of the former is that technology has a unidirectional, strong effect that is not, or only minimally, mediated by other factors, while the latter sees such factors as socialization, social interactions, and social norms as steering technological progress. We will review the key premises underlying these various theories and discuss their strengths and weaknesses.

These early theoretical perspectives represent a rather simplified view of the technology–society interrelationship; recent perspectives are more complex and attempt to provide a more detailed view of how technology and society intersect. We discuss the field of **science and technology studies (STS)**, which emphasizes that artifacts are socially constructed, mirroring the society that produces them. At the same time, tools shape society itself, as well as its values, norms, and practices (Bijker et al., 1999; Callon & Law, 1997; Latour, 1993). As a result, according to the theories postulated by STS, social change needs to be understood in relation to technological developments. In this chapter, we review the most prominent theories within the field of STS: **actor network theory (ANT)** and **social construction of technology (SCOT)**. We will look at concrete examples—for instance, how video games like BarbieGirls and GalaXseeds are developed specifically for children and what understandings of play underlie their design. Finally, we will review the theory of **technological affordance**, which helps us understand how users engage in digital environments such as Snapchat, Instagram, and YouTube.

Utopian versus Dystopian Views of Technology

The utopian and dystopian perspectives are two opposing views of how technology affects our everyday lives. Utopians embrace technology as a new means of achieving progress and improving efficiency. The idea of progress emerged in the seventeenth and eighteenth centuries, particularly in Europe and North America, and became something desirable, a sign of civilization. The **utopian perspective** reflects the assumption of technology as "the realization of science, revealing itself in ever increasing control over nature" (Street, 1992, p. 20). In this view, technology allows us to dominate and manage nature, making our lives easier, and leads to advancements in the production of material goods, thereby reducing costs and increasing efficiency. Progress is not limited to the production of material goods alone but extends to the accomplishment of societal goals, including higher levels of security, better means of communication over time and space, improved health care, and increased autonomy (Hill, 1989). Overall, "technical change serves to improve the quality of life" (Street, 1992, p. 20) and makes many aspects of life easier.

The other main viewpoint is the **dystopian perspective**. For Street, technology "threatens established ways of life" and is thus seen as a **regressive force** (1992, p. 20). This means that technology is not seen as helping society move forward; rather, it hinders the combat of key problems of our times like environmental sustainability, health care, and education. In the realm of education, for example, it is argued that cellphones, laptops, and other mobile devices easily distract students during school lectures and study time, reducing their ability to concentrate, which then has implications for their learning outcomes (Campbell, 2006; Quan-Haase & Collins, 2008). In a study by Campbell (2007), students indicated that the ringing of cellphones during class time was distracting and they strongly supported the implementation of guidelines to help reduce this. This response seems to indicate an understanding that classroom time is governed by social norms that facilitate learning and focused attention, unlike other social situations where inattention is not such a crucial issue.

While not all scholars advocate for simply embracing dystopian views of technology, many scholars do argue that the study of technology needs to go beyond a focus on the immediate and intended benefits of technological inventions, and should also analyze the often **unintended effects** that result in the long run—for example, the effects of industrialization and globalization on the environment. To return to the example of cellphones, an unintended effect of their use is taking students' attention away from material presented in lectures. Cellphones are social technologies, but the sociability they foster may be less desirable in some social contexts than others.

The utopian and dystopian viewpoints provide a rudimentary understanding of how technology affects society. In the next section, we present the various theories that examine in more detail how technology and society intersect.

Theories of Technology and Society

Numerous theories of technology and society have been proposed. To examine these varied theories in more detail, Feenberg (1999) has developed a theoretical model (see Figure 3.1), in which he distinguishes between two central dimensions: (1) neutral (as in the **neutrality of technology argument**) versus **value-laden**; and (2) **autonomous** versus **human controlled**. In this section, we first describe the two dimensions and then discuss each of the four theoretical frameworks that result from the two-by-two matrix depicted in Figure 3.1.

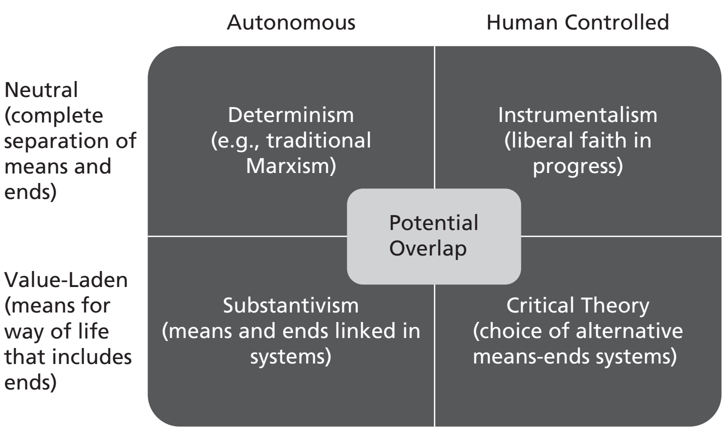


Figure 3.1 Theories of Technology and Society

Source: Adapted from Feenberg, A. (1999). *Questioning Technology*. New York: Routledge, p. 9.

Neutral versus Value-Laden

The first dimension encompasses theories that view technology as falling in the category of either neutral or value-laden. Theories of neutrality describe technology as separate from human activity and with no effect on natural ends—that is, on the fundamental elements of human nature (e.g., ethics, morality, forgiveness, and happiness). Feenberg argues that this neutralization of technology hinders any in-depth analysis of social change because "if technology merely fulfills nature's mandate, then the value it realizes must be generic in scope" (1999, p. 2).

Box 3.1 gives an extreme example of how technology is far from neutral. It demonstrates how features and affordances of the technology can be used to discuss moral and ethical dilemmas in our society and to inform and mobilize others for a social cause.

Box 3.1 Are Technologies Neutral? #50dollarsnot50shades

Just before the movie *Fifty Shades of Grey* was set to be released, a social media campaign was started on Facebook (www.facebook.com/50dollarsnotfiftyshades) and Twitter (#50dollarsnotfiftyshades) that encouraged followers to donate fifty dollars to shelters and institutions that help abused women instead of spending the money on a ticket for the movie *Fifty Shades of Grey*, popcorn, and drinks (Couch, 2015). There were three primary sponsors of the campaign: the National Center on Sexual Exploitation, London [Ontario] Abused Women's Centre, and the agency Stop Porn Culture.

On the one hand, Twitter is a neutral platform for the relay of information and the exchange of messages: anyone with a Twitter account can tweet, retweet, and "favourite" content. On the other hand, Twitter can also act as a catalyst for social change by facilitating awareness of social issues, mobilizing individuals to participate in campaigns, and facilitating discussion around controversial topics. To better understand how Twitter can become a part of a social campaign, all tweets containing the hashtag #50dollarsnot50shades were harvested between 3 February and 7 February 2015 using **Netlytic** software. A total of 8,146 tweets produced by 794 Twitter users were collected, suggesting a strong interest in the topic shortly before the release of the movie. The most commonly occurring keywords were *women*, *boycott*, *abuse*, *violence*, *campaign*, and *donate*. This suggests that the campaign was successful in drawing attention to its primary concern, namely how women are depicted in mainstream media and what has been referred to as the "glamorizing of abusive behaviour" (Couch, 2015). One tweet stated, "Instead of rewarding Hollywood for glamorizing sexual violence, donate to a domestic abuse shelter on Valentine's Day. #50dollarsnot50shades."

Many tweets called for a boycott of the movie, suggesting that it had negative effects on society. But more importantly, as shown in Figure 3.2, Twitter activity drew

Figure 3.2 Twitter Activity related to #50dollarsnot50shades

attention to the important role of women's shelters, the widespread social problem of women's abuse, and the need to protect those in society who are most vulnerable. This case study shows how Facebook and Twitter are no longer neutral tools: they can serve a specific purpose—to create awareness of social problems and mobilize others to take action. As such, digital media can become central players in current debates around social issues.

The opposing view—that technology is value-laden—tends to equate technological development with human progress. In this view, any new experience realized through technology is seen as progress for the entire human race. Feenberg (1999) shows how the first landing on the moon is often described as a collective achievement: *we* as humans landed on the moon. This removes any sociological, cultural, and economic analysis from the technological experience and buries the political consequences that lie behind many technological developments. For example, there is usually no mention in the moon landing story about the arms race taking place between the United States and the USSR at the time, or about the funding that supported it; that is, the taxpayers' money that was used with the aim of advancing science and technology at the expense of education and health care.

Autonomous versus Human Controlled

The second dimension of Feenberg's model distinguishes between technology as exerting control and technology as controlled by humans. The concept of technical development is at the centre of this discourse. Technological autonomy is based on the idea that technological developments and inventions are guided by independent or self-serving dynamics, separate and distinguishable from societal or human influences. Although human beings are involved in the creation of technologies, supporters of **autonomous technology theories** would argue that humans have little choice in deciding how a given technology will evolve and diffuse in society. The underlying assumption of this theory is the notion that technology propels and alters the development of social structures and cultural values.

Within this view, once technologies are introduced into an environment, they will be the key factor in determining the direction of social change and progress. Once the technology is fixed within a society, the corresponding roles and actions associated with that technology become more normalized, thus limiting the input of **human agency**. For instance, the introduction of television is perceived as a catalyst in re-configuring leisure, communication, consumer, and cultural practices in the twentieth century. Supporters of the autonomous technology theory would argue that television as a technological medium became a focal point in family and social life. It changed the way information was acquired and processed, and also created mass communal events through which people indirectly and simultaneously shared analogous experiences. Today, televised events such as the Super Bowl or the series finale of a popular television show, such as *Game of Thrones* or *The Big Bang Theory*, could be considered examples of this phenomenon.

By contrast, critics of the autonomous viewpoint argue that technology is a socially constructed entity, whose meaning and use is determined by human action. Rather than being diminished by technology, human agency becomes the central ingredient in understanding and determining the role of technology within its social context. People have a choice in selecting and deciding how technologies will be used, as well as determining the value given to a particular technology. Concepts showcasing this viewpoint, such as the social construction of technology (SCOT, discussed below), centre around the belief that technology is shaped by human needs and social factors. The cultural norms and values within a social system influence the construction, diffusion, and utilization of a technological product (see Chapter 5). This reasoning can be used to suggest why certain technologies fail to diffuse in cultures or societies that are indifferent toward adopting a product or system that is incompatible with their social beliefs or structures.

Four Theories of the Technology–Society Intersection

Figure 3.1 shows the four main theories identified by Feenberg (1999) along the two dimensions of interest previously discussed, forming four quadrants, each representing a different vision of technology's intersection with society. Each will be discussed next and concrete examples provided.

1. Determinism

Determinism is divided into two primary and opposing theoretical views: technological and social determinism. **Technological determinism** proposes that technology is the driving force in developing the structure of society and culture (see Figure 3.1). Technological determinists adhere to the notion that technology directs and shapes social interactions and systems of thought. The uses of technology are dictated by the design of the technology itself. Technological determinists view technology as an independent and autonomous entity guided by its own internal logic. In response to technological developments, society changes its institutions, modes of communication, labour practices, and cultural meanings. Moore's law is an example of the view of technological determinism. It stipulates that the prediction that "the number of transistors that could be placed on an integrated circuit would continue to double at short, regular intervals has held true ever since, although the interval soon stretched from twelve to eighteen months" (Ceruzzi, 2005, p. 584). As the speed and capacity of computers increases, humans need to adapt to and keep up with these changes. And because technology is self-directing, it is not influenced by social or cultural factors within society.

The second perspective, **social determinism**, sees factors in society as creating specific uses of technology (see Figure 3.1). Social norms, attitudes, cultural practices, and religious beliefs are perceived as directly impacting how technology is used and what its social consequences are. For example, research into the use of media for communicating during a relationship breakup found that norms around communication impact young people's perceptions of media adequacy. Text messaging and social media, for instance, were not perceived as adequate for transferring complex messages during a breakup, whereas in-person communication was perceived as more adequate (Gershon, 2010). (We will discuss the impact of social norms on communication during breakups in more detail in Chapter 10.) This example illustrates the social determinism view, which argues that societal or group norms will determine how a technology is used. To summarize, technological determinism views technology as the driving force of social change, while social determinism views social factors as affecting technological development and use.

2. Instrumentalism

Instrumentalism analyzes technology as a neutral tool or instrument, whose purpose is to fulfill users' specific tasks. Instrumentalists believe that technology can be understood as an evolutionary process in which technologies are the product of previous technological endeavours, whose rationale is to improve productivity and efficiency. Because technology is characterized as being merely a neutral tool, instrumentalism proposes that technologies can be used for either positive or negative purposes depending on the moral intentions of the human agents who employ them.

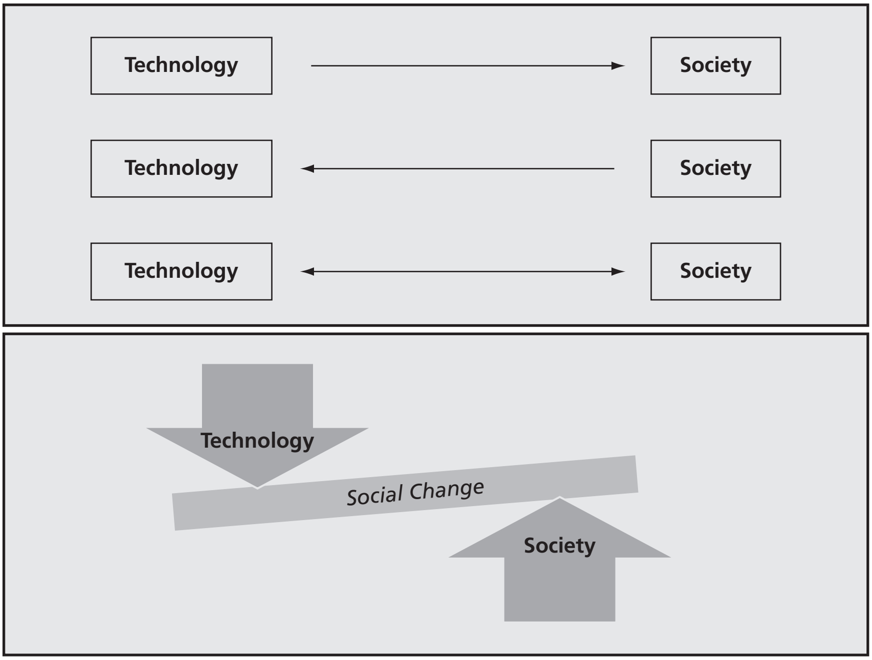


Figure 3.3 Technology and Social Change

3. Substantivism

Substantivism argues that technology brings forth new social, political, and cultural systems, which it then structures and controls. This view supposes that technologies operate under their own inherent logic and goals. A substantivist position expresses the view that technology can act as an independent force and is uncontrollable by humans. Acting as a neutral character, technology shapes society and dictates its components. Propelled and guided by its own embedded logic and goals, technology can modify cultural conditions. For instance, in Chapter 2 we discussed the mass media and its effect on cultural production. The embedded logic of the mass media is to attract large audiences and to commodify cultural goods. While a circus is a local performance that attracts a limited, geographically bounded group of people, a movie can reach a mass audience independent of space and time. This example demonstrates how technologies are not neutral but encompass specific social and political values.

In contrast to instrumentalism, substantivism assumes that technologies can be used for either liberating or destructive means, according to the nature of the technology itself, which establishes and controls society, rather than according to the means and goals of human actors. Human agency, then, cannot control technologies; instead, the technology's inherent logic and goals determine its use. From this perspective, the logic and goal of a weapon is to harm and perhaps even to kill. By contrast, the logic and goal of the printing press is to diffuse information. These examples show how the nature of technology predetermines how the technology will be used and the kinds of impact it will have on society. Substantivism gained social relevance during the Cold War, when the atomic bomb made the possibility of mass destruction very real. Atomic weapons shaped society, increasing fear and impacting people's perceptions of safety.

4. Critical Theory

Critical theory suggests that technology is the product of both technical and social factors. Technology is not simply a means of satisfying goals but a process that directs a specific mode of living and understanding. Technology is not viewed as a symbol of linear progress, but rather as an element capable of adopting different possibilities and directions depending on the social influences and values of its users. Technology must be understood, then, within the context of its use and development. When governed by a **technocracy**, technology embodies the values, social structures, and goals of **hegemonic elites**. That is, the ruling class dominates through the use of technologies that subserve their needs. By contrast, participatory democratic actions offer an alternative to technocracy through "tactical resistance to established designs [that] can impose new values on technical institutions and create a new type of modern society" (Feenberg, 1999, p. 128). Through resistance, technology can be used toward democratic aims, instead of technocratic interests reflecting the values of the social system that makes use of the tool. Chapter 11 discusses the example of counter-surveillance to illustrate the use of technology to question existing forms of domination in society and to establish new norms.

Science and Technology Studies (STS)

Science and technology studies (STS) is an interdisciplinary field concerned with the study of how scientific and technological changes intersect with society. Early STS theorists such as Ellul and Vanderburg (1964, 1981) and Mumford (1967, 1981) argued that technology was an independent force dominating society and thus requiring some form of control and delimitation (Cutcliffe & Mitcham, 2001). STS, however, has abandoned the view that technology is an autonomous force at work independently from society. It now aims to analyze technology in its unique social, local context of "complex societal influences and social constructs entailing a host of political, ethical, and general theoretical questions" (Cutcliffe & Mitcham, 2001, p. 3). This fits perfectly with the definition of technology proposed in Chapter 1. Technology in this context is conceptualized as value-laden, actively shaping and in turn being shaped by culture, politics, and social values (Cutcliffe & Mitcham, 2001). It rejects deterministic assumptions of the effect of technology and calls for **holistic approaches** that employ **qualitative methods** to study technology, such as interviews, case studies, and ethnography. Table 3.1 provides a useful visual summary of key characteristics of STS approaches (Bijker et al., 1999).

There are two major challenges to applying STS to any research project (Cutcliffe & Mitcham, 2001). First, STS aims at conducting meaningful research

Table 3.1 Key Characteristics of STS Approaches

Characteristic	Description
1. Rejection of technological determinism	STS rejects the notion of technological determinism, where technology is perceived as the agent of social, cultural, political, and economic change.
2. Rejection of social determinism	STS also rejects the notion of social determinism, where the inventor of a technology alone drives technological progress without any consideration of the social system in which an invention occurs.
3. Holistic approach	STS intends to study the entire socio-technical system and not the social, political, cultural, and economic dimensions separately; that is, social factors are examined in relation to use or non-use of technology.
4. Qualitative methods	STS uses qualitative methods, such as case studies and ethnographies, to provide an in-depth examination of socio-technical systems that generate rich descriptions.

Source: Based on Bijker et al., 1999.

at both the micro and macro levels. Hence, STS needs to combine individual and global levels of analysis to be able to have a real impact on society's understanding of technology as well as policy. The linking of micro- and macro-level phenomena is a key challenge to sociological inquiry in general. The second major challenge is to embrace neither a utopian (promotional enthusiasm) nor a dystopian (anti-science and technology) view but, to provide in-depth analyses, the kind of analyses that uncover the local context and cultural backgrounds of users of technology, including their motivations for adoption. We discuss two approaches within the field of STS that are representative of the field: social construction of technology (SCOT) and actor network theory (ANT).

Social Construction of Technology (SCOT)

Social construction of technology (SCOT) emerged in the 1970s and its roots are evident in the sociological theories influencing academia during this period. In particular, the humanities eschewed a top-down view of history, politics, and the arts in favour of a bottom-up approach that sought to understand the social constructs and relationships underpinning everyday life.

SCOT advocates, such as Wiebe Bijker and Trevor Pinch, do not see technology as shaping human action but instead see human action as shaping technology. Social constructivists argue that a technological object can acquire different uses and values according to the social context in which it is placed. For example, video games can be a fun way for kids to spend their downtime, learn new skills, and enhance their self-worth through mastery of the game goals. A different use and value can be given to video games when they are offered to those same kids by a single father who needs to balance work-related demands and taking care of his younger children. In this case, the video game becomes an inexpensive babysitter that allows the father to focus on other tasks while his children are absorbed in the video game console. However, this scenario has further ramifications if the father, out of necessity, allows the child to spend many hours on the game and this then negatively affects the child's behaviour (Nierenberg, 2014; Przybylski, 2014). On the other hand, a study by Przybylski (2014) shows that children between 10 and 15 years of age who spent less than one hour a day playing were better adjusted psychologically than those who spent no time on these games. This study suggests that engaging in video games, particularly when that engagement is limited in time and scope, does not necessarily have only negative effects on psychological adjustment and well-being. As a result, the value and consequences of any technology are best understood in terms of different uses and the value assigned in the specific social context.

Scholars employ SCOT to understand technical change, the design of tools, and the technology–society relationship. Four key terms help understand the interplay among design, technology, and society: (1) the **relevant social group**, (2) **interpretive flexibility**, (3) **closure** and **stabilization**, and (4) **wider context** (see Table 3.3).

1. Relevant Social Groups

Relevant social groups are important because of their influence on the meaning attributed to an artifact (Bijker, 2009). Meaning is obtained through interacting with like-minded social groups, who share a similar opinion about a given artifact and its uses. Pinch (2009) has argued that "[i]t is the meanings given to technics . . . that provide a way of understanding successful, failed, tangential, and niche-market technologies" (p. 46). Without the necessary societal support, a new or existing technology can fail to be viewed as useful within a given group, causing both new and older products to be viewed as obsolete. An example of this is the study by Grimes (2014) that attempts to examine how the world of video games can be seen as a "heavily negotiated terrain of activity" (p. 5). In this study, children are the relevant social group as they are the users and co-shapers of the video games and play a role in how "ideal play" is conceptualized in this context. The six video games examined by Grimes are depicted in Table 3.2, including their launch dates, owners, and market sectors.

Based on her analysis of the games, Grimes (2014) identified four themes in terms of how the child player was configured and described in the six games:

1. *Easily amused*: The analysis revealed that most games had limited opportunities for interaction, customization, and communication. This seems to be in stark contrast with the games' goals of promoting interactivity and creativity.
2. *"At risk"*: Most of the games contained many safety features to restrict the content that children could see and to limit their interactions with other players. Often a predefined list of terms was provided by the game to limit interaction to these terms. This greatly restricts communication between players and players' ability to verbalize their thoughts and experiences.
3. *Nice player*: In most games, an idealized form of children's play was represented through the reinforcement of rules around appropriate behaviour.

Table 3.2 Six Virtual Worlds Selected for Analysis

Name	Launch Date	Population Size at Time of Study[a]	Owned By	Market Sector
BarbieGirls	April 2007	1 million	Mattel	toys, media
Club Penguin	October 2005	4 million	Disney	toys, collectible game cards, media
GalaXseeds	February 2007	60,000+	Corus Entertainment	media/TV
Magi-Nation	February 2008	unknown	Cookie Jar Group	toys, collectible game cards, media
Nicktropolis	January 2007	4 million	Nickelodeon	media/TV, toys
Toontown	June 2003	1.2 million[b]	Disney	theme park, media, toys

[a] Data on population sizes were drawn from company-published press releases and player rankings on the virtual worlds' websites.
[b] Estimate for paying members. However, Disney announced in 2008 that since its launch in 2003, over 20 million avatars have been created within Toontown.

Source: Reproduced from Table 1 in Grimes 2010. © 2015, SAGE Publications

It was made clear that no bullying and no troublesome or mean behaviour would be tolerated, even though these are often a part of play and not uncommon behaviours on playgrounds.

4. *Consumer*: Most of the games involved some kind of currency that allowed players to purchase additional features or virtual items. In some cases, virtual consumption was also tied to real-world monetary exchanges.

The analysis shows "play" being narrowly designed around a neoromantic, consumerist ethos. The designers seem to struggle between a need to design games that are creative, imaginative, and fun, and the need to provide an environment for children that is safe, rewards kindness, encourages learning, and at the same time allows for consumerism to occur. By contrast, popular video games among youth, like Fortnite, have received considerable criticism because of how play is conceptualized as violent behaviour against other players (Muncy, 2019).

2. Interpretive Flexibility

Interpretive flexibility describes how artifacts are not neutral; instead, their meaning emerges in a socio-cultural context. For Pinch and Bijker, what this means is "not only that there is flexibility in how people think of or interpret artifacts but also that there is flexibility in how artifacts are designed" (1987, p. 40). The movie *The Gods Must Be Crazy* (1980) provides an example of interpretative flexibility. The Coca-Cola bottle creates major upheaval in the community as the bottle is repurposed for a variety of tasks, including curing snakeskin and making music, and as a mortar for food preparation. Because each community member feels that this bottle has become central to his or her work, and because there is only one bottle, the result is inevitably conflict and controversy. The movie makes it clear that a simple tool, such as a bottle, can be used for multiple purposes and its meaning and relevance emerge in a socio-cultural context.

3. Closure and Stabilization

As an artifact gains prominence in society, its flexibility to be interpreted for other uses decreases because the social construction of the artifact's meaning becomes solidified. Closure describes the moment in the cycle of design when the relevant social group has reached a consensus of what the tool is all about. When stabilization is reached, the tool has been assigned a very specific use and little experimentation will occur from that point onward as to what other purposes the tool could serve.

4. Wider Context

The last term is wider context, which describes how "the sociocultural and political situation of a social group shapes its norms and values, which in turn influence the meaning given to an artifact" (Pinch & Bijker, 1987, p. 428). Norms and values are powerful frameworks for interpreting artifacts and for understanding their value in society. A prime example can be seen in reproductive technologies such as birth control. Even though birth control methods such as hormonal contraceptives are generally safe and effective, with widespread popularity in many parts of the world, they are rejected in some regions because they are in opposition to the culture's values and norms. (This clashing of values and technology will be discussed in Chapter 5 under the umbrella term **compatibility**.)

Box 3.2 uses the case study of the electric car in France to further exemplify some of these points, and demonstrates how the development of the electric car can be examined using SCOT. The strength of this approach is that it provides a useful framework for understanding how design unfolds over time and helps identify key social factors. When reading Box 3.2 also think back to the discussion of electric vehicles in Chapter 1.

Nevertheless, critics of SCOT, such as Langdon Winner, have argued that the theory lacks an understanding of "the dynamics of technological change," such as the social context, economic conditions, and structural relationships within society at the time of a particular technology's introduction (Winner, 2003, p. 234). Second, critics have argued that SCOT supporters spend too much time studying the development and social construction of a technology, while at the same time showing "a disregard for the social consequences of technical choice." Winner (2003) characterizes these as the **social after-effects** that result from selecting or adopting one technology over another, such as the transformation of cities that

Table 3.3 Key Terminology in SCOT

Key Terminology	Definition
1. Relevant social groups	Social groups such as developers, engineers, and investors shape the meaning given to technologies through their visions and values.
2. Interpretive flexibility	There are a wide range of ways of looking at an artifact and its potential applications in the real world.
3. Closure and stabilization	Through negotiation among key social groups and users, over time an artifact is given a specific meaning and use.
4. Wider context	Contextual factors influence the meaning ascribed to an artifact.

Box 3.2 The Case of the Electric Car in 1970s France

Despite its anticipation for several decades, the age of the electric car is only now arriving thanks to California-based car manufacturer Tesla, discussed in Chapter 1. With their low fuel costs, quiet hum, and clean emissions, electric cars should be more popular than they are. Yet while hybrid vehicles (those powered by hybrid fuel cells) have made their mark on the North American automotive landscape, the emergence of the electric car has been slow. As discussed by Callon (1987), the development of the electric car is an interesting example of how the success of an emerging technology can be heavily weighted by the social factors and shifting values constructing its meaning.

Callon's (1987) work analyzed the attempt of several parties, representing science, industry, and government, to combine their knowledge to create an electric car in 1970s France. In response to social protests and spiralling fuel costs, Electricité de France (EDF) envisaged "a society of urban post-industrial consumers" who shared the notion of ushering in a "new era of public transport" driven by the cost-effective and environmentally friendly electric car (Callon, 1987, p. 85). The Compagnie Générale d'Electricité (CGE) would design the electrical components of the vehicle, such as the motor and batteries, and car manufacturer Renault would assemble the vehicle's body and structure. Problems began to arise within the process, however, when the cheap catalysts envisioned to run the vehicle became contaminated or destabilized. Furthermore, Renault started to actively critique the project based on its newly acquired electrochemical expertise and its understanding of consumer needs. Worst of all, the general public's initial enthusiasm for the electric car, with its projected better fuel performance and fewer emissions, rapidly waned in the face of rising unemployment (Callon, 1987, p. 91). Without support from relevant social groups, interest in the project died and the traditional car was once again perceived as an acceptable, and perhaps even appealing, mode of transportation. This case study is particularly relevant when we consider how successful Tesla has been in branding its electronic vehicles and the worldwide surging consumer demand for its Model 3 and Model X.

has resulted from the widespread adoption of cars. Cities are designed to optimize driving but are not conducive to biking and walking. This shows how technological choices have social after-effects that are transformative and disruptive to many other domains of life.

A third area of criticism is the way in which SCOT scholars give importance and salience to the opinions of some groups and interests over others. That is, SCOT overlooks those groups within society that have no input in approving a technology or that suffer from the social consequences of that technology's selection (Winner, 2003, p. 238). Consider current discussions in Canada around the acquisition and construction of energy pipelines (Kheraj, 2018). Multiple social groups have divergent opinions around the utility, safety, role, and environmental effects of the technology on people and land. In the past, Canada has ignored the perspectives of some social groups and favoured the viewpoints of others, as seen by the unilateral construction of two major pipelines in the 1950s. For example, Indigenous peoples have often been left out of the discussion despite the energy pipelines affecting them directly (this discussion will be further expanded in Chapter 12). By disregarding these groups, SCOT provides only a limited perspective on how technologies are diffused and how they gain social relevance in society. Additionally, the relativist nature of the SCOT approach—in which each social group gives meaning to a technology—provides little information for determining whether one social construction is better or more valid than another (Boreham, Parker, Thompson, & Hall, 2008).

Actor Network Theory (ANT)

Actor network theory (ANT) is a sociological theory popularized in the 1980s by scholars Latour, Callon, and Law. This theory treats "everything in the world as a continuously generated effect of the webs of relations within which they are located" (Law, 2009, p. 141). Proponents of this approach examine and describe the relationships and practices undertaken by actors. Within ANT, **actors** or **actants** can emerge in a variety of forms ranging from human beings to concepts or ideas, technologies, institutions, and so forth. Rather than explain why relationships between actors occur, the theory instead examines *how* these relationships are constructed and practised—that is, ANT is based on a constructivist approach, where relationships are placed in a particular social context. A strength of this theory is its ability to examine the active processes and interconnected relationships between human and non-human actors, which is not possible in many of the other theories of technology.

At the core of understanding these relationships is the concept of the **network**. Networks consist of relationships between people, but they also comprise interactions with objects and organizations. In Latour's classification of the term, a network contains "resources that are concentrated in a few places" and that are connected to one another (1987, p. 180). Subsequently, the "connections transform these scattered resources into a net that may seem to extend everywhere" (Latour, 1987, p. 180).

In contrast to the contemporary usage of the word *network* to characterize the transportation of information, ANT views the role of the network as one of **transformation** (Latour, 1999). Networks are categorized by their size, concentration of resources, and fragility. Using telephone lines as an example, Latour notes that individual lines are "minute and fragile" to the point that they are not rendered on typical maps, and each line can be easily cut (Latour, 1987, p. 180). However, as a group, the telephone lines seemingly encompass a vast network, crossing geographical boundaries and functioning as a single unit. Nevertheless, if a single element of the network is fractured or disabled, the network is prone to failure. To remain strong, networks undergo a continual process of re-evaluation and redevelopment, which includes being influenced by elements from other networks. For instance, the Internet has changed the telephone network in fundamental ways.

ANT can be applied to contemporary analysis of spatial phenomena that intersect with new technologies. Two types of spatiality are examined within ANT (Michael, 2017):

1. **spaces of prescription**: these are networks with a clearly defined and recognizable centre. The network is overall stable and follows pre-established norms and rules.
2. **spaces of negotiation**: these are networks where the connections are constantly renegotiated by various social actors.

An example of how we can examine geographies through the ANT lens is by looking at activities such as climbing. Barratt (2012) studied how new **hybrid spaces** of rock climbing emerge through a network that is comprised of new and old technologies. New technologies are action cameras that allow a climber to video record the entire experience thereby adding excitement, showcasing risk, and also providing authenticity (Michael, 2017). Video can then be posted on YouTube or shared via social media amplifying the audience and adding to the experience even after the climb is completed. Old technologies that are part of the experience include climbing shoes, bouldering mats, and other needed equipment. The technologies serve a dual purpose: first, they enhance the capabilities of the human body, and second, they heighten and modify the experiences of the climb. This analysis of the use of old and new equipment for rock climbing shows how ANT "illuminates spatiality as fluid and multiple, complex and contested, connected and differentiated" (Michael, 2017, p. 114). As more technologies become integrated into geographical spaces, additional analysis will reveal how they are changing the ways we understand and interact with urban spaces. A good example of this is Yelp, a locative app, that allows users to identify restaurants, bars, and coffee shops near them. Yelp also serves as a recommender system, thereby connecting a geographical map of businesses with a global community providing "recommendations" on local places in real time.

Limitations of ANT

Despite ANT's merits, however, scholars have identified several weaknesses. First, a major point of criticism for the opponents and detractors of ANT is the heterogeneous nature of its actors and networks. By placing human and non-human actors on the same footing, too much emphasis is placed on the role of non-human actors, thereby reducing human actors to mere objects. This is particularly relevant when detailing the role of power in shaping, re-casting, and ending alliances between human and non-human participants (Grint & Woolgar, 1997). The role of power in defining the relationship between human and non-human participants was discussed in Chapter 2 when we examined how the nature of work, and the relation between craftspeople and their craft, drastically changed as a result of the introduction of new weaving and spinning machines in the beginnings of the industrial era. In this instance, weaving machines did not remove craftspeople from their jobs, but

Table 3.4 Key Limitations of ANT

Limitation	Description
1. Heterogeneous actors and networks	Human and non-human actors are given equal significance, ignoring the role of human agency in decision-making. This ignores the relevance of power and economic interests in technological developments.
2. Networks remain vague	The structure and composition of networks are not sufficiently described, nor are the connections that link various actors.
3. Macro-structures are ignored	Fails to consider the role of macro-level social structures, social norms, and cultural practices in shaping the network and its configuration.

employers used their position of power to replace highly skilled craftspeople with a larger, less expensive, and unregulated workforce (Berg, 1994). Second, critics have also suggested that ANT fails to properly define or describe the nature of its networks: the structure of these networks can appear overly complex and abstract, making it difficult for others to understand what the networks mean. Third, critics have opined that the theory tends to acknowledge localized networks and fails to examine either the role of broader macro-level social structures or the influence of cultural practices in affecting the construction and redevelopment of a network (Walsham, 1997).

Technological Affordances

The theoretical framework of affordances allows us to understand what features, functions, and characteristics of digital media facilitate what kinds of social and information possibilities and constraints. The *affordances* term has a long-rooted history in psychology (Gibson, 1966), human–computer interaction (Norman, 1988), and communication (Wellman et al., 2003). Affordances refers to how computers, apps, and interfaces together create a range of action possibilities. Thus, affordance comes to mean to invite or suggest a user action. For example, the "like" feature on Instagram makes it very easy to interact with large amounts of images. As a user scrolls through the images, a simple "tap" on the image represents a "like". Users can thereby interact with hundreds of accounts and images, making it one of the most fast-paced online environments.

History of Affordances Concept

Gibson (1966), in the field of psychology, coined the term "affordances" to describe how features of the environment create opportunities for good or ill in terms of an object. Gibson (1966) describes it as follows:

> The verb to afford is found in the dictionary, but the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the [person] in a way that no existing term does. It implies the complementarity of the [person] and the environment. (p. 127)

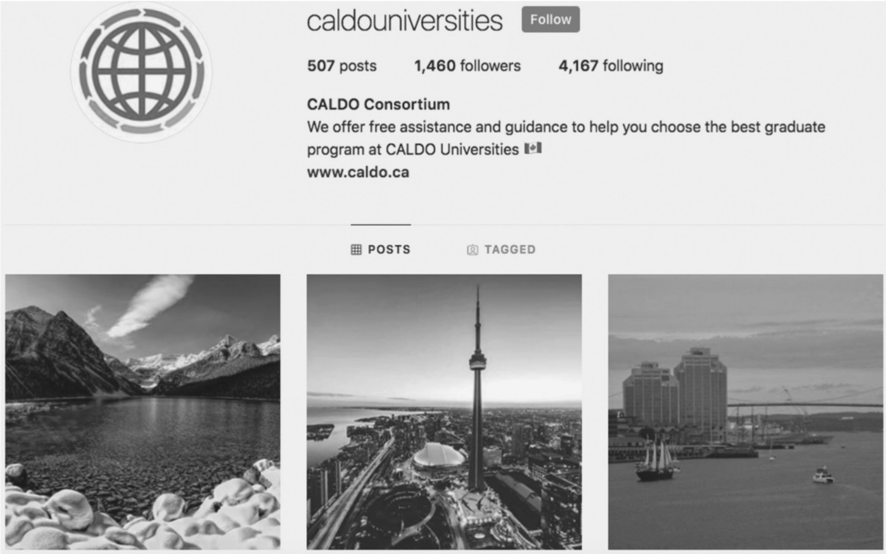


Figure 3.4 CALDO Consortium (@caldouniversities) uses the features and functions available on Instagram to attract students from around the world to come and study in Canada.
Source: CALDO University Consortium (@caldouniversities)

Gibson's (1966) object affordance concept demonstrates how the design of objects interacts with a person's mental model and thereby elicits specific opportunities. The most common example used in the literature is that of a door handle. A well-designed door handle elicits opening of the door without the need of any additional explanation or illustration. It is simply well designed. By contrast, a poorly designed door handle may need clarification in the form of text; for example, a word like "pull" or "push" to help a person navigate the space.

Norman (1988) developed the concept further in the context of human–computer interaction (HCI) to refer to how computers create a range of action possibilities. In computer science, the affordance question helps with the design of a user interface (UI) by establishing how specific buttons, icons, features, or functions elicit specific forms of interaction by the user. In this context, affordance comes to mean to invite or suggest a user action or actions.

Affordances of Social Media

Studies looking at the affordances of social media stress both the social and information benefits (Fox & McEwan, 2017). Fox and McEwan (2017) argue for a move away from studying channels exclusively to focusing more on specific features, "considering affordances instead of channels should offer more nuanced—and durable—theorizing that is more flexible across contexts" (p. 299). A look at affordances allows us to understand the development of social norms in digital communication and link these to features and functions (Quan-Haase, Cothrel, & Wellman, 2005). There can also be a feedback loop in that understanding affordances in the educational context can aid designers to map social and information behaviours to features and functions (McCay-Peet & Quan-Haase, 2016), allowing them to design with learning outcomes in mind.

The affordances concept has been applied also more widely to how features and functions of digital media lead to key **social affordances** in society (Bradner & Kellogg, 1999). Wellman et al. (2003) found that digital media such as listservs, email, and instant messaging afforded new types of communities by facilitating long-distance communication, strengthening social ties near and far, and promoting connectivity and personalization. Some of the key social affordances include "always" connectivity; through widespread adoption of mobile phones worldwide, keeping connected 24/7 is a daily reality. For example, phone calls and messages emphasize 1:1 private conversations, while email affords more possibilities for One:Many as well as for Many:Many communication through address lists and message forwarding, and social media such as Facebook even more strongly emphasize Many:Many communication through posting to personal networks. These social affordances embed digital media heavily into everyday life routines and practices, including family ties, political activity, and local and non-local community. Some understandings of affordances look at general features such as personalization, while other approaches look at specific interaction features such as retweets (Nagy, & Neff, 2015). This allows scholars to use the affordances framework flexibly and apply it to a wide range of domains and research questions. Box 3.3 shows how affordances theory can help us understand how fake news propagates within social media. It shows how features and functions of social media help diffuse misinformation.

Critiques of the Affordances Concept

The affordances concept allows for investigations into what features and functions of technology facilitate or constrain social and information behaviours. Even though the concept is widely used in computer science, communication, and new media studies, there has also been criticism around its definition and application (Quan-Haase, 2019). First, the term is often only loosely defined and is used in a wide range of contexts, thereby creating conceptual vagueness (Nagy & Neff, 2015). Second, some scholars have argued that an exclusive focus on features and functions can leave scholars myopic to social contexts, thereby favouring technological determinism. Third, Fox and McEwan (2017) warn scholars not to confuse researcher-perceived affordances with user-perceived affordances. That is, a feature or function may suggest specific affordances from the researcher's point of view, but these may in fact be perceived very differently by the user. Finally, the meanings given to affordances may vary across cultures, communities, life stages, and other social factors that need to be taken into consideration (Quan-Haase, Williams, et al., 2018). Affordances may particularly vary across levels of expertise in using digital media. Affordances that allow an expert user to find new information online and discover satirical texts, images, and videos may overwhelm a novice user of digital media and lead them to fake news and misinformation.

Box 3.3 Information Affordances and Fake News

A phenomenon that has received considerable attention in the media is the propagation of "fake news." Fake news is defined as "news articles that are intentionally and verifiably false, and could mislead readers" (Allcott & Gentzkow, 2017). Fake news articles can have political or social implications and are difficult to disprove (Garber, 2018). Fake news has been on the rise worldwide and has affected the 2016 US election, debates in Canada around the construction of energy pipelines, and the role of vaccines in preventing the flu (Cain, 2018). Several social and information affordances of social media facilitate the propagation of fake news. Often users forward, like, or share stories that have catchy headlines, so-called "clickbait." Clickbait is "content whose main purpose is to attract attention and encourage visitors to click on a link to a particular web page" (Oxford English Dictionary). While the headline may sound interesting, the content may not be true. As a result of its catchiness, this kind of content may attract more likes, shares, and forwards, leading to rapid dissemination across social networks. Fake news can serve several functions including entertainment, supporting political agendas, or swaying public opinion (Bessi & Ferrara, 2016). In a 2017 poll, 80 per cent of Canadians felt confident in their abilities to identify fake news. Yet, when tested on a series of articles, 63 per cent failed and 37 per cent passed. In the study, English-speaking Canadians were presented with six images of front pages from news sites and asked to identify fake stories. To pass, a person had to identify at least four of the six news sites correctly. This shows how tricky it can be to properly identify fake news. Another affordance of digital media that complicates the identification of fake news is the fact that these stories are often shared or liked by family, friends, and other trusted network members. We tend to give the stories more credibility because we see our social networks as being the source, even though they may be simply serving as conduits of fake news. Often, those sharing a story may not have read or verified the story themselves. This makes social networks and digital connectivity a great means for sharing information quickly, but it also increases the likelihood of misinformation to diffuse widely and at a rapid speed.

Conclusions

Simple approaches to understanding the interrelationship between technology and society have been largely refuted. Utopian and dystopian visions of technology are too simplistic and do not consider how technology has become embedded in our everyday practices. Technological determinism views the effect of technology on society as unidirectional and does not consider social factors. By contrast, social determinism assumes that social factors drive technological design, use, and consequences alone without ascribing any power or influence to technology. Not even approaches advocating soft determinism provide a satisfactory answer as to how technology and society intersect. Current understandings of technological society put forth in the field of STS propose a **mutual shaping** process, where technological factors impact society and in turn societal factors impact technological design, development, implementation, use, and social consequences. In these approaches, technology is not studied as a universal force; instead, technologies are examined in unique social contexts with specific cultural, religious, and political characteristics.

Questions for Critical Thought

1. When comparing utopian and dystopian views of technology, which one do you think has more applicability to society today? Provide a rationale for your point of view.
2. What are the main criticisms put forward against the actor network theory (ANT) approach?
3. How can we study how video games influence children's learning and well-being? Are some games more suitable than others to the concept of the ideal "child player"?
4. Define the affordances concept and outline what social and information affordances your favourite social media tool provides in your everyday life. Think outside the box and discuss both positive and negative affordances as well as short-term and long-term effects.

Suggested Readings

Bowker, G. C., Timmermans, S., Clarke, A. E., & Balka, E. (Eds.). (2015). *Boundary objects and beyond: Working with Leigh Star*. Cambridge, MA: MIT Press.

This edited collection shows how science and technology studies is situated within ecologies of knowledge that represent complex social and technological systems.

Grimes, S.M. (2014). Configuring the child player. *Science, Technology & Human Values*. Advance online publication doi: 10.1177/0162243914550253.

The article presents a study of various video games and argues that these are negotiated spaces where ideas resurface of what an imagined, ideal "child player" looks like.

Michael, M. (2017). *Actor-network theory: Trials, trails and translations*. London, UK: Sage.

This book represents a new and critical look at ANT and its many contributions to technology studies.

Pinch, T., & Bijker, W.E. (1984). The social construction of facts and artifacts, or how the sociology of science and the sociology of technology might benefit each other. *Social Studies of Science, 14*, 399–441.

The paper describes an integrated social constructivist approach toward the study of science and technology. From this perspective, science and artifacts are defined as social constructs.

Online Resources

Computer History Museum
www.computerhistory.org/
The website provides the world's most comprehensive institution dedicated to the history of computing and its impact on society.

Helping Ensure News on Facebook Is from Trusted Sources
https://newsroom.fb.com/news/2018/01/trusted-sources/
Facebook adds information to this site to detail how it is countering the large influx of fake news and misinformation on its site.

Life Hacker
https://lifehacker.com/video
This site posts a wide range of videos on how to use software programs like Microsoft Windows or how to solve everyday problems.

Society for Social Studies of Science (4S)
http://4sonline.org/
This is an international non-profit organization dedicated to the study of science, technology, and medicine, with an emphasis on how these develop and interact with their social contexts.

Interactive Activities

Activity 1: Affordances of LinkedIn

LinkedIn is a worldwide platform that allows users to create profiles and connect to other users and businesses. The value of LinkedIn lies in connecting people who are looking for a job with those who can offer positions. Take a look at the key features of LinkedIn and consider the social and information affordances of the platform:

- What features in LinkedIn allow you to create a sense of personal connectivity rather than simply connecting information?
- What features of LinkedIn allow for connecting unexpected parties that may not know each other?
- What features of LinkedIn allow those looking for a job to identify companies that would fit their personality and personal values?

Activity 2: Location-Based Services

Consider a service like Yelp, which is used daily by thousands of users.

- How does Yelp change how we navigate a city?
- What information provided on Yelp influences your decision to go to a place? The price, the reviews, the photos?
- What kinds of reviews have you provided on Yelp? Do you think they have affected others' decisions to go to a place?
- To what extent does Yelp preclude serendipitous discovery of "new" places, if everyone follows Yelp's advice?

4 Techno-Social Designing

Learning Objectives

- to look at how technology is designed and developed prior to users adopting it;
- to trace the emergence of technopoles and uncover their social significance in the context of modern cities and economies;
- to discuss the concept of the creative class and show how it is leading toward economic prosperity in post-industrial cities;
- to investigate the concept of research and development (R&D) and the pressures existent in the sector;
- to examine the inner workings and outer pressures of software development teams, in particular in the gaming industry; and
- to uncover the ways in which algorithms structure how we see the world and serve as tools of oppression.

Introduction

Users of technology are, for the most part, oblivious of the stages that precede the adoption and use of a technology. For instance, it took many iterations, failures, and setbacks before the cellphone gained widespread acceptance and use. Most users do not consider the creative processes that underlie technological invention and innovation because these processes do not directly affect their day-to-day use of tools. The aim of this chapter, then, is to uncover these often hidden creative processes and to examine the visions of developers, the challenges experienced by developers, and the complex interweaving of technological development and societal factors.

In addition to examining theories of design, in this chapter we introduce the term **technopole**, which is used to describe specialized cities dedicated solely to technological innovation. We focus on the gaming industry in Canada—specifically in Vancouver—as an example of the kind of labour that is involved in the development and production of video games. We show how the establishment of the gaming industry in Vancouver has yielded a vibrant technopole that attracts a highly educated workforce. We highlight the political, social, and economic repercussions of technopoles, as well as their vulnerability in the context of fragile global markets.

The chapter continues by explaining the concept of **research and development (R&D),** the pressures existent in R&D teams, and the ways that innovation occurs in these teams. We then directly link R&D to economic development and review Schumpeter's classic economic model, which argues that the structure of society is directly linked to creative processes and innovations. Next, the chapter presents statistics from the **Organisation for Economic Co-operation and Development (OECD)** that compare expenditures on R&D across nations and examines how these are linked to global economic development. The final part of the chapter investigates the inner workings and the outer pressures of software development, which is one type of R&D that has come to occupy a central role in the world economy. As part of the discussion on software development, we examine **code** and algorithms. While much technology today runs on invisible algorithms, these embody power relations and can serve as forms of social oppression.

Technological Design and How It Intersects with Society

The study of technology tends to focus on technologies that are widely used in society without giving much consideration to the **creative processes** that take place in the design and implementation phases of those technologies. However, technological design occurs long before a technology is revealed to users. Extensive testing, developing, and prototyping take place during the design phase of a new product, which can extend over a long period of time. For example, developments of the cellphone were described as early as 1945, when J.K. Jett, the head of the US **Federal Communications Commission (FCC)**, announced that AT&T had for the first time used a type of low-powered transmitter that employed high-band radio frequencies that could allow millions of users to communicate (Farley, 2005). The first cellphone was introduced in 1973 with the release of a handset that weighed approximately 2 kg (Heeks, 2008). Despite these advances, however, cellphones did not become widely used in North America until the 1990s and did not really take off until around 2002. By 2014, cellphone penetration rates were above 100 per cent in some Asian countries; Hong Kong, for example, had 237 phones per 100 inhabitants, suggesting that each individual owned multiple devices.

What are the reasons for the general public's lack of knowledge about the field of technology design? Why do scholars not have a better understanding of how design unfolds if it often spans such a lengthy period? Several important factors are responsible for the lack of knowledge about this phase. We discuss three of the more central factors next.

1. *Lack of reflective processes*: Because developers of technology are primarily concerned with the day-to-day tasks at hand and are also usually pressed for time, they do not tend to reflect on how the design process unfolds and what factors impact it. When, for example, Pasteur and his team developed the **pasteurization** process in the nineteenth century, they were not concerned

with how they made the discovery; they had more pressing concerns, such as developing a more effective technique for food preservation that ultimately could help prevent illness and save lives (Latour, 1988).

2. ***Retro-analysis***: Most accounts and analyses of how a given technology was designed often become relevant, or have social significance, only after the fact. For instance, Bruno Latour (1988) examined the complexities of how the process of pasteurization was developed almost 200 years after Pasteur and his team discovered the technique. Most insights are gained through archives, memories of people involved, and any other paper trail available.
3. ***Black box of design***: Many innovations occur behind closed doors as a result of competitive pressures, and hence it is difficult, or impossible, for researchers to obtain access to these developments as they unfold. This is particularly the case with research linked to the military, which often falls under the rubric "top secret." But this secrecy applies equally to innovations occurring in other industries: fears of spies are not merely a myth in R&D but often a reality. Former Google employee Paul Adams (2011) experienced the consequences of secrecy in the software development industry when he left Google to start working for Facebook and was denied authorization to publish his book *Social Circles*. For Google, this work represented a major infringement of its intellectual property, as Google+ had not been released at the time. The company feared that information contained in Adams's book would constitute a leak to the public prior to the much-anticipated release of Google+.

These three factors are linked directly to our limited understanding of how design unfolds. There is a need to develop new strategies to better examine how social factors affect technology design, production, and use. Sociologists can make an important contribution by helping us understand how individuals make sense of technology and how social factors affect design and production. Inequalities in wealth distribution, poor labour conditions, and social unrest constitute central pieces of this sociological analysis. We examine next how systems theory helps us to understand the social factors at play in technological design. Then we look at technopoles as the key centres of innovation, where products are designed and produced.

Systems Theory

In this section, we discuss the key premises of **systems theory**, a highly influential approach to the study of how technological and societal factors impact design. Systems theory examines how physical artifacts, social institutions, and social context all interact to influence design and cause social change (Hughes, 1983). In his influential book *Networks of Power: Electrification in Western Society, 1880–1930*, Thomas P. Hughes defines *systems theory* as the study of self-regulating social and natural systems that can influence their own behaviour through feedback loops.

Bánáthy (1997) defines a **system** as "a configuration of parts connected and joined together by a web of relationships" (p. 22). Hughes developed systems theory with the aim of understanding the design and development process of technologies in the context of societal forces. For him, societal forces play a key role in the design and development process because technological changes are closely linked to the goals and interests of individuals, groups, and organizations. Hughes illustrated the use of systems theories for studying technology by studying the development of the electric power grid. His primary goal in presenting this case study was to

> explain the change in configuration of electric power systems during the half-century between 1880 and 1930. Such change can be displayed in network diagrams, but the effort to explain the change involves consideration of many fields of human activity, including the technical, the scientific, the economic, the political, and the organizational. This is because power systems are cultural artifacts. (Hughes, 1983, p. 2)

The **systems approach** allows researchers to simultaneously examine micro- and macro-level phenomena; for instance, design decisions made in Facebook's headquarters can be directly linked to trends unfolding in the wider society, such as the introduction of Twitter, which has posed serious competition (Kirkpatrick, 2010). Hughes (1983) suggested that three stages characterize the design and development of a technology:

1. **Technology development**: In this phase, the technology is being invented and developed. The technology slowly takes shape, with inventors and entrepreneurs working on creating a prototype or demonstrating its utility. Often other players, such as managers and financiers, may also be indirectly involved in this phase.
2. **Technology transfer**: During the technology transfer stage, innovations are transmitted from one geographic area or social group to others. In this phase, agents of change play a central role in aiding in the transfer of technological know-how from inventors to the larger public or specific target groups (see Chapter 5 for a more in-depth discussion). Agents of change can include inventors, investors, managers, etc.—generally, individuals with a vested interest in the spread of the innovation.
3. **System growth**: Examining the growth of a system is a methodologically challenging task. A good example of this process is the development of the personal computer (PC). The PC has experienced differential growth in its various components, including random-access memory (RAM), processor (CPU), screen quality, and storage capacity (hard disk). Differential growth occurs when one component develops rapidly, leaving many other areas of development behind. For example, in the computer industry, software developed rapidly, often forcing PC hardware components to keep up with the requirements

> in speed and capacity (Dedehayir & Mäkinen, 2008). As a result, users had to update their computer every few years so that current software programs could run efficiently. Central to the examination of system growth is an understanding of **reverse salients**, which is an imbalance in the growth of a system's sub-components. The concept has been widely adopted in the social and computer sciences because "the socio-technical characteristic of the concept affords flexibility," allowing developers to focus on difficult-to-solve problems (Dedehayir, 2009, p. 586).

Hence, a key task of developers is to work around irregularities and attempt to have the system fully functional as a coherent whole. In order to be able to tackle these reverse salients, developers must first identify them as **critical problems**. Only then can potential solutions be proposed. A critical problem refers to a challenge that requires a complex solution, often bringing to bear both technological innovation and institutional or social change. An example of a reverse salient that was redefined as a critical problem is the slow progress in battery development. All components of a cellphone have developed at extraordinary speed, yet battery life continues to be a sub-component that has been difficult to advance. Most cellphones' battery life will last only 24 to 28 hours. This is identified as a critical problem by the industry and as battery design and function continues to improve, this will also translate into longer battery life for cellphones.

In the view of science and technology studies (STS) and systems theory, design is a central topic of inquiry that needs to address political, economic, social, and cultural factors. Without an understanding of how these factors play a role in the design of technology, technological progress is reduced to a purely technical process, ignoring the fact that technology is a central component in our technological society. That is, what technological problems we see as important to solve, for example, making decisions as to where we want resources to go—in the areas of the military, health care, education, or transportation—is also what defines us as a society.

Technopoles: Centres of Innovation

The term **information society** has been widely used to describe a shift in the economy from a structure where production was at the centre of economic development to one where knowledge is considered a central asset (see Chapter 1; Fuchs, 2010). Several terms have been employed to describe this shift, including *post-industrial society*, *post-Fordism*, *knowledge society*, *the information revolution*, and *network society* (Bell, 1973; Castells, 1996). In this new economic model, information and knowledge become key commodities, with capital and production still relevant but as secondary industries affiliated with the information society.

As a result of this shift, the centres of power have also shifted. Many terms have been used to describe the physical places dedicated to innovation, including high-tech sectors, biotechnology, and tech hubs. Castells and Hall (1994) use the term **technopole** as an umbrella concept and define technopoles as "planned developments" whose function it is "to generate the basic materials of the informational economy" (p. 1). Technopoles across the world show a certain kind of homogeneity: they are complex socio-technical systems constituting a geographical area that is made up of buildings, people, institutions, and corporations.

Castells and Hall (1994) view contemporary technopoles as arising from three interrelated processes:

1. **Information revolution**: A technological revolution built around information technologies, creating a need for the design of new digital tools, platforms, and content. As a result, a wide range of products and services are needed to sustain the information society that results. Examples include online retailers (e.g., Amazon), online travel brokers (e.g., Expedia), and content-sharing sites (e.g., Snapchat).
2. **Globalization**: The formation of a global economy that transcends national boundaries, governments, and laws. Such a system is highly interconnected, or **interdependent**, with each single component affecting other components located in different geographic regions. A good example of this is Airbnb, which connects users to accommodations anywhere in the world.
3. **Informational production**: The development of new forms of economic production centred on information. Informational describes an economy where "productivity and competitiveness are increasingly based on the generation of new knowledge and on the access to, and processing of, appropriate information" (Castells & Hall, 1994, p. 3). This is a trend away from the agrarian and industrial models, where the sum of capital, labour, and raw materials created economic growth. In the new model, the outputs from science, technology, and information-related industries are the basis for economic expansion (Rao & Scaruffi, 2010). An example of this is Facebook, a global social networking site that derives its value from giving third-party partners access to information about users or processing information about users that can push relevant ads to targeted social groups.

These three processes lead toward the creation of technopoles as centres of innovation, where new technologies are developed and tested. In these highly competitive environments, technological innovation develops from "learning by doing" instead of being based on off-the-shelf solutions (Castells & Hall, 1994). Those companies and institutions that compose the technopole have to be flexible and willing to constantly experiment with new ideas in order to remain competitive in a global market. These centres of innovation must, then, integrate seamlessly with service facilities in emerging economies, as well as with production centres often located in the **Global South**, "creating a synergistic interaction between design, production and utilization" (p. 5). The *Global South* is a term embraced in transnational and postcolonial studies to replace past terms such as *Third World* (i.e., Africa, Latin America, and *developing countries* in Asia), *developing countries*, or *least developed countries* (LDC). For example, the design, testing, and prototyping of products may occur in North America, but the production process often takes place in Asia, necessitating high degrees of co-operation and coordination among different firms.

In Box 4.1, we examine Canada's gaming industry in Vancouver as a model of a technopole that unites highly skilled workers, a geographic area, social networks, and public institutions with corporations that provide large sums of capital investment. The gaming industry in Canada is one of the largest worldwide and it contributed $3.7 billion in economic growth in 2017. With a 24 per cent growth from the previous year, it constitutes a growing sector of the entire Canadian economy (Entertainment Software Association of Canada, 2017). Several factors make Canada an ideal location for a technopole (Dyer-Witheford & Sharman, 2005): (a) a highly skilled labour force, (b) grants and supports from government, (c) competitive wages in comparison to other countries, (d) first-rate public education and health care, and (e) settlement in some of the most liveable cities in the world. Part of the business success of the Canadian gaming industry comes from industry–government partnerships in the form of financial support. The Canadian government has provided financial support to the industry via the **Canada Media Fund (CMF)**, which has provided funds to jump-start new business in the form of loans, and tax credits that help companies get started (McConnell, 2017).

Canada has a long history of **startup companies** in the gaming industry dating back to the 1980s. Startups are newly created companies with a strong emphasis on R&D. They often rely on **venture capital firms** and **angel investors** to help them establish their operations. Angel investors are individuals who provide capital investment for initiating technology businesses and in exchange become shareholders of the company or receive some form of repayment over time. The gaming industry in Canada has had close ties to universities. First, these companies have relied on skilled workers graduating from computer science, design, and communications programs. Second, much innovation in the gaming industry has come from publicly funded university–industry partnerships. This has created a diverse community that fused technical research and scholarship. This is a good example of the optimization of the use of basic research to solve applied problems, as discussed in Chapter 2.

Global Technopoles

Technopoles have emerged around the globe as governments become more and more eager to capitalize on the growing technology industry. However, technopoles also bring risks to local industries (Kirby, 2002). Kitchener-Waterloo, in Ontario, is a prime example of an economy that showed rapid growth with BlackBerry (formerly Research in Motion or RIM) dominating the mobile market and other high-tech companies moving into the region. As a result, real estate developed quickly,

Box 4.1 Vancouver: A Vibrant Centre for the Canadian Video Game Industry

Vancouver is a vibrant and multi-cultural city, with its beautiful views of the Pacific Ocean and the coastal mountains. Vancouver is also a hub of innovation and technological developments, in particular within the video game industry. In 2017, British Columbia's video game industry grew by 20 per cent, with 152 companies, which employed 5,900 people (Sapieha, 2017). The average salary in 2015 was about $77,300 per year, which is higher than the average salary across Canada of $49,738 (Entertainment Software Association of Canada, 2017). This mix of diverse and influential players led to large growth in the gaming industry.

Ben Nelms/Bloomberg via Getty Images

Coding, sports, and video gaming are intertwined at the Electronic Arts Inc.'s campus in Burnaby, British Columbia, Canada. Other releases include *Battlefield V*, *FIFA 20*, *NHL20*, *The SIMS 5*, and *Unravel Two*.

jobs expanded—particularly in the high-tech industry—and the region experienced an economic boom. However, starting in 2013, BlackBerry saw stark competition from other companies rapidly moving into the mobile market. By September 2013, BlackBerry laid off 4,500 employees (40 per cent of its staff) and reduced its operations. A study of employment in the region found that "Blackberry's loss of market dominance may have resulted in a deep pool of experienced, qualified developers (especially embedded developers) in the region available to start or join new companies" (Lamb & Rubinger, 2017). This downturn illustrates how technopoles are vulnerable to global trends and can economically impact a business, leaving the local community with debt, unemployment, and poor living conditions.

Global Cities and the Creative Class

Global cities, a term Sassen (2001, 2017) coined and popularized, are increasingly important in a globalized world and in promoting transnational flows of goods, services, and people. As centres for markets, innovation, and production, they are the social, cultural, and economic bridges to the rest of the world and, as such, have a significant impact on global affairs. As diverse and complex urban environments, these cities are places where new relationships are formed. For Sassen (2017), the global city, and not the nation-state or corporate entities, will be the central place of development in the globalized era. She stresses how with the rapid influence of technology giants, these companies will now move toward designing the **smart cities** of the future. A good example is the partnership between the city of Toronto and Google envisioning how to build a new waterfront neighbourhood, Quayside (Bliss, 2018). While it may seem a good idea at first to develop a smart city, much opposition has emerged listing ethical issues around data collection, use, and storage (Wakefield, 2019). A key concern was that those living at Quayside would be practically living in a lab, where their every move could be recorded and part of the experiment.

Influential geographer and public intellectual Florida (2003, 2005) has taken a similar position to Sassen about the transformational potential of cities. He suggests that some cities have a concentration of the **creative class**—individuals that possess a high degree of education, skills, and creativity. Members of this "creative class" move to such cities because of the potential economic and lifestyle benefits that are afforded to them and not available elsewhere. Cities that possess the "three Ts"—technology, talent, and tolerance—are particularly successful at attracting members of the creative class (Florida, 2003, 2005). Florida suggests that Canadian cities such as Vancouver, Toronto, and Montreal are examples of cities which possess the three Ts. The new technological innovations and social progress that drive change in society in the **Global North** (and global society) emanate from these cities inhabited by the creative class. Florida's (2003, 2005) work suggests that human decisions about where to live are just as important as political or corporate power in shaping our societies.

Technopoles and Exploitation

Technopoles influence their surroundings in varied ways; their influence on Western nations is fundamentally different than the effect they typically have on countries of the Global South. In the Global North, technopoles tend to create vibrant and prosperous regions that bring together innovators, investors, and diverse talent, whereas those in the Global South become the suppliers of services and goods. One example of how the Global South works hand in hand with technopoles located in the Global North is the establishment of **supplier factories**, which are megafactories located in countries such as mainland China, India, and, more recently,

Chinese manufacturing in the high-tech industry.

Indonesia. Supplier factories are dedicated solely to the mass production of goods for the technology industry. Many technology giants have supplier factories located along the east coast of China, in the provinces of Guangdong, Fujian, and Zhejiang. Conditions in these facilities are notoriously exploitive.

What does **exploitation** in these companies entail? A report by China Labor Watch (2011) suggests that workers are often forced to work overtime; that fire and safety risks do not meet standards as outlined in China's labour law and brand companies' social responsibility codes of conduct; and that workers receive poor compensation and are often exposed to toxic chemicals. One company that has received considerable negative media attention is Foxconn, a multinational electronics contract manufacturing company located in Taiwan. Foxconn is considered the largest electronics contractor manufacturer in the world (Circuit Assembly, 2009) and is among China's largest private employers. Most of Foxconn's clients are American, European, and Japanese electronics and **information technology** companies, manufacturing such well-known products as the iPhone, Kindle, and PlayStation. International attention was first drawn to Foxconn's poor working conditions in 2011 following reports of high rates of worker suicides; the situation escalated in January 2012 when 150 employees threatened to commit suicide if working conditions were not improved.

Marx's (1867/1996) original thinking around exploitation came from his analysis of industrial-based factories, in which he observed that the proletariat worked hard under dire conditions but obtained only a fraction of the gains made from the sale of products. The capitalists—those who own the economic means to invest in production—ultimately keep most of the earnings for themselves, refusing to share with those who produced the goods.

For Marx, a salient aspect of exploitation was **alienation**, a concept we will discuss in more depth in Chapter 7. Alienation results from engagement in repetitive and automated tasks that do not reflect a person's skills. Workers at supplier factories are required to repeat the same task all day long, without much variation. Further, workers may be embedded in gigantic halls or areas with hundreds of other workers but may have little to no contact with them. This leads to further feelings of alienation, depression, and loneliness.

Watchdogs and Social Responsibility

The poor working conditions in technopoles around the world have drawn considerable media attention. A 2013 article in *The Guardian* entitled "The woman who nearly died making your iPad" reported on how Foxconn employs "young, poor migrants from the Chinese countryside, cramming them into vast workhouses and crowded dorms, then spitting out the ones who struggle to keep up." Closing the factories is not a viable solution because so many workers would lose their jobs. Fuelled by this and other media reports, various independent institutions have sprung up with the aim of monitoring the working conditions in these types of factories and helping to develop solutions. One such institution is China Labor Watch (CLW), a non-governmental organization (NGO) based in New York City. Labour activist Li Qiang founded CLW in October 2000 to investigate and monitor workers' rights in China through the release of reports, legal action, and support of workers. The company has an excellent record of bringing cases to court and pointing the way toward needed changes in policy and regulation.

Based on Marx's work on exploitation, scholars and social activists have proposed alternative models that can help improve working conditions in these factories regardless of where they are located, while allowing for global capital to continue flowing into low-waged countries in the Global South (Yu, 2008). One such model is based on corporate social responsibility, or CSR, which entails the adoption of corporate codes of conduct to help regulate labour practices and encourage supplier factories to commit to higher standards of corporate conduct (Yu, 2008). While these corporate codes of conduct vary considerably, they tend to stress the elimination of child labour and forced labour, the benefits of collective bargaining, and stipulations against discrimination (Tsogas, 2001). Yu has identified a series of positive outcomes (2008):

- enhanced brand value and reputation,
- connections to customers and their expectations,
- positive employee morale,
- increased productivity, and
- better crisis management.

Evidence suggests that these corporate codes of conduct help companies address problems of poor labour conditions but they only tackle the tip of the iceberg. Though they help address some problems, they do not create real social change in terms of improving low wages or long working hours, or extending workers' rights to association (e.g., meeting to discuss labour concerns) (Yu, 2008). Further understanding is needed of how socially responsible capitalism can operate and help improve working conditions in supplier factories located in technopoles around the globe.

Despite the risks associated with the development of technopoles, governments in both the Global South and North continue to invest heavily in the high-tech sector and to attract competitive companies through tax incentives, infrastructure, etc., in the hope of being part of the economic prosperity brought about by the informational economy.

The Role of Research and Development (R&D)

No company can survive in a competitive market without R&D. Even companies that invest extensively in R&D can collapse if they do not focus on the right kind of technology. Both Kodak and Polaroid, for example, saw their business models collapse and their profits vanish as a result of inefficient R&D and the companies' slow uptake of digital photography. R&D is defined as "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications" (OECD, 2009). The Organisation for Economic Co-operation and Development (OECD) includes three areas in its conceptualization of R&D and defines them as follows:

1. **Basic research**: Consists of experimental or theoretical investigation that is aimed at acquiring new understandings of the underlying foundations of phenomena and observable facts. Basic research differs from applied or experimental research in that it is not intended to lead to any particular application or use in the field.
2. **Applied research**: Also constitutes original research conducted with the aim of acquiring new knowledge. In contrast to basic research, it is intended primarily to address or solve practical problems.
3. **Experimental development**: Systematic research based on existing knowledge that aims to develop new materials or products; to propose new processes, systems, and services; or to modify processes already in place.

Even though all three areas contribute to the economy and are thought to provide direct economic returns, companies tend to invest primarily in applied research and experimental development, while universities and governments tend to support basic research. These differences in focus are a direct result of the expected economic returns of the three areas of R&D. Historically, there have been many different attempts to model the link between R&D and economic development. However, most of these theories were basic, did not provide much insight into the mechanisms that linked R&D to the economy, and neglected to consider the following important questions: How does R&D yield gains? What mechanisms are in place to increase the economic returns coming from R&D?

Many scholars see Joseph Schumpeter (1883–1950), an economist and political scientist at Harvard University, as "providing the most comprehensive and provocative analysis since Marx of the economic development and social transformation of industrializing capitalism" (Elliott, 2004, p. vii).

Economic Development and the Creative Process

In his analysis of economic development, Schumpeter identified the **creative process**—defined as the development of the economy through the production process—as a central activity of economic prosperity. He divides the creative process into three distinguishable stages: (1) invention, (2) innovation, and (3) imitation.

1. Invention

The stage of invention, which Schumpeter referred to as the **process of circular flow**, is characterized by general equilibrium because there is little change in the interrelation of economic factors. During this stage, the supply of goods is perfectly tailored to meet consumer demands, and as a result no tensions or social problems arise in the social system. This stage has no innovators, leaders, or heroes because actors are only passive observers of a well-functioning economic system.

2. Innovation

For Schumpeter, radical transformations occur during the innovation stage, bringing about a fundamentally different social system. Schumpeter further proposed four kinds of changes that occur during the innovation stage: (a) increases in salaries, (b) population growth, (c) changes in consumer tastes and choices, and (d) changes in how production occurs. While growth is an important aspect of the innovation stage, what is decisive is that change occurs not only quantitatively but also qualitatively. Schumpeter argued that even if you add "successively as many mail coaches as you please you will never get a railway" (Schumpeter, 2004, p. 64, Footnote 1). Similarly, many high-tech companies have been created in the past two decades, but few of them have the profit margins, user base, and influence of Google. This fact led Jarvis to propose in his book *What Would Google Do?* that Google simply had developed a radically different approach to packaging and offering information services to users. All the other newly created companies may be quantitatively different, but they are not qualitatively different and lack this element of innovativeness.

This proposal led Schumpeter to identify innovation as the single most important driver of economic prosperity, which he understood to be the "commercial or industrial application of something new—a new product, process, or method of production; a new market or source of supply; a new form of commercial, business, or financial organization" (Elliott, 2004, p. xix). The consequence of innovation is a radical transformation in the economic structure of society, which in turn disrupts social structures. Schumpeter introduced the term **creative destruction** to summarize the social, economic, and cultural consequences that innovation brings about.

Yet innovation is not easy to accomplish. Schumpeter (2004) identified three key factors that impact innovation. First, innovation is based on new ideas and processes, making it difficult to accurately predict the expected outcome and potential future revenue (Jarvis, 2009). In general, there is little information and knowledge about how processes will unfold, leading to great uncertainty. Second, because there is such a great deal of uncertainty, it is difficult for investors to predict the **return on investment (ROI)**, and hence there is apprehension about supporting the innovation (Miller, 2011). (Return on investment is the net return when the cost of investment and the gain from investment are taken into account.) Third, there is a general reluctance to accept change in society, making it difficult for innovators to convince others of the usefulness of their ideas. Even Alexander Graham Bell found it difficult at first to convince others of the usefulness of the telephone (Fischer, 1992).

These three obstacles to innovation become apparent when the **innovator-entrepreneur** is compared to the capitalist. The capitalist relies on detailed economic analyses, which show in predictable ways the revenues that will result from investment. By contrast, innovators take risks and tend to experiment with new forms of thought and action. As Elliott (2004) argues, at the centre of Schumpeter's social and economic analysis lies the figure of the innovator-entrepreneur, who drives technological change through his vision, which then will impact all aspects of society.

3. Imitation

Schumpeter (2004) analyzed economic development and established that it does not evolve evenly but, rather, in **cyclical fluctuations**: suddenly, often in clusters. Why does economic development follow this kind of cyclical fluctuation? First, Schumpeter argued that these fluctuations are the normal way in which capitalist systems evolve and even prosper. Second, Schumpeter attributes the cyclical nature of the economy to the process of **imitation**. Once an innovation is diffused into society, other producers will learn about it and want to reproduce it in order to profit from its widespread popularity. This process of imitation—both in the original industry and in secondary industries—results in economic growth. For example, an innovation in the car industry will lead other car manufacturers to follow and develop similar models. At the same time, other industries will develop or improve products to support those in the automotive sector, such as better glass, roads, safety equipment, etc. Once the innovation is widespread and ceases to be new, capital investment diminishes as no additional ROI is expected. Further, "as an avalanche of consumer goods pours onto the market [there are] dampening effects on prices; rising costs and interest rates squeeze profit margins: and the economy contracts: recession" (Elliott, 2004, p. xxvii). From this standpoint, recessions are a predictable and normal part of the cycle of economic development and to be expected as innovations reach their peak.

In summary, Schumpeter's economic and social analysis suggests that innovation is at the centre of economic development and closely linked to the structure of society. From this point of view, R&D is a centrepiece of economic development, and new technologies are forces of social, political, and economic change.

Global R&D

Why should nations care about R&D? And why should governments invest taxpayer money in R&D if that money could be invested in social programs, education, or health care? The expenditures linked to R&D accrued by companies, institutions, and nations are an indicator of their commitment to science, technology, and innovation. Based on Schumpeter's (2004) analysis, innovation can be directly linked to economic output. The higher a nation's investment in R&D—in terms of capital, people, and infrastructure—the greater the economic return. The **gross domestic expenditure on R&D (GERD)** is most frequently used for the purpose of comparing the investment in innovation that occurs across nations. The GERD index takes into consideration the total expenditure (current and capital) on R&D accrued by a nation over a one-year period, including expenses by companies, research institutes, universities, and government laboratories (OECD, 2009, Science and Technology Section).

Figure 4.1 shows the expenditures in R&D as a percentage of gross domestic product[1] (GDP) for the years 2000 to 2016 for selected G20 countries. We can make three observations:

1. Korea shows the largest increase over time and is the number one country in R&D investment as a percentage of GDP.
2. Sweden continues to spend high amounts on R&D but has reduced its total expenditures since 2003.
3. Canada is below the OECD average (dark line) and spends less than other G7 countries such as the US and Japan.

There is no magic number in terms of how much GDP a country should spend on R&D, but past research suggests that investments in innovation can help stimulate the economy.

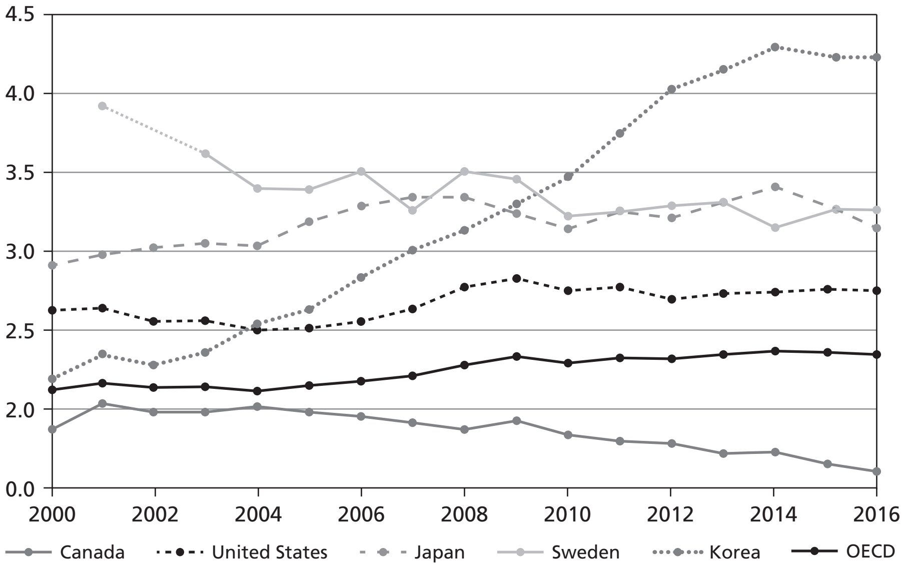


Figure 4.1 Gross Domestic Spending on R&D (as a Percentage of GDP)

Source: OECD (2018), "Gross Domestic Spending on R&D," in OECD Data: Main Science and Technology Indicators, OECD Publishing. https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm

Important indicators of a nation's potential to innovate include the number of (a) patents issued (b) peer-reviewed publications, and (c) new products developed. While most nations are committed to providing support for R&D, the expenses linked to innovation need to be carefully weighed against expenditures in the areas of health care, the military, and basic infrastructure. Because various groups in society have different interests and priorities, finding the right balance between economic and social interests is a challenge for most governments.

In addition to monetary investment in R&D, other initiatives have been developed to expedite and improve innovative processes. One recent global trend to encourage innovation has been to decentralize and spread R&D teams around the globe. Many large companies have adopted this approach, including Microsoft. Microsoft Research, the company's research arm, is devoted to carrying out both basic and applied research in the areas of computer science and software engineering. Instead of Microsoft Research physically being in a single location, it has several institutions in the United States (including Redmond, Washington; New York City; and Cambridge, Massachusetts), Canada (Montréal, Québec), and additional locations (Bangalore, India; Cambridge, England; Cairo, Egypt; Beijing, China; and Herzelia, Israel) (visit Microsoft Research's website at http://research.microsoft.com to see the locations around the world). The company's researchers usually work in local teams with members who are collocated and also have some involvement in global projects.

There are, however, R&D teams in other companies that are fully integrated around the globe. The purpose of these dispersed work structures is to benefit from the diversity of cultural backgrounds, expertise, and languages that a global team provides. In addition, a key advantage is the time gap between team members who work in different time zones. This allows team members to take on different shifts in developing the product: while part of the team sleeps, another part takes over and continues development, helping reduce the time to completion considerably. These initiatives demonstrate that for companies in the high-tech sector, managing innovation becomes a central aspect of remaining competitive.

Understanding the Social Milieu of Software Development

Software development has become a central component of R&D. The relevance of software development, and its potential to attract millions of users who will produce massive amounts of content, can be seen in the high financial value of companies such as Facebook, Twitter, Flickr, and *HuffPost*. In 2011, AOL bought *HuffPost*, an American news website and aggregated blog, for $315 million USD. In 2006, Google purchased YouTube for $1.65 billion USD, even though it had not yet made a profit. Facebook, another company that has not yet made a profit, is now valued at $100 billion USD (Bilton & Rusli, 2012). The high financial value of these companies shows that code is not just a string of bits, but rather a tool that facilitates complex social behaviours, such as informing, sharing, and collaborating on a large scale.

Carmel and Sawyer (1998) have developed a theoretical framework that emphasizes the social milieu in which software development occurs, and they distinguish between two different types of teams: **packaged software development** and **information systems development**. Packaged software development refers to software that is produced in large quantities and can be obtained off the shelf; Microsoft's Office suites are an example. This contrasts with information systems development, which is customized software, such as Facebook, that is designed to meet the needs and requirements of a particular group of users. Further, Carmel and Sawyer's framework distinguishes four levels of analysis that are critical for understanding the work of these teams: (1) industry, (2) tasks, (3) cultural milieu, and (4) groups (Quan-Haase, 2009). Table 4.1 summarizes the key differences between packaged software development and information systems development for each level of analysis.

1. Understanding the Industry

The high-tech industry in which software development occurs is characterized by intense time-to-market pressure: companies compete to be the first to deliver software that includes the "latest" functionality at low prices (Dubé, 1998; Krishnan, 1998; Zachary, 1998). As indicated in Table 4.1, the time-to-market pressures are greatest for packaged software development teams because they are dependent on frequent and highly innovative releases. Currently, we observe these pressures in the growing tablet and e-book reader industry, where companies are in stark

Table 4.1 Software Development Framework

	Packaged Software Development	Information Systems Group
Industry	• Time-to-market pressures • Success measures: profit, market share	• Cost pressures • Success measures: satisfaction, acceptance
Tasks	• Staff assigned to specific tasks • User is distant and less involved in development • Process is immature • Software development is via coordination	• Staff assigned to specific projects • User is involved and provides input • Process is more mature • Task accomplishment is independent
Cultural milieu	• Entrepreneurial • Individualistic • Long work hours	• More bureaucratic • Less individualistic • More set working hours
Groups	• Less likely to have matrix structure • Involved in entire development cycle • More cohesive, motivated, jelled • Opportunities for large financial rewards • Large discrepancies in income • Small/collocated	• Matrix-managed and project-focused • People assigned to multiple projects • People work together as needed • Salary-based • Relies on formal specifications • Larger/dispersed

Source: Adapted from Carmel & Sawyer, 1998.

competition to acquire market share. For these companies, it is essential to acquire early market share and position themselves as a leader.

2. Understanding the Tasks

The primary task of software development teams is to write code. While all team members know how to program, each person is responsible for specific components of the software that require specialized expertise in areas including quality assurance, programming, marketing, design, and client services. In the information systems groups, people are more closely integrated with the development of the product than is the case with packaged software. When software is developed for a client, usually that client will have very specific needs that the software must meet, while packaged software is tailored toward a large user base.

3. Understanding the Cultural Milieus

The work culture of software development teams is characterized by highly individualistic work habits (Borsook, 2000). This means that developers have no predetermined work schedule, but their schedule and tasks are constantly changing. In the lead-up to a release date, employees can work 50, 60, or even 80 hours per week, and the pressure at those times is high. Not all developers, however, have the same **status** within a team. The term **software cowboy** describes the high-performing developer, who is a "brilliant genius, who single-handedly conceives and codes clever new systems in sweaty and sleepless weekends of nonstop programming" (Constantine, 1995, p. 48). There are always a few software cowboys in every team, who earn above-average incomes and excel in writing code and solving programming problems.

4. Understanding Team Structure

The existence of software cowboys does not preclude the team from showing high levels of co-operation and cohesion (Wysocki, 2006). Carmel (1995) labelled this type of highly cohesive working unit a **core team**. Team structures in software development vary considerably. A high level of communication and exchange between members of the team is necessary because of the interdependence of all components of the product. Moreover, consultation on design issues is also required because these affect the operability of the code.

Of particular interest are game developers because the profession "is one of ongoing struggle, from meeting production deadlines to dealing with the precarity of work from project to project" (Livermore, 2013). One central theme in this industry is the difficulty in separating work from play. Those who are employed as developers and testers of video games often think of their work as consisting of fun, making it difficult to regulate work hours and expectations. This problem is further confounded by the fact that workers in this industry are often attracted by fairly informal work settings, where it is difficult to determine when work starts and ends.

One example described in the media pinpoints these types of social problems: the spouse of an Electronic Arts game developer in British Columbia, known online under the pseudonym "EA Spouse", blogged about the poor and problematic labour practices in the industry. The blog describes in detail the long hours as well as the repercussions for family life:

> Now, it seems, is the "real" crunch, the one that the producers of this title so wisely prepared their team for by running them into the ground ahead of time. The current mandatory hours are 9am to 10pm—seven days a week—with the occasional Saturday evening off for good behaviour (at 6:30pm). This averages out to an eighty-five-hour work week. Complaints that these once more extended hours combined with the team's existing fatigue would result in a greater number of mistakes made and an even greater amount of wasted energy were ignored. (http://ea-spouse.livejournal.com/274.html)

Working in industries where work and play are seamlessly interwoven creates many social problems in terms of the repercussions for family life, in addition to the toll on the individual (Glasner, 2019).

Unpacking Code and Giving Meaning to Algorithms

As noted above, much of the output of R&D in a digital society is in the form of code. Code is defined as a system comprising symbols and rules for representing information or instructions in a way that a computer can read and use (*Oxford English Dictionary*). Code that is optimized for solving a specific problem or giving a complex command is referred to as algorithm. Often, when we discuss software development, we tend to forget what code means and how algorithms shape our society. Yet algorithms are powerful tools and those who create them can shape how we understand the social world around us (Bucher, 2018).

The digital revolution has increased our reliance on algorithms; in fact, algorithms play a role in many domains of daily life. Algorithms are central in facilitating how we interact with our environments and they also shape our social world. For example, a weather app can provide up-to-date information on temperature, humidity, and UV intensity in any location around the world. Additionally, many countries have alert systems that via radio, television, and cellphones will provide information on natural disasters, terrorist threats, and poisonous substances. In Canada, Alert Ready will send out messages in real time warning about a potential threat. These alerts are managed via algorithms that can target individuals in specific regions and locations. Algorithms are also used to filter out information. For example, users obtain news targeted to their interests and preferences with the aim of reducing the number of irrelevant news stories they receive. Algorithms are also part of our social world. On Facebook they make friend suggestions and filter updates from our Facebook friends based on factors such as frequency of interaction, perceived relevance, and location. While algorithms are at work in the background, invisible to users, they do shape what we see, who we interact with, and how we see the world. Box 4.2 discusses how algorithms can influence how we see the world and ourselves through the example of search engines and the kinds of information and images they retrieved through search queries (Pariser, 2011).

Box 4.2 Algorithms of Oppression

Using search engines, Noble (2018) shows how algorithms have become an integral part of our everyday lives and the ways we interact with information that we tend to take them for granted. Yet search engines are code and as such they embed the social worlds of those who design them. What that means is that search engines are not neutral and objective tools; rather, the results they yield contain biases. Often these biases develop from assumptions held by those who develop the algorithms. When we look at the diversity in terms of ethnic background and gender of the computer programmers, engineers, and software teams at Google, we quickly learn that a majority are white and male (Noble, 2018). Noble writes about how this biased composition and lack of diversity can lead to a new phenomenon she terms **technological redlining**. Technological redlining shows how search engines "reinforce oppressive social relationships and enact new modes of racial profiling" (Noble, 2018, p. 1). The practice of redlining has been documented in offline contexts but is not well understood online. Noble describes how she was Googling "black girls" and was shocked with the search results. The first hit was HotBlackPussy.com, a porn site. What do we learn from doing these searches and analyzing the results? How is it possible that Google can get away with providing search results that are non-credible and hurtful to an entire community? Search engines reflect many biases in society including racism and sexism. These kinds of biases are not questioned by the mainstream and yet they can create new biases and constitute new forms of oppression—digital oppression. As a result of Noble's work, Google updated its algorithm and, by 2012, the search query "black girls" no longer resulted in hits to pornography. This shows that making the biases of algorithms visible and questioning their role in society can help create social change. But it also shows that these proprietary and secret algorithms are outside of public scrutiny; the average citizen has neither access to the algorithms nor input into how they operate. Considering that Google deals with about 69,000 search queries every second and about 6 billion searches per day globally, this lack of transparency and scrutiny opens up many ethical concerns.

Safiya Noble, a Professor of Communication, examines the ways in which algorithms represent forms of oppression.

Conclusions

This chapter addresses the often neglected topic of technological design, showing that its complexity results from the way that design unfolds. In the past, studies of design largely disregarded the influence of social factors, instead focusing primarily on the technology as the driving force. The field has moved away from understanding design as a technologically deterministic process, and several approaches have been developed within the field of STS to investigate the mutual shaping of social and technological factors in the process of design. These approaches provide new terminology and models to analyze how design unfolds and to examine its close interlink with social, economic, cultural, and historical factors.

The chapter introduces *technopoles* and *global cities* as umbrella terms to describe centres of innovation. Technopoles represent the engines of the information society because they comprise highly skilled workers, infrastructure, and capital investment for the purpose of designing and developing innovative products in the industry. However, not all regions of the world can afford to sustain technopoles, further increasing the gap between the haves and the have-nots. We conclude by showing that in an information society, nations, a skilled workforce, and markets are highly interdependent. Changes, even small ones, in one sector or region can have social and economic consequences in other parts of the world.

Our analysis of GERD, the measure of investment in innovation, shows large discrepancies among nation-states. On the one hand, there is large integration, mobility, and dependence among the key centres of innovation and world markets. On the other hand, the disparities between the haves and the have-nots, both between nations and within nations, are ever increasing. This necessitates future detailed analysis of technopoles and their social, economic, and political consequences.

Questions for Critical Thought

1. What are the key factors that have led to our lack of knowledge in the field of technology design?
2. Explain the concept of technopole by using Castells and Hall's framework. Then discuss its economic, cultural, and social impact on local communities.
3. What is appealing to you in becoming a video game developer? What social, economic, and health factors would deter you from choosing this as a career despite the many benefits?
4. How do algorithms shape the way we look at the world? Discuss the example of search algorithms to demonstrate how they can create the illusion of neutrality when in fact they encompass power relations existent in society.

Suggested Readings

Noble, S. U. (2018). *Algorithms of oppression: How search engines reinforce racism*. New York: New York University Press.

This book critically examines the role of algorithms in our digital society and their power in shaping how we see the world.

Ruggill, J., McAllister, K., Nichols, R., & Kaufman, R. (2016). *Inside the video game industry: Game developers talk about the business of play*. New York: Routledge.

Through interviews with software developers who work in the video game industry, the authors provide a behind-the-scenes look at how the gaming industry works, including hiring and firing practices, gender disparity, and the struggles for work–life balance.

Yu, X. (2008). Impacts of corporate code of conduct on labor standards: A case study of Reebok's athletic footwear supplier factory in China. *Journal of Business Ethics, 81*(3), 513–529.

This is an engaging overview of the merits and problems of socially responsible capitalism.

Zackariasson, P., & Wilson, T.L. (2012). *The video game industry: Formation, present state, and future* (Vol. 24). New York: Routledge.

This resource provides an overview of the video game industry and its economic and social intricacies.

Online Resources

China Labour Watch
http://chinalaborwatch.org/home.aspx
CLW is a not-for-profit, non-governmental organization (NGO) that advocates for workers' rights in China by increasing the transparency of supply chains and factory labour conditions.

Dr. Safiya Noble on Algorithms of Oppression
https://www.youtube.com/watch?v=6KLTpoTpkXo
Dr. Noble talks about the role of Google Search in everyday life and in the creation of knowledge. She talks about her book *Algorithms of Oppression* and how search engines amplify some voices and make others invisible.

Internet Live Statistics
http://www.internetlivestats.com
This website shows the number of search queries being conducted on Google in real time.

SourceForge
http://sourceforge.net/
This site hosts thousands of software development projects created and developed by a community of open-source developers.

Stack Overflow
https://stackoverflow.com/
An online community that attracts about 50 million developers monthly who come together to solve coding problems, build skills, and find jobs.

Interactive Activities

Activity 1: Expenditures on R&D

Go to the OECD website and explore the gross domestic spending on R&D. Try the following:

1. Go to the website: https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm
2. First, look at data from G20 countries and adjust the timeframe of the data; for example, look at data from the 1990s to 2017.

   What countries emerge as having greater expenditures in the past?

3. Now, look at data from G7 countries and adjust the timeframe of the data; for example, look at data from 1984 to 2017.

   Having made the change, what countries emerge as having greater expenditures in the past?

   How do expenditures for Korea change?

   How does the OECD average change over time?

   How is Canada positioned in terms of R&D expenditures? In comparison to G7 countries? In comparison to all countries?

4. Overall, do you think governments should invest more in R&D expenditures? What kinds of arguments may influence policy?

Activity 2: Technopoles

Look at the interactive map developed by the Brookfield Institute at Ryerson University: https://brookfieldinstitute.ca/report/stacking-up/

- What cities in Canada are seeing the fastest growth in terms of the number of video game developers?
- What factors could be benefitting some cities over others?
- What challenges do you see Canada needing to address to further develop its video game industry?
- What are the key factors that need to be in place for a city to become an innovation hub (or technopole)?

Take a look at this map and see how Toronto, Montreal, and Vancouver show up as the largest developer cities: https://tinyurl.com/y2myqwnv

5 The Adoption and Diffusion of Technological Innovations

Learning Objectives

- to understand the process that underlies the adoption of technological innovations and the factors affecting this process;
- to understand the classic model of the diffusion of innovations;
- to examine key adopter groups, how the groups differ, and their characteristics; and
- to investigate the range of government policy that is put in place to promote innovation.

Introduction

The study of technology typically focuses on those tools, techniques, and apparatuses that have been widely adopted in society. That is, we are most interested in technologies that are well known and have made an impact on how we live. Although less attention is paid to technological adoption and diffusion, this area of research provides insights into a set of research questions that are central to society: Why is one tool adopted over another? What tools did users reject? What processes—at the micro and macro levels—are at play during the adoption and diffusion of an **innovation**? The study of adoption and diffusion shows that technologies are not a given but are instead a result of social, cultural, political, and historical factors.

This field of study is referred to as the **diffusion of innovations**. The field has grown exponentially: in 1962 there were 405 publications in the area; by 1983 the number had increased to 3,085 (Rogers, 1983). In fact, a search conducted in 2019 for the terms *diffusion* and *innovation* yielded 165,632 entries in a social science database, and these counts did not include the vast number of publications in related fields, such as engineering, science, and medicine. One reason for this rapid growth is the pervasiveness of technology in our society and its increasing impact on how we work, play, socialize, and communicate. We can readily see this impact when we examine the use of mobile technologies and related apps, such as Instagram, Fire Balls 3D, or YouTube, which are accessed first thing in the morning and last at night. Scholars no longer see technology adoption and diffusion as a purely technological matter but have come to see it instead as reflecting social processes as well. This chapter will provide an overview of the key concepts, theories, and research findings in the diffusion of innovations literature and discuss them in relation to the diffusion of specific technologies. In this chapter we will also learn about how governments boost innovation through policy.

Technological Innovations: The Process

The most influential researcher in the diffusion of innovations literature is Everett Rogers, a rural sociologist and communication scholar. His seminal work *Diffusion of Innovations* (2003) is the second most cited book in the social sciences and provides a comprehensive overview of diffusion studies.[1] In the book, he defines an *innovation* as "an idea, practice, or object that is perceived as new by an individual or another unit of adoption. An innovation presents an individual or an organization with a new alternative or alternatives, with new means of solving problems" (Rogers, 2003, p. xx). The term *innovation* is used interchangeably with *new technology* or *technological innovation*. **Adoption** is referred to as the decision to start using an innovation for a specific goal. While adoption takes place on an individual basis or at the organizational level, *diffusion* describes the process by which, over time, an innovation becomes adopted by a social group. Hence, diffusion is a macro-level phenomenon that is structural in nature.

Early models of the diffusion of innovations tended to place the innovation itself at the centre of the diffusion process. The assumption was that an innovation that was superior to previously established technologies would quickly spread and become widely used in society. Diffusion was solely a matter of technological superiority. These models, however, did not capture the complexity of how diffusion occurs; adopters need to be considered, as they are active participants in the decision-making process. These models also failed to account for the social, cultural, and political factors that affect adoption; individuals are members of social groups and the norms, beliefs, and attitudes of these groups will also shape adoption decisions.

Inventing and Copying Technology

Jared Diamond has long been interested in the evolution and history of innovations. He argues that studying the origins of technological innovations is central to understanding social change in society. When one looks at the history of tool use, for example, social groups may at first appear to be highly innovative, constantly developing creative solutions to existing problems. Based on the anthropological record, however, Diamond concludes that innovations are rarely developed locally; most innovations are taken from other social groups—this is referred to as the copying of technology. Social groups are less likely to invent new ways of dealing with problems than they are to copy existing solutions developed and tested elsewhere. Two key factors affect whether innovations are more likely to be invented locally or copied from other societies: **ease of invention** and **interconnectedness** (Diamond, 1997).

Innovations that are easy to invent are more likely to be developed locally, while innovations that are complex are usually copied. As Diamond (1997) explains, "[s]ome inventions arose straightforwardly from a handling of natural raw materials. Such inventions developed on many independent occasions in world history, at different places and times" (p. 254). Pottery is a good example of an invention that has several independent origins, probably because pottery results from the handling of a raw material, in this case clay. By contrast, the magnetic compass was invented only once in world history because of the sophistication in design and the need for integration of various domains of knowledge with technical skills. Other inventions identified by Diamond that have been invented only once in the Old World and never in the New World include the water wheel, the rotary quern, and the windmill, which suggests that the spread of most technologies is a social process where one social group learns about a new technology from another.

Geographical location plays an important role in a society's adoption of technologies. Societies located in central areas, such as medieval Islam, for example, with access to both their own inventions and those of their neighbours, were generally better equipped for and more receptive to acquiring and adopting new technologies, in contrast to more geographically isolated regions and societies, such as Tasmania. Societies that were isolated needed to rely on their own ingenuity because they could not easily borrow ideas or inventions from other social groups. Conversely, the diffusion of some technologies was principally connected to a need to retain power over rivals, as in the Maori tribes' acquisition of muskets from European traders in early-nineteenth-century New Zealand (Diamond, 1997).

While the study of technological innovations tends to focus on the spread of ideas and tools, there have been instances in history where new technologies were abandoned, a process referred to as **technological regression** (Diamond, 1997). An example of technological regression is the history of guns in Japan. Guns were first brought to the country in 1543 by Portuguese traders. Following this initial acquisition, the Japanese rapidly adopted the weapon, manufacturing their own guns and becoming one of the largest areas of gun ownership in the world. Within less than a century, however, guns completely disappeared from the island. There were three key socio-cultural factors mitigating against a complete adoption of the gun as a mechanism for war in the Japanese context: (1) customs, (2) power, and (3) politics. The Japanese warrior class, the samurai, who held great political and cultural sway, were against the weapon. The samurai weapon of choice, the sword, was a powerful "class symbol," and samurai warfare itself was centred on single combats between swordsmen. The samurai saw the gun, therefore, as an ungraceful weapon. The gun's popularity also receded because of its foreign origin, as goods and ideas produced outside Japan became increasingly despised as part of an anti-foreign backlash (Diamond, 1997).

The Classic Model of the Diffusion of Innovations

The most influential model of diffusion is that of Everett Rogers, first proposed in 1962 based on his seminal work in rural sociology on the spread of agricultural innovations. Rogers was keenly interested in how agricultural innovations found acceptance by farmers. He interviewed 200 farmers to find out what motivated them to either adopt an innovation or reject it. Unlike most of the previous work on the topic, Rogers's work focused on the social factors that influenced adoption. Based on his own work and subsequent studies in the field, he proposed a comprehensive model of the diffusion process.

For Rogers, the concepts of **uncertainty** and **information** were central to the diffusion process. Potential adopters are constantly dealing with high levels of uncertainty because they do not know whether or not the new innovation will yield the expected outcomes; hence, its adoption is coupled with risks. If they adopt and the innovation does not provide the expected personal and societal benefits, negative effects could ensue at the economic, social, environmental, and societal levels. The deployment of the atomic bomb in Hiroshima and Nagasaki during the Second World War is an example of a technology that had not been employed before but was tested in the context of war and yielded disastrous effects for humanity.

A more mundane example of uncertainty as described in Rogers's model of diffusion is the adoption of new hardware/software. For example, when the Apple iPad Pro was released in 2018, consumers were tempted on the one hand to buy the new device to obtain the flexibility of downloading e-books, surfing the Web, checking email, and, most importantly, being able to annotate and edit text in a flexible manner (Murphy Kelly, 2018). This multimedia device also provides a wide range of entertainment capabilities, including watching movies on demand, creating a complex music library, and participating in both single and multiplayer online games. Owning an iPad Pro itself is also a powerful symbol of how tech-savvy a user is. On the other hand, there is considerable uncertainty as to whether the new line of iPads will become widely used and accepted or whether another, superior tool will be developed, making the iPad Pro obsolete shortly after its launch. The new iPad Pro has Face ID and USB-C, making it easy to turn into a workstation. Potential buyers then have to ask themselves whether it is worthwhile to spend $999 for the 11-inch display iPad Pro, or whether they should wait until the next **killer app** is available, or simply buy a Kindle, Nook, or Sony Reader instead. The choice also carries some risk, as users who choose a poor model (e.g., poor development, lack of apps, inferior technical support) will suffer the consequences.

Information, the second key concept in Rogers's model, becomes an important resource because it reduces uncertainty and helps potential adopters make a decision about a particular technological innovation's usefulness and efficiency. Information can be obtained from multiple sources, including the technology itself, peers, the media, and individuals inside and outside one's social group. The quality and extent of the information that an adopter receives will determine the certainty with which that person can make a decision. The amount of information available also affects the time it will take an individual to decide whether to adopt or to reject.

The Main Elements of the Diffusion of Innovations

Rogers defines *diffusion* as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (2003, p. 5). In this definition, four main elements become prevalent in the diffusion of innovations: (1) the innovation, (2) communication channels, (3) time, and (4) a social system (see Figure 5.1). We next discuss each element in the context of Rogers's model of the diffusion of innovations.

1. The Innovation

Innovations, as defined earlier in this chapter, consist of new ideas, practices, or objects linked to technology and therefore encompass all elements of our proposed definition of technology—what was referred to in Chapter 1 as material substance, knowledge, technological practice, technique, and societal complexity. But not all innovations are of the same type; indeed, the nature of innovations can be classified in a number of different ways, based on their complexity, target audience, etc. Some innovations take off quickly, while others diffuse slowly. For example, blue jeans, a consumer good, took only five years to spread throughout the United States, while the use of the metric system is still not widespread in Canada even though it was introduced in 1970 and had a dedicated government

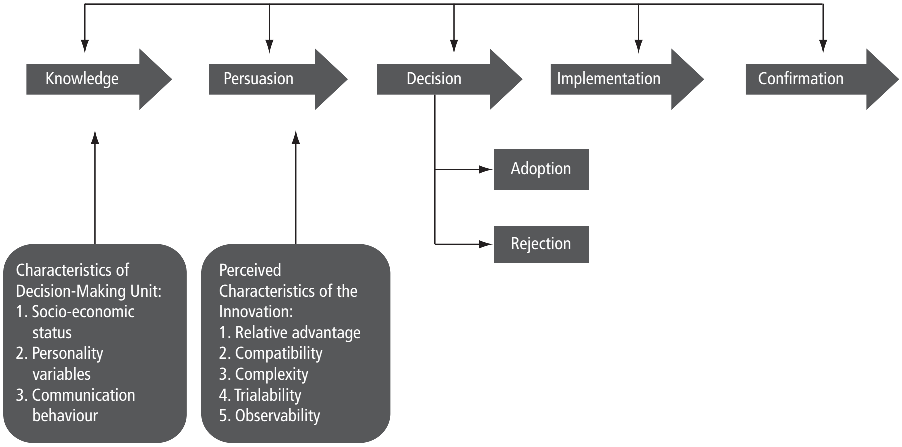


Figure 5.1 The Innovation-Decision Process

Source: Adapted from Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press, p. 165.

agency promoting it (the Metric Commission). If Canadians are asked today about their height and weight, most will still reply in feet and pounds, respectively.

To help us distinguish among the wide range of innovations, Rogers identified five perceived characteristics of an innovation (see Figure 5.1): (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. These five characteristics of innovations help us predict the speed with which an innovation spreads and help us understand how the nature of the innovation itself affects the process. Each characteristic is discussed next.

First, **relative advantage** assesses the merits of an innovation in relation to the idea, practice, or object it is to replace. If potential adopters perceive that the innovation has added value, they will be more likely to adopt it. Early models tended to focus solely on the characteristics of an innovation as a means to assess its potential for adoption within a social group. That is, the models emphasized the "objective" advantages of a technology. This simple view is now obsolete because empirical studies have demonstrated that it is the "perceived" advantage of a technology that matters. An individual's perception is strongly influenced by social factors, including the social prestige associated with the innovation, the adoption rate of others in the social group, and information about the innovation received from communication channels.

Second, **compatibility** refers to an innovation's fit with a social group's existing norms, values, and attitudes. Only in those instances where a good fit exists

AnthonyRosenberg/iStockphoto

Are you obsessed? Self-tracking and monitoring via mobile technologies is now a common practice as a means to increase body awareness, promote fitness, and improve health outcomes.

will an innovation be adopted. Box 5.1 discusses self-tracking tools as a way to stay fit and monitor one's health.

Third, **complexity** describes the level of proficiency needed to comprehend the workings of a technology and use it with ease. People will be more likely to adopt technologies that are transparent in their function and benefits than those that are difficult to operate. Photography, for example, diffused slowly in society because people were not sure at first how cameras worked and what the consequences would be of depicting their image. Even today, in rural areas of some countries people refuse to be photographed because they fear that the camera could take away their soul.

Fourth, innovations that users can test prior to implementation are more likely to be adopted than those that cannot be tried. **Trialability** lets potential adopters reduce the uncertainty associated with the innovation and gather evidence about its value and associated potential risks through hands-on experience.

Box 5.1 Self-tracking and Monitoring: Healthy Living or Obsession?

Self-tracking or life logging is the practice of using digital tools like social media, apps, or devices to capture daily activities and measure physiological markers. Through the practice of monitoring and recording, daily life becomes more transparent and quantified. About one in three people engage in tracking (Barton, 2017). The term the **quantified self** is often used to refer to the aggregation of numbers that are associated with the monitoring. The market is saturated with self-tracking devices and apps. Fitbit is one example of a well-known brand that has come to represent the growing market of tracking tools. With these tools, we can track how much time we spent walking or exercising as a proxy of how fit we are. We can also track our sleep as a means to determine if we are getting enough rest. We can also track our caloric intake to make sure we are not gaining weight. All the numbers together make up the quantified self. The idea is that these measures provide greater transparency of our behaviours and routines, helping us shape how we live our daily lives. We can then use these numbers to adjust activities and improve our lifestyle and well-being. So, what does the evidence say so far about how effective self-tracking actually is? In one study, no benefits were found in helping a group of overweight individuals lose weight. Those with trackers in fact lost less weight than a control group with no trackers. In another study that included 200 women who wore Fitbits all the time, women reported that they increased their level of exercise and had a healthier diet. This study found that Fitbits created an obsession with tracking that was difficult to turn off. Over half of the women reported feeling their behaviours were controlled by Fitbit and 30 per cent indicated that the Fitbit was a guilt-inducing "enemy." This suggests that while Fitbits are trendy, it remains unclear to what extent they can positively impact our health and well-being.

Last, Rogers identified the characteristic of **observability**, which refers to the visibility of the innovation itself and its benefits to other members of the social group. If others can see the innovation and how it works, they are much more likely to discuss it with each other and thereby obtain valuable information that can help them with the decision-making process.

2. Communication Channels

Central to the process of diffusion of innovations is the communication that occurs between individuals. Communication channels are the means by which the exchange of information occurs. The most commonly utilized forms of communication for the purpose of diffusing an innovation are the mass media, including television, radio, newspapers, and the Internet. While mass media are the most efficient means of reaching a large audience, they are not as effective at persuading a potential adopter as are interpersonal channels. Communication among peers is effective because peers can provide first-hand accounts about their experience with an innovation. Individuals are more likely to trust these accounts than messages coming from the mass media, which often represent the interests of vendors.

In the literature, two additional reasons have been identified for the strong influence of personal relationships in comparison to that of mass media. First, a large number of individuals are not exposed to mass media because they do not read a newspaper on a regular basis or watch news on television. Thus, personal relationships have a greater reach with this group of people, who chat more informally about technologies. Discussions with friends and family are an important component in the decision-making process. Second, individuals who are less interested in technologies are more likely to discuss an innovation informally with a friend than to obtain information from formal sources, such as newspapers or the radio. This is because they are not motivated to seek out information on technological developments on their own account. Their general involvement with technology is low and most of the information they obtain about a given innovation will occur accidentally through encounters with other adopters in their social circle.

3. Time

In the social sciences, time is usually a variable that is of little relevance. Most studies completely ignore time because it is a part of all phenomena and therefore does not merit much attention. Research in the diffusion of innovations, in contrast, is unique in the social sciences in terms of its emphasis on time, which is a central variable for examining when individuals first become aware of an innovation. Distinct adopter categories can be observed based on when individuals adopt a specific technology. These are described later in the chapter. Time also helps to explain an innovation's rate of adoption within a particular social system, which is measured as the number of adopters within a given time period.

4. Social System

Rogers (2003) defines the social system as “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal” (p. 476). The units are individuals, groups, or organizations that are interested in acquiring information about a technological innovation in order to make a decision about whether to adopt or to reject that innovation. Examining the diffusion process within a social system is necessary because the structure of the social system as well as its values, norms, and beliefs have a major impact on the diffusion process.

The Innovation-Decision Process

After reviewing numerous adoption studies, Rogers was struck by the finding that the rate of adoption was similar across a wide range of innovations. When he plotted the frequency of adoption on a graph by time, Rogers discovered that the rate of adoption formed an S-shaped curve, which Rogers termed an **S-shaped curve of adoption**. Figure 5.2 shows how a few individuals adopt an innovation early, the majority adopt an innovation at the midpoint of the cycle, and a few adopt the innovation very late. The moment when the majority of individuals in a social group adopt an innovation is referred to as the point where the S-shaped diffusion curve takes off. It represents a critical turning point for the diffusion of any innovation because it is at this point that it has been widely adopted in society.

To determine what occurs during the adoption process, Rogers (2003) examined the innovation-decision process and identified five distinct stages: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. Figure 5.1 depicts the various stages that an individual goes through when making a decision about the adoption of an innovation.

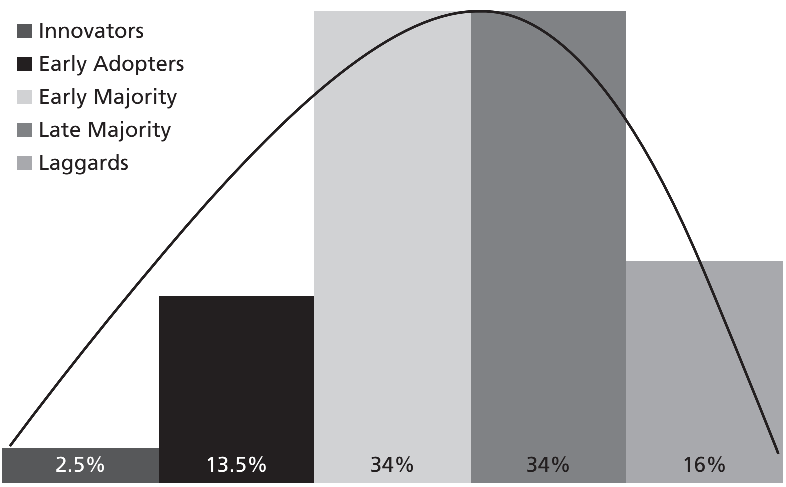


Figure 5.2 Adoption Categories

Source: Adapted from Rogers, E.M. (2003). *Diffusion of Innovations* (5th ed.). New York: Free Press, p. 247.

First, in the **knowledge stage** an individual learns about an innovation for the first time and obtains information about how it operates. Coleman, Katz, and Menzel (1966) found that information about an innovation was often obtained quite by accident through conversations with peers and interactions with sales personnel, and by exposure to the media. Individuals vary in terms of how receptive they are to information about technological innovations. Those individuals who have a need to solve a specific problem or who want to accomplish a particular task are more receptive to obtaining information related to their need. Hence, those individuals seek out messages that are in agreement with their interests, needs, and attitudes. The process of seeking out relevant information is referred to as selective exposure and shows how individuals may be exposed to the same information but evaluate its relevance in different ways based on their needs.

Different kinds of knowledge are relevant in the knowledge stage. **Awareness knowledge** is a term meaning the moment at which an individual becomes aware of the technology's existence and considers adopting it. From the awareness of the innovation emerges a need for **how-to knowledge**, which explains how the innovation is used properly and in what settings it can be employed beneficially. Finally, **principle knowledge** encompasses an understanding of the mechanisms that lie behind an innovation. For example, understanding the usefulness of and need for sanitizers is based on mechanisms outlined in germ theory.

Second, in the **persuasion stage** potential adopters continue to seek out information about an innovation, albeit now in a very active manner. Through such additional information, adopters develop either positive or negative emotions toward the innovation; these attitudes combined with the knowledge acquired earlier will help them to make a decision.

Third, the **decision stage** in the innovation-decision process describes the activities that lead toward adoption or rejection of an innovation. As defined earlier in this chapter, adoption refers to the decision to use an innovation. Rejection, by contrast, is the decision not to use a new technology. The decision-making process is often described as clear-cut: either an innovation is adopted or it is rejected. In reality, the boundaries between adoption and rejection are blurred, with many potential adopters first partially adopting an innovation by using it on a trial basis, defined previously as trialability. Once they have tested the innovation, they make a conclusive adoption decision. When it is not possible to test the innovation first, they will seek the opinion of peers who have had first-hand experience with it. Rogers terms this trial by others because the opinion of other users will help inform a person's adoption decision.

Fourth, in the **implementation stage** an individual starts using the innovation. It is here that an adopter often runs into technical problems. At this stage, information seeking continues to be central as the adopter troubleshoots the encountered obstacles. If users find it difficult to solve the problems encountered, they may stop using the new technology and return to what they are familiar with. Most diffusion research has tended to focus on changing attitudes or adoption behaviours, and has placed less emphasis on implementation itself and the social consequences of adoption.

In Box 5.2 we discuss how voice recognition is becoming more widely acceptable with new AI assistants such as Siri and Alexa.

The adoption of voice recognition technology shows how adoption and diffusion are often unrelated to the efficiency, benefits, and utility of technologies themselves and are instead closely associated with the complexities of the social

Box 5.2 The Diffusion and Adoption of AI and Voice Recognition Technology

Voice or speaker recognition is the capability of a device or app to receive and interpret spoken words or to comprehend and follow a command. AI via voice recognition is changing many aspects of daily life. Amazon's Echo Speakers, which facilitate interaction with its AI assistant Alexa, are quickly penetrating the market.

All the major tech players are following suit and launching their own AI assistants: Siri for Apple, Viv for Samsung, and Cortana for Microsoft. It is difficult to assess the social impact of these AI assistants, as they are not radically changing daily life, yet within the next two years they will become the primary means by which people

Is Siri becoming an integral member of your household? AI assistants such as Siri and Alexa are becoming integrated into most household technologies, from sound equipment, to heating/cooling systems, to lamps, yet it is not clear to what extent consumers are going to fully embrace the technology in their everyday lives.

continued

get information, goods, and services, and marketing will turn to them for audience attention (Dawar, 2018). One domain that AI assistants are to revolutionize is the area of consumer choice. As consumers have greater choice among products, they will turn to AI assistants to help them make rational choices about what product is superior. AI assistants can easily navigate a wealth of information, product reviews, and price comparisons to provide recommendations based on complex algorithms. This will take some of the decision-making away from consumers and facilitate shopping decisions (Dawar, 2018). Amazon's Alexa, for example, sold over 100 million units in 2018 and, depending on consumer decision-making, this number could drastically increase in the next decade (Bohn, 2019). As AI assistants continue to develop, it remains unclear if consumers are willing to rely more heavily on AI assistants and what domains of daily life (i.e., information on weather, stock market updates, calls to family, shopping lists) will be impacted the most. For example, Alexa also integrates with the Fitbit discussed above, allowing users to engage with their fitness data in new ways (Connor, 2019).

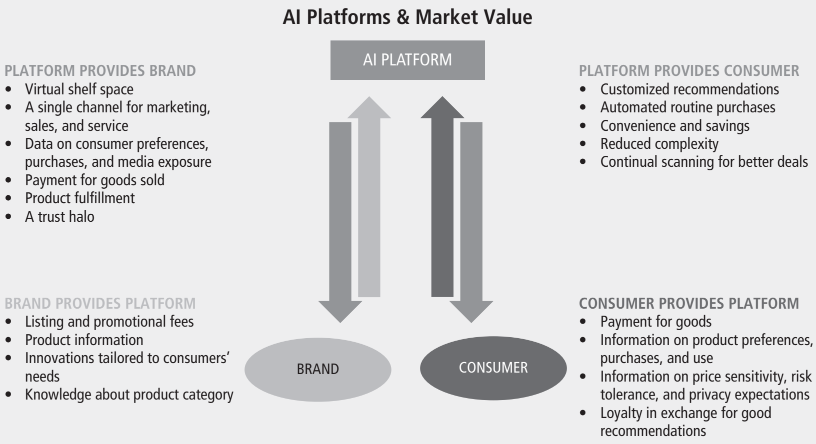


Figure 5.3 How AI can create value for consumers and marketers

Source: Adapted from Dawar, N. (2018). Marketing in the age of Alexa. *Harvard Business Review*, May–June, 80–86.

system into which they are introduced. With rapid developments in AI, voice recognition is becoming more prevalent, yet this opens up new questions about privacy and technology ubiquity in everyday life. As Alexa for example integrates with the Fitbit, the AI system can collect and analyze fitness data remotely and potentially sell it to third parties for targeted advertisement, or fitness data can be shared with companies for closer monitoring of their employees' whereabouts (Rowland, 2019). Another concern is that the functionality of the personal assistant requires that the microphone on the device always be listening for the "wake word"; a specific word that orders the assistant to respond to a forthcoming command (for example, “Alexa,” or “Hey Google”). Amazon says that only the command after the wake word is sent to Amazon to be processed, but the fact is that a microphone connected to Amazon is always listening into your home (Su, 2019). It also raises new questions about whether consumers will spend more money on platforms like Amazon with the seamless integration of AI assistants into the home and how it will influence purchasing decisions.

Fifth, following the implementation of a new tool, adopters continue to seek out information about the innovation to confirm that they have made the right decision by adopting the innovation. This stage is referred to as the **confirmation stage** and unfolds over a lengthy period. If information arises that disconfirms the usefulness of the innovation, adopters will either try to seek out further information or consider discontinuing use of the innovation, particularly if using the innovation has negative consequences that are confirmed by peers as well. This has been referred to as **discontinuance** and describes the rejection of an innovation after earlier use. If researchers fail to consider discontinuance, conclusions about an innovation’s acceptance rates may be overestimated. Several factors impact discontinuance, including perceived characteristics of the innovation, competing innovations, evaluations of peers, and the innovation’s fit with the social system’s norms.

Classifying Adoption Categories

Research consistently shows that members of a social group adopt innovations at a different pace, with some members adopting an innovation early in the process and others adopting it much later. Early researchers realized the importance of identifying and categorizing adopter groups but could not agree on terminology and method of categorization. In 1962, as mentioned, Rogers proposed the S-shaped curve of adoption to classify adopters, and this quickly became the dominant method of categorization.

The relevance of the S-curve of adoption to classifying adopter categories becomes evident when the cumulative rate of adoption is plotted instead of the absolute frequency by time. This curve has the shape of the normal distribution, often also referred to as a bell curve, with 50 per cent of individuals adopting halfway through the adoption period. Rogers employed this bell-shaped curve as a means for categorizing adopters based on when they adopted a new innovation relative to others in the social system. Five key types of adopters were identified (see Figure 5.2):

1. *Innovators*: These individuals constantly seek out new ideas and information, and this thirst for newness leads them to expand their social circles—which is why they are often referred to as cosmopolitans. Their role is that of importing new ideas into their social group from the boundaries; that is,

they are the **gatekeepers**. Because innovations are risky, they need to be able to cope with the uncertainty associated with adopting new tools, devices, and procedures.

2. *Early adopters*: Individuals in this group play the most central role in the diffusion of innovations process. They are well respected among their social network and serve as role models. Others in their social group will come to them for advice on the usefulness of technological innovations. As a result, they have been termed **opinion leaders**: individuals whose opinions influence the attitudes and behaviours of others in the social group. Unlike innovators, who are cosmopolitans, early adopters are similar to others in their social group and have ties to people in the community.
3. *Early majority*: These are individuals who are a step ahead of the average adopter. Before adopting an innovation, they go through a careful deliberation process where they consider the pros and cons of new ideas vis-à-vis the status quo. In comparison to innovators and early adopters, they have no gatekeeping or opinion leadership role in their social group. Instead, they serve as **interconnectors**; that is, they serve as a bridge between early and late adopters, providing relevant information about the innovation to the late adopters and often convincing them of the usefulness of the adoption.
4. *Late majority*: Members of this group adopt only after the average adopter has started using the innovation. They wait for everyone else to adopt first to reduce the uncertainty associated with adopting innovations. For these individuals, adoption occurs as a result of economic forces combined with pressure from their peers. The late majority are hesitant to adopt and skeptical of anything new; they would rather stick to the old ways of doing things.
5. *Laggards*: This group represents the traditional individuals who are the last in a social system to adopt an innovation. Laggards are often isolated or are more locally oriented and connected to others with similar traditional values. Ironically, by the time laggards adopt a technology, new innovations have often already superseded the technology in question. As a result, when laggards adopt a technology, all members of a social system have adopted the innovation, and a state of market saturation can be observed.

Socio-economic characteristics perform a crucial function in shaping individuals' ability or willingness to adopt new concepts, technologies, and innovations. Early adopters, for example, have been shown to be wealthier and better educated than the laggards. Additionally, early adopters have shown an ability to absorb abstract concepts, accept change, seek information, and be well connected with both communication channels and peers, more so than laggards. Because of their increased financial resources, early adopters are more willing and able to take on the risks associated with new innovations, such as investing in a new idea or technology that may never be diffused into the mainstream. Often members of the laggard category may be forcefully pushed to adopt the new technology. For example, technical support and updates for the operating system Microsoft Windows XP (released in 2001) were discontinued as of 8 April 2014. At the time of support expiration, millions of users worldwide were still using XP as their predominant OS, such that it still had a market share of around 27 per cent for all desktop operating systems. In China, about 50 per cent of computers were still running Windows XP, and governments were paying a significant amount of money to Microsoft to extend support. Users who continue to use XP will be susceptible to more security risks, which has served as a push to upgrade machines to the new Windows 8 operating system. Moreover, Microsoft has even offered a \$100 discount to upgrade from XP, as a form of incentive payment for adopting their newest OS.

Rogers's (2003) adoption categories have important implications for how we understand the spread of new technologies in society. The five groups represent differences in how individuals in society approach new technologies and in their willingness to adopt. The categories show that innovations take time to spread, with innovators and early adopters employing new technologies first and others in society slowly following their example. Time is an important factor when examining the spread of innovations, as well as the innovation-decision process. To show the applicability of the concepts, we will discuss several current examples in the remainder of the chapter.

Critiques

Rogers's model of the diffusion of innovations has been helpful in understanding many aspects of how new technologies and innovations diffuse in society over time at the individual and societal levels. Nonetheless, the model has also received a range of criticisms from scholars. Lundblad (2003) argued that, although the theory is detailed at the individual level, it falls short when it describes the innovation-decision process within organizations, as it does not address what characteristics of an innovation interact to affect its adoption within organizations and there is no information on how the size of the organization affects its potential to adopt innovations. For example, it is a lot easier for a small corporation to make changes to recycling and get its workers on board a new recycling program. In a large organization, like a college or university, this would take much more effort. Furthermore, Damanpour (1996) discussed the complexity in testing such theories in practice, as there is little research to back up the model's empirical validity; what this means is that it is difficult to identify what dimensions of the model are most important. Does the characteristic of the innovation affect adoption? Or is it the characteristics of the person making the decision? Finally, Rogers's model has been updated by additional models such as Technology Acceptance Model, or TAM. The model is simpler and looks at two key factors: perceived usefulness (PU) of a new technology and perceived ease of use (PEOU). TAM predicts that these two factors can explain if a technology gets adopted and used, rather than looking at the many dimensions that Rogers had proposed. Therefore, despite the many advantages to the model, it is a model that might need some updating.

Marketing Relations with Early Adopters

This chapter has so far discussed Rogers's classic model of the diffusion of innovations in detail. Even though the model was proposed in the 1960s, it has had a continued impact on disciplines such as sociology, communications, technology adoption studies, and science and technology studies (STS). In this section, we will examine how social theory on the adoption and diffusion of technological innovations can be applied to market research. This is a topic that is of great relevance to those developing digital tools, software, hardware, or any new technology. We will discuss a series of on-the-ground examples to illustrate the continued relevance of Rogers's classic model.

The literature on digital innovations is one area that shows extensive use of Rogers's social theories. His work has widespread acceptability and applies to many market analyses of digital artifacts. TrendsSpotting.com tech analyst Taly Weiss discusses the role of innovators and early adopters in online marketing as follows: "[I]t's understanding the role they play and how they are to be approached. Getting it wrong can cost companies revenue. But getting it right can propel a product or brand to the front of the pack" (Rich, 2010). Market analysts continue to worry about how innovators and early adopters behave because they understand that having a critical mass is central to the diffusion of any technological innovation, digital or otherwise.

Laura Rich, a technology analyst from Yahoo.com, provides a compelling examination of how Apple and Google have dealt with early adopters. The case studies show that Apple neglected its early adopters, and had to quickly rethink its marketing strategy to keep this group's support. When the iPhone was released in the United States in 2007, its sticker price was $599 USD. Many early adopters wanted to be the first to own an iPhone and, because of the demand, had to line up at stores for hours to obtain one. For these early adopters, being the first to own an iPhone was important, and lining up was only a small hassle when considering the reward of owning the desired gadget. These are not average users of cellphones but a subset of people who feel strongly about Apple products and for whom the iPhone is more than just a cellphone. These early adopters of Apple products—who call themselves "fanboys"/"fangirls"—felt let down by Apple when only a few months later the price dropped to as little as $399 USD. On the Web and through traditional media, they expressed their outrage and disappointment with Apple. Steve Jobs, Apple's former CEO and one of the most influential players in the technology sector, realized the mistake Apple had made by offending their most devoted and trusted users. In a public apology he directly addressed early adopters:

> [E]ven though we are making the right decision to lower the price of iPhone, and even though the technology road is bumpy, we need to do a better job taking care of our early iPhone customers as we aggressively go after new ones with a lower price. Our early customers trusted us, and we must live up to that trust with our actions in moments like these. We want to do the right thing for our valued iPhone customers. We apologize for disappointing some of you, and we are doing our best to live up to your high expectations of Apple. (Jobs, n.d.)

How could Apple, a key leader in the sector, have disregarded its early adopters? Despite their central role in the diffusion process, early adopters work behind the scenes: they are not paid by companies, and they do not play any official role. As Figure 5.4 shows, however, they are part of the bumpy beginning that many innovations need to overcome. And despite not having a formal role, early adopters are central to the process for three main reasons. First, the work of early adopters is done most of the time through their personal connections with family, friends, neighbours, and co-workers. It is in this mentor role that their influence on the adoption process plays itself out. Second, they often disseminate the information about an innovation by showing strong endorsement. For example, early iPhone adopters used their devices in public spaces, attracting the attention of other potential adopters, thereby indirectly contributing to publicity by creating product awareness as well as endorsement. Third,

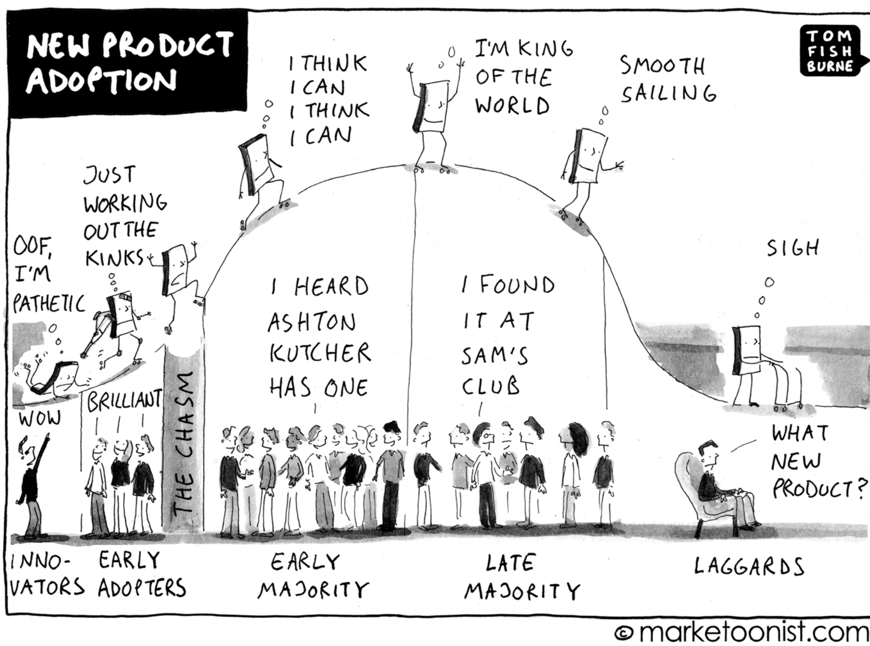


Figure 5.4 "Marketoonist" Tom Fishburne's Humorous Twist on the S-Shaped Adoption Curve

Source: Marketoonist/Tom Fishburne

early adopters have gone through the innovation-decision stages. They can then share information they have gathered about the product and the attitude they have developed with potential adopters.

Another great case study of how a new media product has diffused with the help of early adopters is the mainstreaming of YouTube—in terms of both its consumer base as well as its producer base. YouTube gained popularity as a result of early adopters' forwarding links to YouTube videos via email and instant messaging. These early adopters would often send mass emails to friends, making them aware of new, meaningful, bizarre, or comical videos.

Two YouTube videos were instrumental in the spread of the service into mainstream: "Lazy Sunday" and "Numa Numa." In December 2005, early adopters started forwarding the link to a *Saturday Night Live* sketch titled "Lazy Sunday"; it quickly went viral, introducing many people to YouTube for the first time. The video featured Chris Parnell and Andy Samberg dancing and singing a farcical hip-hop song about cannabis. A second video that was instrumental in making YouTube mainstream and encouraging users to become content producers was "Numa Numa," which shows Gary Brolsma performing the song "Dragostea Din Tei" by the Moldovan band O-Zone. The original "Numa Numa" video has been seen 700,000,000 times worldwide—the second-most-viewed viral video after the video of the *Star Wars* kid, which shows Ghyslain Raza swinging a golf-ball retriever (BBC, 2006). These videos brought much-needed exposure to YouTube, showing new users the ease with which YouTube could be accessed and hinting at the ease with which this group might in turn create and share their own YouTube videos. As of 2020, YouTube had slightly more than two billion unique users, representing about one out of three Internet users globally.

In this section, we have looked at how Rogers's classical model of the diffusion of innovations has been applied to market analysis. Analysts pay a lot of attention to their early adopters because they realize that having a critical mass (i.e., enough people who support the product or idea in question) is central for the adoption of any innovation, and in particular for the adoption of digital tools and **Web 2.0** sites and services. Not paying careful attention to early adopters can backfire and cause companies to lose their most valued customers, as the example of Apple demonstrated. Early adopters play a number of key roles in the diffusion process by creating product awareness, endorsing the product, and spreading the message via word of mouth, which often happens online on Facebook, Twitter, and Instagram.

Government Policy and Innovation

Governments understand that society is undergoing rapid change and with it needing to address complex social, political, and environmental problems. A 2018 report by OECD describes how governments recognize that "technology is disrupting the status quo and creating a future of unknowns" (p. 2). With growing economic and social inequalities, rapid climate change, and continued regions of conflict, we are witnessing unprecedented migratory movements and a social backlash. Governments are moving quickly to implement innovations in a wide range of sectors to promote well-being and reduce social inequality. Governments are also developing new approaches to policy, infrastructure, and services to meet the needs of rapid population growth. Countries that are at the forefront of innovation have an economic advantage. First, innovations create new job opportunities providing employment at all levels. Second, innovations lead to other innovations, thus creating a hub of innovation with new job opportunities. Finally, innovations in governance can help cope with new challenges in transportation, health care, and education. The OECD (2018) conducted a global review of government innovation trends. In their report, the OECD highlights three areas in which governments worldwide are moving.

- **Area 1: Identity:** Governments are moving toward the creation of digital identities that integrate all aspects of a citizens' life and facilitate access and provision to services. Some of these initiatives have also received criticism because there has not been sufficient discussion around privacy concerns and potential for hacking into private data once a person's information is digitized (Shahin & Zheng, 2018).
- **Area 2: Systems approaches and enablers**: Developing information systems to improve how government services are accessed by and provided to citizens, thereby transforming how governments operate and interact with citizens.
- **Area 3: Inclusiveness and vulnerable populations**: Improving the lives of vulnerable citizens to improve educational and job opportunities. For example, Seoul is developing an extensive program to redefine the meaning of "work" in the context of an ageing population that will more than double by 2050 (OECD, 2018).

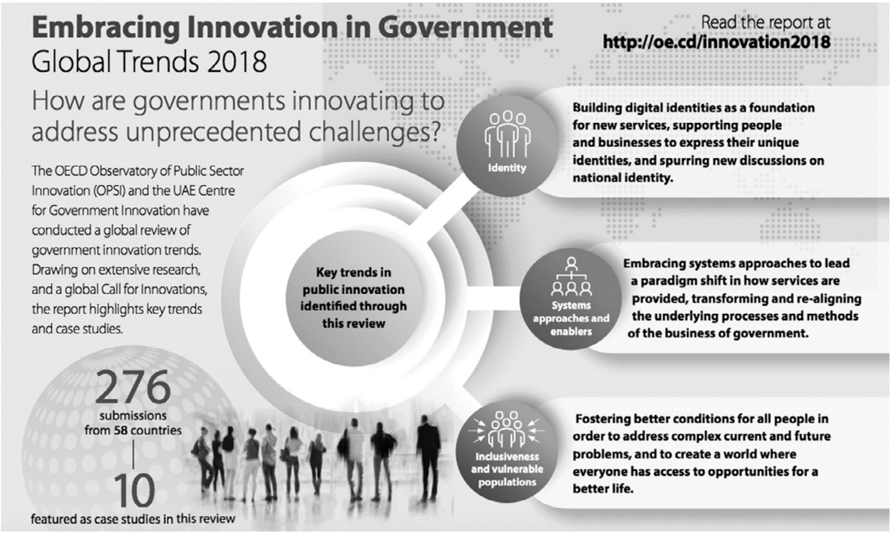


Figure 5.5 Global Trends: Embracing Innovation in Government

Source: OECD (2018). Embracing innovation in government: Global Trends 2018. URL: http://www.oecd.org/gov/innovative-government/innovation2018.htm

But how do governments create the right conditions for innovations to occur? Governments around the world have different policies in place to promote innovation and develop capacity. Box 5.3 discusses Canada as one example of how the government has structured its innovation plan. The plan focuses primarily on skill development, funding of innovative projects, the creation of clusters of innovation, and financial and resource support for businesses engaged in innovation.

Box 5.3 Government of Canada Innovation Policy

Governments around the world develop policy to boost innovation. Canada has a number of different initiatives and has made large investments into promoting innovation. The government of Canada focuses on several core areas. One of the most central areas is skills development and lifelong learning. Through teaching skills throughout the K–12 curriculum the goal is to prepare the next generation workforce, with a particular focus on STEM and digital skills. The second key policy focuses on supporting Canadian business innovators by facilitating the process of applying to a range of funding opportunities. One bold approach taken by the government of Canada is the support of **superclusters** (Government of Canada, 2018). These superclusters are collaborations among companies, academic institutions, and not-for-profit organizations toward developing new innovations. The Canadian government has invested $950 million to support business-led innovation superclusters. One of the superclusters that was funded is located in Atlantic Canada and focuses on strengthening Canada's ocean industries such as marine renewable energy, fisheries, aquaculture, oil and gas, defence, shipbuilding, and transportation. The **Oceanic Supercluster** integrates a range of technologies for monitoring and supporting the marine life in Atlantic Canada in tandem with oil extraction technology. The goal is to develop the most advanced technologies in the areas of digital sensors and monitoring, autonomous marine vehicles, energy generation, automation, marine biotechnology, and marine engineering technologies. Finally, an area of innovation the Canadian government is targeting is clean technology, a rapidly growing market. The goal is for Canada to continue innovation in the areas of sustainable and renewable energy. This difficult and also controversial challenge will be further discussed in Chapter 12.

Innovation, Science, and Economic Development Canada

Conclusions

This chapter provides an overview of methods and processes affecting technological diffusion in both historical and contemporary terms. The value placed on newly acquired ideas, practices, and objects, which Rogers defined as innovations, can differ radically between societies, spatial areas, and historical eras. Those who see a tool's distinctive benefit may consider adopting, borrowing, or re-calibrating this technology to the specifications of their social, economic, or cultural needs. However, acceptance is not a given. Considerations such as uncertainty, utility, cultural adaptability, and economic resources guide this decision-making process, as described in Rogers's model of the innovation-decision process. Ultimately, members of a social group may reject a technology or alter their perceptions of its usefulness, resulting in the abandonment of an object or idea in spite of its benefits—which is described as technological regression.

In a high-tech society, modern consumers, organizations, and governments are faced with similar concerns, questions, doubts, and analyses. For every technological success, there have been notorious failures. Portable electronic devices, such as mobile phones, fitness trackers, and tablets, have become seamlessly integrated into society, bringing with them a new colloquial language and set of expectations for managing, organizing, and conducting one's personal and professional life. By contrast, many recent technologies—e.g., DIVX disks, the Apple Newton, and the Segway—have been rejected primarily because of factors such as cost, perceived lack of usefulness, or incompatibility with other accepted technologies. Similarly, there are examples of contemporary technologies, such as HD DVDs, that were unable to diffuse within society because of the increased acceptance and industry support for Blu-ray, a competing technology. Governments continue to implement policy to support local development of innovation across areas—health care, digital technology, gaming, and farming—with the aim of developing the next "big thing."

As our world rapidly changes, we must understand the social processes underlying technological diffusion. The existence of technological divides among adopter categories provides evidence that the rapid disposal of aging technologies in favour of new, flashy gadgets may not always be the best course of action.

Questions for Critical Thought

1. How are the concepts of uncertainty and information linked in the innovation-decision process?
2. What are the motivations for individuals to engage in self-tracking? Discuss the effects of self-tracking on well-being. Include in your discussion the positive and negative effects, both short-term and long-term.

3. Compare and contrast innovators and early adopters. Which of the two adopter categories is more important for the diffusion of innovations, and why?
4. What government policies are most effective in promoting innovation? Identify two policies that you consider most effective. Justify your response.

Suggested Readings

Choia, H., Kimb, S. H., & Lee, J. (2010). Role of network structure and network effects in diffusion of innovations. *Industrial Marketing Management, 39*(1), 170–177.
This article investigates why an innovation sometimes diffuses throughout society, while at other times it diffuses only to sub-groups.

Dawar, N. (2018). Marketing in the age of Alexa. *Harvard Business Review*, May–June, 80–86.
The author discusses how new voice recognition technologies are becoming seamlessly integrated into everyday life and how this affects marketing and consumer behaviours.

Johnston, D., & Jenkins, T. (2017). *Innovation nation: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, happier*. Toronto, ON: McClelland & Stewart.
This children's book provides a fascinating look at innovation in Canada with lots of fun illustrations.

Lupton, D. (Ed.). (2017). *Self-tracking, health and medicine: Sociological perspectives*. Abingdon: Routledge.
This is an investigation into how self-tracking can play a role in health promotion and health care and its implications for how we understand our bodies and organize our everyday lives.

OECD (2018). Embracing innovation in government global trends 2018. Retrieved from http://www.oecd.org/gov/innovative-government/embracing-innovation-in-government-2018.pdf
This resource shares technological innovations made by international governments as a way of providing an overview of technology's continued advancement.

Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.
Rogers's classic work investigates the processes that define and characterize the adoption or rejection of innovations.

Online Resources

Amazon Echo & Alexa 10 everyday uses (Craig's Tech Talk)
https://www.youtube.com/watch?v=G2P_jFN0Pr8
This YouTube video shows how Alexa can serve as an assistant for reminders, alarms, and other daily tasks.

Canada's Innovation Superclusters
https://www.youtube.com/watch?v=QTf-37xiaUA&feature=youtu.be
The government of Canada describes the idea of an innovation supercluster and how it promotes economic development and well-being.

Counting the Hours
https://www.insidehighered.com/advice/2018/10/29/tracking-your-time-can-help-you-determine-what-do-your-life-opinion
This resource provides a look at how self-tracking your time for a week can show you how you are spending your time and how it allows you to make adjustments.

The Uploaded Life: Personal Evolution through Self-Tracking
https://www.youtube.com/watch?v=8wqC6ad1V_Q
This resource shows how body tracking devices operate and how data affect health and other aspects of life.

Interactive Activities

Activity 1: Conduct a Time Audit

Start by reading the article "Counting the Hours:"

https://www.insidehighered.com/advice/2018/10/29/tracking-your-time-can-help-you-determine-what-do-your-life-opinion

After reading the article engage in a time audit by tracking how you are spending your time for two days (48 hours).

Step 1: Identify 10 activities that you are spending the most time on. For example, social media, writing, studying, sports, walking, meeting with friends, etc. Record in minutes how much time you spent on each of those 10 activities over a 48-hour period.

Activity	Real-Time	Ideal Time	Time Difference: Real Time Minus Ideal Time	Relevance of Activity to Well-being
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Step 2: Rate these activities by how important they are to you in terms of your well-being in the column to the right.

Step 3: Determine which activities you are spending more time on than you would like by looking at column 4 (Time Difference: Real Time Minus Ideal Time).

Step 4: Try to set new goals for the following week and monitor if you are achieving those goals by repeating the activity.

Step 5: Were you surprised by the findings? Or, did they confirm what you already knew? Did you enjoy the exercise of self-tracking? Do you think it has a positive effect on your lifestyle?

Activity 2: Siri, Voice Recognition, and Shortcuts

Voice recognition is advancing rapidly, allowing users to give their mobile phones commands to perform a set of tasks. Here two videos to guide you in setting up shortcuts based on voice recognition.

- For iPhone: https://www.youtube.com/watch?v=-NJAUmc4y-A
- For Android: https://www.youtube.com/watch?v=YUHDQRRIUVk

Look at the video and set up three new shortcuts on your iPhone or Android device. Use the commands and rate your experience:

- How difficult was it to set up the command?
- Is the command helpful?
- Do you have positive feelings toward your mobile phone as you interact with the device via voice?

6 Technology and Inequality

Learning Objectives

- to discuss how differences in technology ownership and know-how lead to social, economic, and cultural inequality;
- to critically examine how the phenomenon of the digital divide has transformed from a problem solely of Internet access to one linked to digital skills and a range of opportunities;
- to understand the global digital divide and the micro- and macro-level barriers that exist in the Global South regarding access to and use of technology;
- to question the usefulness of the digital divide framework in the context of development policy by reviewing critical perspectives.

Introduction

In this chapter, we address issues of **inequality** as they play out in technological ownership and know-how. Understanding **technological inequality** is of great importance to researchers, policy-makers, and politicians because technology provides educational, political, and economic advantages. The lack of connectivity and digital skills creates power imbalances and, potentially, conflict among social groups. This chapter specifically examines digital inequality as a pressing issue of our times: what are the social consequences for those disconnected from the Internet and related digital media? While researchers agree on the importance of studying the digital divide, much controversy still surrounds its definition (Helsper, 2019; Quan-Haase et al., 2018). This chapter covers the historical developments of the digital divide concept, examines the complexity of its measurement, and considers its relevance to policy in Canada and around the globe. A key argument is that the use of digital technologies not only reflects Internet **access**, but also reveals differences in skill level. Many individuals, despite having access to digital technologies, cannot take full advantage of the resources available to them online because they do not know how to navigate and evaluate the endless number of resources available. We also take a closer look at recent arguments that the digital divide extends to the use and monetization of social media. These sites provide individuals with a means of staying up to date with the news, connecting with their social networks, and accessing valuable information and cultural resources. What happens to those individuals who do not have access to social media or do not fully comprehend its relevance in society?

We also cover the global digital divide, which describes the gap in access to and use of the Internet that exists between **nations**. We discuss China as a prime example of a **newly industrializing nation** that has struggled to join the **information society** and, in the process, has developed an ambivalent relationship with the Internet. The chapter ends with a critical reflection on and a series of conclusions about our current state of knowledge regarding the Internet's role in creating social change.

The Digital Divide

The **digital divide** describes discrepancies between social groups in access to, use of, and empowerment by networked computers and other digital tools (Hargittai, 2020). Initially, policy-makers and scholars used the term to describe the gap in ownership of stand-alone personal computers that existed among various social groups. However, with the rapid expansion in the networking of computers in the 1990s, the term digital divide came to denote access to digital resources primarily via computers but also via cellphones, **phablets**, laptops, and tablets. The term gained particular prominence when, in a 1996 speech, US President Bill Clinton and US Vice President Al Gore used the term to emphasize the social and technological challenges presented to America in the **information age**, where a gap would emerge between the **haves** and **have-nots**. Closing the digital divide turned into a key political target within the North American policy framework (Epstein et al., 2011).

Issues of the digital divide have been phrased in terms of how the Internet provides opportunities to overcome or exacerbate existing inequalities. Norris (2001) writes about how "digital networks have the potential to broaden and enhance access to information and communications for remote rural areas and poorer neighbourhoods, to strengthen the process of democratization under transitional regimes, and to ameliorate the endemic problems of poverty in the developing world" (p. 6). Consequently, questions regarding the digital divide are of major concern to all citizens because the economic, cultural, and social possibilities of individuals and entire nations can depend on people's ability to leverage digital technologies and participate in the information age. For example, much policy debate surrounds the scarcity of skilled labourers that are needed to sustain quickly growing technopoles in cities like Toronto, Menlo Park, and London. The Canadian Big Data Consortium has suggested that the skills gap could reach 150,000 employees in the data science field alone (Dow, 2019). It is also important to consider and critically assess the early studies of the digital divide and their focus on access. These studies show how the debate around the digital divide has changed over time, as well as the kinds of challenges early users of the Web needed to overcome, including high costs for computers and needed infrastructure.

Early Studies of Penetration Rates

Early studies of the digital divide were primarily concerned with issues surrounding access. Key to examining **Internet access** has been an assessment of the Internet's **penetration rate** in various social groups. Two US surveys conducted in 1995 and 1998 by the **National Telecommunications and Information Administration (NTIA)** pointed out alarming differences in Internet penetration rates based on age, gender, education, rural/urban regions, single-/dual-parent households, ethnicity, and income (Epstein et al., 2011). The results show that inequalities existent in society are reflected in Internet usage, with those online being primarily white, younger males with higher socio-economic status living in urban areas.

The US debate was mirrored in Canada, where several surveys were conducted in the mid-1990s to assess the extent to which Canadians were connected. A Statistics Canada report investigated in more detail the effect of income on connectivity (Dickinson & Sciadas, 1996). A comparison of 1994 and 1995 household penetration rates for various **information and communication technologies (ICTs)** showed two trends: (1) telephone and cable both had reached high penetration rates, and these were stable; and (2) an increase was observed in the availability of computers and **modems**. Modems are devices that allow for digital data from a computer to be converted into the analog signal of a telephone line, thus connecting home computers to the Internet. In 1994, 99 per cent of Canadian households had a telephone, 74 per cent had cable, 25 per cent had a computer, and only 8 per cent had a modem.[1] By contrast, in the 1995 data, 99 per cent had telephones, 73 per cent had cable, 29 per cent owned a computer, and 12 per cent had a modem. While there is a demonstrated increase in computer and modem ownership within the one-year period, it remains unclear which social groups were adopting these technologies, and which were falling behind.

For this purpose, the penetration rates for ICTs were calculated separately for each **income quartile**. Four income quartiles were examined in the study: (1) less than $21,398; (2) $21,398–$39,949; (3) $39,950–$63,034; and (4) above $63,034. The statistics show that for telephone and cable penetration rates little to no differences can be observed between the high- and low-income quartiles. By contrast, income is strongly associated with both computer and modem penetration rates. In the highest income quartile—those who earn more than $63,034 a year—computer and modem ownership were 50 per cent and 22 per cent, respectively. Individuals in the lowest income quartile—those who make less than $21,398 a year—reported much lower percentages of computer and modem ownership: 12 per cent and 5 per cent, respectively. Dickinson and Sciadas (1996) raise the issue of inequality: "As penetration rates rise, households that can least afford their own terminals will make up a larger proportion of the 'have-nots'" (p. 6). We conclude that in the 1990s affordability was one of the main constraints to household ownership of a computer and modem.

In the Statistics Canada report discussed above, similar gaps were found along other key socio-economic variables. For example, when the head of the household was employed, computer ownership was 38 per cent, while only 21 per cent and 13 per cent of those unemployed or out of the labour force, respectively, reported owning a computer. Households where the head had a university degree were six times as likely to own a computer as households where the head had less than a grade 9 education. Stark differences in penetration rate are also observed between rural and urban areas: 22 per cent and 6 per cent of rural residents owned a computer and modem, respectively, while 30 per cent and 13 per cent of urban residents owned a computer and modem, respectively.

What conclusions can we draw based on early analyses of Internet penetration rates in Canada and the United States? First, access to the Internet reflected existing inequalities in society, with income, employment, education, ethnicity, rural/urban location, and age all affecting adoption patterns. This is not surprising, as economic resources are required to purchase a computer and to connect to the Web via an Internet service provider (ISP). Often Internet use also created class divisions, where blue-collar workers were less likely than office workers to use computers at work and thus be exposed through work. In addition to these existing inequalities, education and age played a role because users need skills to use a computer and navigate the Internet. This was particularly the case in the early 1990s when graphical Web browsers, such as Chrome, Safari, and Explorer, did not yet exist to facilitate the navigation and retrieval of content. Second, the gap in access may exacerbate existing inequalities by putting the "have-nots" at a disadvantage over the "haves" in terms of information, connectivity, and skills. Since these early studies of the digital divide, several changes have occurred. Of particular relevance have been initiatives specifically aimed at decreasing digital inequality.

Closing the Digital Divide

The large discrepancies in access to the Internet brought the issue of the digital divide into public consciousness and triggered new policies targeted at increasing digital inclusion. What kinds of interventions were devised to address issues of the digital divide? Programs were created not only by governments but in parallel by non-profit organizations and private funding agencies. One of the government-led interventions in Canada was the **Canadian Advanced Network and Research for Industry and Education (CANARIE)**. Founded in 1993 and based in Ottawa, CANARIE (2010) is a fibre-optic and satellite data network that "facilitates leading-edge research and big science across Canada and around the world." CANARIE's networking capabilities allow researchers to collaboratively analyze data that can lead to discoveries in the realms of education, health sciences, and technology.

As another example, **Lifeline** is a US-based government initiative that worked closely with community groups to help close the digital gap among vulnerable populations. Lifeline was established in 1985 to provide low-income households with affordable access to telephones and was expanded in 2016 include cellphones with the capabilities to receive text, voice, and data under the program (FCC, 2019). The program is designed chiefly to assist low-income Americans to access information, stay connected with family and friends, and be able join the digital realm. The program has successfully connected 10.7 million low-income Americans. Yet, in the most recent overhaul of the FCC, the program is in jeopardy and could be cut (Barwick, 2018).

Despite the good intentions of such initiatives, the digital divide is a complex problem that cannot easily be solved with the provision of infrastructure, computing resources, and funds. What is the effectiveness of these initiatives and can they effect real social change? Have penetration rates increased along the lines of inequality?

While the gap in access to the Internet has shrunk considerably since the mid-1990s, scholars have identified disparities among users in terms of the types of access they have to the Web (dial-up, broadband, or wireless), their knowledge and skills when online, and the variation in online activities they perform (Huynh & Malli, 2018; Vehovar et al., 2009). This highlights the gap between access and skill because "[i]f some individuals cannot use computer technology, then all the access in the world will do no good. Further, if people cannot find the assistance they need to use the technology, then access alone does little to alleviate the problem" (Mossberger, Tolbert, & Stansbury, 2003, p. 39). Hence, access to the Internet may be less of a concern over time in Canada and the United States, but differences among Internet users in terms of their skill level continue to be problematic. As a result, alternative definitions of the digital divide have been proposed that better reflect the complexity of the concept. These definitions look at the digital divide beyond penetration rates and examine it in terms of the kinds of benefits obtained from Internet use.

One alternative definition is the one proposed by Mossberger, Tolbert, and Stansbury (2003), where the authors identify four central components of the digital divide: (1) the access divide, (2) the skills divide, (3) the economic opportunity divide, and (4) the democratic divide. We discuss each dimension next and how it affects individuals' lives and their opportunity to leverage resources.

The Access Divide

The access divide examines whether or not a person has access to the Internet and the type of access as well as the location and frequency of use. In the early days of the Internet, having a dial-up connection provided access to a wealth of information. This is no longer the case because the Internet has evolved from a primarily text-based information repository to a multimedia immersive environment. Dial-up does not adequately support Web pages with images, video, and/or voice, making it excruciatingly difficult and frustrating for people with dial-up access to take full advantage. Recent policy discussions have also focused on a divide along cellphone ownership and data plans. Consider the social and economic disadvantages that people who do not own cellphones face. People who are disconnected cannot access the news in real time; they cannot connect to their friend and family networks via Facebook, Instagram, and other social media in real time; and they cannot access many government resources. Box 6.1 discusses homelessness and the important need for digital connectivity to access for example information about available services. Also, apps designed for Apple or Android operating systems are inaccessible without a smartphone; as numerous apps are released on a yearly basis, this leads to real disadvantages.

Another key challenge to Canadians' Internet use is the country's geography, specifically its low population density in relation to its geographic size. As a result, commercial carriers have limited economic incentives for connecting rural or remote areas. In their analysis of Chapleau, a rural Northern Ontario community, Collins and Wellman (2010) discuss how rural Canada is unique in terms of Internet adoption in at least two ways. For one, there is little infrastructure available in

Box 6.1 Homelessness and Digital Connectivity

Often people experiencing homelessness are left out of the discussion of the Internet because many assume that if you are homeless, you have more pressing needs than Internet access. Yet people without homes have interests, hobbies, a need for information, and a need for social connectivity. Precisely because they lack a permanent home, these people need cellphones and Internet access to help them connect with the larger, dispersed world. One reason many people do not think of the homeless populations as needing a phone is because they think of cellphones as a status symbol, displaying education, sophistication, and perhaps even wealth. In the past decade, however, this way of thinking has changed. Cellphones are ubiquitous today, with most Canadians relying on their phones for connectedness. Cellphone use is so popular that many young adults are already showing problematic (or addictive) use of electronic devices and cellphones (Centre for Addiction and Mental Health [CAMH], 2016).

For people experiencing homelessness, present-day cellphones, or smartphones, provide three key benefits:

1. Cellphones can allow them to call for protective services, such as the police, thereby increasing their safety.
2. Cellphones can help them seek and find employment and housing because potential employers and landlords can contact them conveniently.
3. Cellphones can help them coordinate essential activities: for example, appointments with government services and doctor's visits.

Taken together, then, cellphones can no longer be considered a luxury item; today, they are a necessity.

these areas in terms of broadband connectivity; without high-speed Internet, it is difficult for residents to access images and videos online. Second, and most importantly, “[t]he Chapleau experience did not reflect rural Internet users becoming the same as urban and suburban Internet users” (p. 1363). A key challenge moving forward is to provide rural areas with Internet access. That is, rural and urban Internet users are dissimilar in terms of how they make use of the Internet in that rural users tend to integrate it into their own social practices and daily habits. To some extent, then, it becomes an Internet that serves rural lifestyles. The problem is that without high-speed Internet connections, rural residents cannot benefit from job opportunities, online medical treatments, and online educational resources. This makes rural high-speed Internet a critical policy issue. Canada’s auditor general has made it clear that the first policy step is to determine a set standard for the **minimum amount of Internet connectivity** that applies to all parts of the country (The Canadian Press, 2018). Living in a rural area is associated with being 49 per cent less likely to access the Internet than those who live in urban areas (Haight et al., 2014).

In the Canadian context, it is also relevant to discuss the challenges and struggles against systemic and circumstantial obstacles encountered by Indigenous people (First Nations First Mile Connectivity Consortium, 2018). Broadband is employed by Indigenous people to deliver services and connect globally, “[b]ut outside of major centres, many First Nations remain underserved” (First Mile, n.d.) Often this is linked to a lack of infrastructure to provide broadband or a lack of equipment and high costs. To improve connectivity, different strategies have been proposed to increase people’s inclusion in the networked society. According to McMahon (2014), the **First Mile Project** is an approach that focuses on “ways that public policies, regulations, and other supports enable user communities to generate and sustain their own networked digital infrastructures” (p. 2005). Coalitions have been formed between Indigenous groups across Canada in order to influence the policies and regulations governing their digital infrastructures, which has contributed to digital self-determination for Indigenous communities. A 2018 book entitled *Stories from the First Mile* describes the role of digital self-determination in a larger reconciliation framework:

> This counter-story is valuable in the work of reconciliation. On one hand, the book gives additional weight to the criticism that Canadians are beneficiaries of a capitalist/colonial relationship that tends to keep rural and remote First Nations communities in a state of dependency. On the other hand, it is clear that First Nations and diverse Canadian organizations have been able to generate effective collaboration on ICT to secure significant advances in areas such as education (Internet schooling in the communities), health care (tele-health), and language revitalization (video-conferencing across isolated communities). (p. vii)

The work by the First Mile Project demonstrates the relevance of digital connectivity to Indigenous people (First Nations, Métis, and Inuit) and their communities. The role of digital connectivity is manifold. For example, the Ktunaxa Nation Network is a community-based, First Mile–driven infrastructure project and has 23 communication towers and fibre-to-the-home (FTTH) in two communities (First Nations First Mile Connectivity Consortium, 2018). The Ktunaxa Nation Network serves many purposes including the revitalization and dissemination of the Ktunaxa language through online resources, including real-time and pre-recorded language classes, a digital grammar book, and a digital dictionary. This demonstrates the relevance of these many projects to culture, community, and reconciliation.

In sum, the divide between haves and have-nots has not been completely closed: the gap continues to exist along the lines of income, education, age, rural/urban location, and immigrant status. We also learned that highly impactful projects are taking place across Canada as part of a move toward digital self-determination for Indigenous communities. There are also other key aspects that are often disregarded in the debate in addition to access. In the next section, we examine some of these factors, including knowledge levels and digital skills.

The Skills Divide

The **skills divide** can be examined in terms of **technical competence** and **information literacy** (Hargittai, 2019). Technical competence includes knowledge about how to use computers, whereas information literacy refers to the ability to seek out

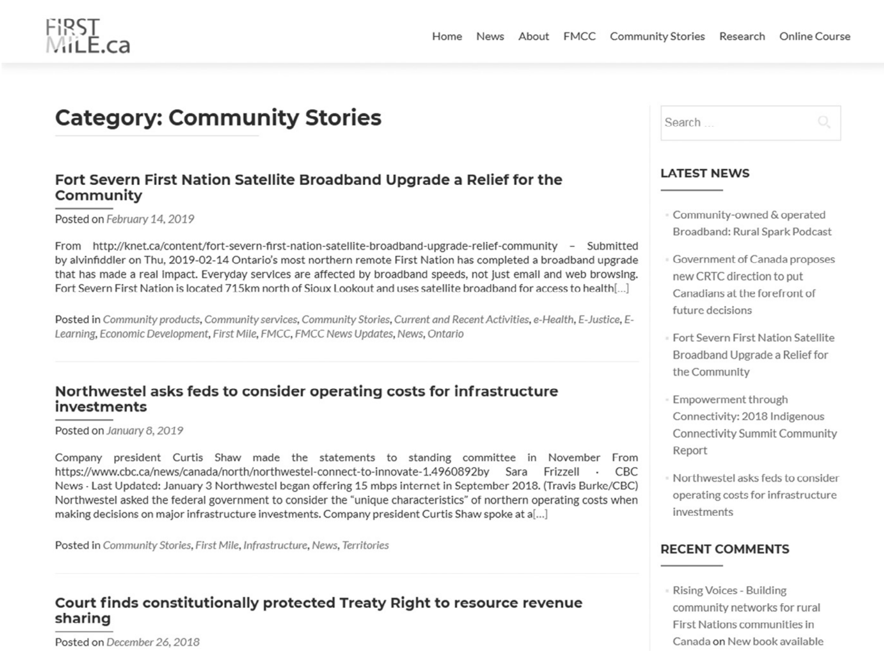


Figure 6.1 First Mile Project: Resources and Networking

First Mile Project website. Used with permission.

information, evaluate it, and use it for specific purposes, such as finding a job, solving a problem, or dealing with health-related concerns.

In Canada and the United States, attempts to close skills-based gaps in the digital divide occurred early on through the establishment of community-based training programs. In Canada, the **Community Access Program (CAP)**, a government initiative administered through Industry Canada beginning in 1994, was aimed at providing Canadians with affordable access and the necessary skills to use the Internet in primarily rural areas (Cullen, 2001). These skills included basic computer and Internet skills, from elementary Web design to advice about online education (Cullen, 2001). In Canada and the United States, libraries have played a central role in terms of providing computer skills to users (Bertot, Jaeger, McClure, Wright, & Jensen, 2009). Hargittai and Hsieh (2010) suggested that digital skills can be adequately measured by noting an individual's Internet knowledge—that is, their understanding of Internet-related key terms. Box 6.2 illustrates their measure.

The Economic Opportunity Divide and the Democratic Divide

The **economic opportunity divide** reflects the advantages provided by access to digital technologies, such as finding a job, obtaining health information, and being able to take an online course. With the widespread diffusion and reach of digital media into all aspects of daily life, digital media now not only provide the means to finding information about jobs and applying for jobs online, but they also allow individuals to make an income from their digital engagement. In chapter 7, we will discuss new forms of work made possible through digital connectivity such as gig work and the sharing economy.

The **democratic divide** describes the use of the Internet for political engagement, such as obtaining information about political candidates or parties, being able to make donations to political entities, and communicating with government, for example, over email.

Linked to differences in income and education are variations in people's ability to navigate the Internet and find relevant information. Hargittai (2002) concludes that

> [m]erely offering people a network-connected machine will not ensure that they can use the medium to meet their needs because they may not be able to maximally take advantage of all that the Web has to offer. Policy decisions that aim to reduce inequalities in access to and use of information technologies must take into consideration the necessary investment in training and support as well. (Conclusion section, para. 2)

As the Web continues to develop and applications become more varied, the divide based on access, skills, economic opportunity, and engagement in a democratic discourse is becoming a more pressing policy issue.

Box 6.2 Measuring Digital Skills

A series of validated measures have been developed to measure a person's digital skills. One such measure was developed by Hargittai and consists of 27 terms with which a person must indicate whether or not they are familiar. To measure your own level of digital literacy, complete the set of items below and count how many times your answer is "Yes."

After having indicated if you are familiar with the different terms, reflect on your score. To what extent does your score accurately reflect your self-perceived skill level? Do you think that you could benefit from further expanding your digital skills? A recent report demonstrates that there is a real lack of digital skills in Canada and suggests educational institutions from elementary schools to universities and colleges integrate more extensive digital skills learning (Huynh & Malli, 2018).

Table 6.1 Measuring Digital Skills

Term	Yes/No	Term	Yes/No
Reload		Frames	
Advanced Search		Podcasting	
Favourites		Web Feeds	
Bookmark		Torrent	
Spyware		BCC (on email)	
Preference Setting		Bookmarklet	
Blog		Wiki	
Firewall		Cache	
PDF		Widget	
JPG		Phishing	
Tagging		Malware	
Weblog		Social Bookmarking	
Newsgroup		RSS	
Tabbed Browsing		Total = (sum of yes answers)	of 27

Source: Adapted from Hargittai, E., & Hsieh, Y. P. (2012). Succinct survey measures of web-use skills. *Social Science Computer Review, 30*(1), 95–107. https://doi.org/10.1177/0894439310397146

The Social Media Divide

An important aspect often neglected in writings about the digital divide and its social implications is the continuously changing nature of the Internet (Haight et al., 2014; Quan-Haase & Wellman, 2004). While simply accessing the Internet for finding information was considered important a decade ago, being able to effectively use social media is now seen as important. Although spending many hours on social media has been widely criticized and some studies on screen time warn about the negative effects of overuse (Madigan et al., 2019), engagement on these sites is not just about having fun. Rather, recent evidence suggests that it is tied to positive outcomes ranging from identity management to informational access and the creation of social and cultural capital (Ellison, Steinfield, & Lampe, 2006).

For Pierre Bourdieu, a renowned French theorist, social and cultural capital form the very foundation of social life and determine social relations among individuals. **Social capital** is understood by Bourdieu (1973) as the resources, both actual and potential, available through a person's social networks. **Cultural capital** describes the sum of intangible social assets that allow an individual to claim membership in specific social circles (Bourdieu, 1973). Cultural capital allows individuals to show credibility and belonging. Examples include formal education, knowledge of the arts, and understandings of appropriate behaviour and norms. Cultural capital is particularly relevant for adolescents and young adults, for whom fitting in with peers is a central part of their socialization. Knowing who to follow on Instagram and what the latest gossip is on Snapchat are all part of building one's cultural capital and fitting in with peer networks both online and offline. The growing evidence linking social media use and forms of non-economic capital suggests that examining differences in the adoption and use of social media are critical for studies of the digital divide (Haight, Quan-Haase, & Corbett, 2014; Hargittai & Hsieh, 2010). Social media such as LinkedIn are also part of larger job-seeking strategies (Kenthapadi, Le, & Venkataraman, 2017).

The social media divide is the gap that exists between users of social media along key demographic variables, such as gender, income, and education. Haight et al. (2014) conducted one of the first studies of the social media divide and found that for Canadians, education was a central predictor of social networking site adoption. Canadians who did not complete high school were more likely to be users of **social networking sites** in comparison to those with a high school education. Current students (in high school or post-secondary education) were by far the most likely adopters of social networking sites: 87 per cent usage compared to 48 per cent for those with no high school education. Furthermore, women were more likely to adopt social media than men: women were 58 per cent more likely to use Facebook, Twitter, or Instagram than men. While posting videos and content to YouTube may give the impression of a fun form of engagement with a global audience, for many YouTubers it is in fact their primary source of income. The social capital they built by increasing the number of subscribers and garnering more likes and shares is what allows them to gain prominence and be recognized as an influencer. Incomes from YouTube vary considerably, but YouTube stars can make up to millions weekly (Parkin, 2018). Box 6.3 discusses YouTube stars as one type of economic opportunity provided by digital connectivity.

Box 6.3 YouTube Stars: Social Media as Social, Cultural, and Economic Capital

YouTube has become an important source of revenue (Musonera & Weber, 2018). YouTubers who can garner a large following are also able to monetize their fame. Individuals who have over 1 million subscribers are referred to as "YouTube stars"; usually the focus is on subscribers to a channel rather than views to a single video. In today's YouTube numbers a million is certainly impressive, but some channels have much larger numbers of followers. For example, PewDiePie has over 88 million, Justin Bieber has 43.6 million, and 5-Minute Crafts has 51.1 million subscribers (YouTube, 2019). Some YouTube stars are making a very high income from their channel, with estimates suggesting that stars can make as much as $10–$18 million USD a year. To be able to earn income from YouTube, a startup set of equipment is needed: camera, microphone, tripod or gimbal stabilizer, lighting, and video editing software. Many YouTubers start their careers in their bedrooms, and have a low startup investment, but, to maintain their star status, YouTubers need to post new videos regularly, often at least weekly, and maintain a high degree of novelty and authenticity. With so much content available on YouTube for free, they can quickly lose their status. This has led to both burnout and identity crises. Elle Mills, a Canadian YouTuber, recently spoke out about the anxiety and depression caused by her YouTube fame, and her reasons for leaving the business for good (see Chapter 10). Many YouTubers express their dislike of YouTube's algorithm, "a system that actively promotes quantity over quality," as YouTuber Matt Lees expresses (Parkin, 2018). This has been a common trend over the last year, with more YouTubers either quitting or taking a break from YouTube, such as Marzia Bisognin (Marzia, formerly CutiePieMarzia), Lilly Singh (Superwoman), and Bobby Burns. A final important point is the ethical consideration of which videos can and should be monetized (Robertson, 2019). For example, advertisers have raised alarms about their ads being shown in conjunction with anti-vaccine videos and allowing YouTubers who post these videos to make an income based on misinformation that can put children's lives and society at large at risk. YouTube announced that it will pull ads from anti-vax conspiracy videos because these misinform the population and can be harmful (Robertson, 2019).

Having a social media account is important not only in terms of engaging with friends and family, but also in terms of gaining social capital and cultural capital. Social capital provides the friendship and information networks that provide a wide range of social support. But the hard-gained social capital can also be monetized and lead to a substantial income, as discussed in Box. 6.3. Social media sites such as LinkedIn can also serve to establish work relations, which can be important to find information about jobs. Overall, social media adoption and use can provide a range of social, cultural, and economic benefits. We will discuss further the pros and challenges of social media in Chapter 10 and the stress and information overload they generate for users and caregivers in Chapter 12.

The Global Digital Divide

The term **global digital divide** was coined to describe the differences in access to and use of the Internet among nations and regions of the world. Most analysis of the digital divide focuses on disparities within Western nations. An equally pressing concern is, however, the inequality in access to technology between nations. These disparities in access are thought to have major social and economic consequences for nations and their development. The problem is often perceived as one of centre and periphery, where developed countries control the flow of information (Fuchs, 2008). In 2001, the North American dominance in terms of Internet use was reflected in usage statistics that showed that as much as 60 per cent of the online population was North American (ACNielsen, 2001, as cited in Chen, Boase, & Wellman, 2002). Statistics collected by the Internet World Stats demonstrate that North America and Europe have the highest levels of Internet penetration, with 95 per cent and 85 per cent, respectively, which is in stark contrast to the 36 per cent and 49 per cent levels found in Africa and Asia, respectively (Internet World Stats, 2018). The low levels of Internet penetration in these nations undermines their efforts to improve their citizens' quality of life and increase their participation in the global economy.

Nations in the Global South continue to struggle in their efforts to become digital, having to overcome numerous barriers that exist at both the micro- and macro-levels. The most salient ones include the following:
Micro-level barriers:

1. *Relevance*: When individuals are struggling to make basic ends meet, like food, health, and shelter, often with no income or earnings below the poverty line, digital connectivity is not a priority.
2. *Economic barriers*: The cost of computers is one major deterrent for many in the Global South. This cost is coupled with the monthly payment to ISPs that is necessary for Web access.
3. *Illiteracy*: Many parts of the developing world continue to have high levels of illiteracy.
4. *Poor computing skills*: Even if individuals have literacy skills, they may have no previous experience with keyboards or computers.

Macro-level barriers:

5. *Lack of infrastructure*: The Global South is lacking in terms of hardware, software, and Internet connectivity. This is particularly true for rural areas.
6. *Lack of support*: It may be difficult to find others who have had past experiences with computers and the Internet to help them troubleshoot computing problems with hardware, software, and Internet navigation.
7. *Cultural barriers*: Acceptance of new technologies and practices may be a challenge when such habits have not been widely adopted. Additionally, many ICTs

do not have a universal design, and as a result, norms and customs are often not in agreement with or do not facilitate the use of some features and capabilities of ICTs.

8. *Electricity supply*: Often there is no continuous electricity supply; this particularly affects African nations.
9. *Political barriers:* Political instability, censorship, and regional warfare can account for inconsistent and inequitable access to ICTs.

Nonetheless, the composition of Internet users has changed considerably since the early inception of the Web, with a large proportion of citizens in the Global South being avid users. To address the gap between nations, the World Summit on the Information Society (WSIS) has been held since 2003 by the United Nations with the aim of establishing programs that could target those nations lagging behind. A central goal is to establish the role of ICTs to achieve the Sustainable Development Goals as outlined in the **2030 Agenda for Sustainable Development**. In 2018, the UN organized a meeting "All on Board—Closing the Digital Gap for Women and Girls in Developing Countries" and during the meeting Under-Secretary-General of the UN and Executive Director of UN Women, Phumzile Mlambo-Ngcuka, argued that:

> It is not easy to imagine development in the 21st century without the effective use of technology in our everyday lives. If girls and women do not have access to, control over and full use of technology, they will simply be left behind. That is the reason for the discussion that we are having today: we need to close the gap. If the gap widens, it pushes girls and women further and further behind. . . . We would like by 2021 to see significant change: an increase of women who are connected; an increase of women who are learning naturally and are able to access education at home; a number of people producing content that is relevant for women; and the number of women in the labour force providing services, but also being able to provide expertise and making a difference in the industry.

As previously mentioned, the barriers to access are numerous and often directly linked to key factors of inequality: gender, poverty, illiteracy, infrastructure, and political/social realities. While ICTs hold much promise, Gurstein (2007) points out that they can have a positive impact only if coupled with appropriate socio-economic policy. It is also important to keep in mind that "rather than closing the divide for the sake of it, the more sensible goal is to determine how best to use technology to promote bottom-up development" ("The Real Digital Divide," 2005). **Information and communication technologies for development (ICT4D)** aims to use ICTs directly to reduce poverty and improve health care, education, and work conditions. Box 6.4 discusses the One Laptop per Child initiative as an ICT4D example that has had an impact on some of the poorest regions of the world.

Box 6.4 Closing the Global Digital Divide: One Laptop per Child

One Laptop per Child (OLPC) is a US non-profit organization whose mandate is to "create educational opportunities for the world's poorest children by providing each child with a rugged, low-cost, low-power, connected laptop with content and software" (One Laptop per Child, 2010b). The idea behind OLPC is to empower the world's least-advantaged children by involving them in their own education and increasing their connectivity to others.

Beginning in 2005 with a prototype featuring a yellow hand crank used to power the computer, known as the green machine, OLPC soon began to gain support of organizations such as the **United Nations Development Programme (UNDP)**. A study of children in Madagascar found that the children used the laptops in similar ways to those in other nations—for educational purposes at school, and social purposes at home—and overall helped the children nurture their creativity (Nogry & Varly, 2018). Despite the OLPC's good intentions, the program has been heavily criticized. Kraemer, Dedrick, and Sharma suggested that "expecting a laptop to cause such revolutionary change showed a degree of naiveté, even for an organization with the best intentions and smartest people" (2009, p. 71). While OLPC presented OLPC as a method for helping to close the digital divide, African critics have argued that the scheme tries to impress Westernized ideas of education and progress onto regions where necessities such as clean water, formal education, and health-care programs are of far greater importance (Smith, 2005). Saxe and Kirby (2018) also found unintended negative consequences, such as local resentment from schools that did not receive laptops, the children becoming victims of theft, and extra time having to be spent by educators to learn the educational software on the device—time that could have been used to create more beneficial activities for the students. The low cost of the XO laptop should make it affordable for a large segment of the population. However, some have argued that purchasing the device is not so straightforward because OLPC has not taken into account the additional costs associated with the technology in terms of software upgrades and licences, training, technical support, maintenance, and replacement of broken or malfunctioning computers (Kraemer et al., 2009). Similarly, Osimani et al. (2018) argue that the management of all of the devices, involving for example software updates, hardware maintenance and repair, and inventory tracking, is a difficult task to keep up with. Designed with good intentions, OLPC's program serves as a paradigm of the types of technological and social issues affecting developing countries. Despite its seemingly minimal startup costs, OLPC's concept overlooked the type of unique cultural, political, and socio-economic conditions facing poorer countries. By viewing ideas of the digital divide through a Westernized lens, OLPC failed to understand the concerns of local environments, particularly in regions where basic nutritional, health, and educational needs trump the purchase and diffusion of digital technologies.

As Box 6.4 describes, the global digital divide is a complex issue and local, cultural contexts need to be taken into consideration into any approach geared to closing the divide. Moreover, as First Mile, discussed above, demonstrates, community-based, self-determined projects have a much greater likelihood to succeed and have positive long-term effects. The social and economic consequences of the digital divide continue to be the subject of much debate.

China's Move toward Digitization: A Unique Example

The People's Republic of China, or China for short, is a unique case in terms of the diffusion of the Internet for several reasons. First, China has seen incredible growth in its information and communications sector—both for personal use as well as business. This growth can be seen when looking at China's largest e-commerce company, Alibaba (Hong, 2017). Alibaba's stock has doubled since it started trading on the New York Stock Exchange (NYSE) in 2014. The fact that a Chinese e-commerce site is worth more than Facebook, eBay, and Amazon together signals that the fastest-growing market is now in Asia and not North America. It also signals that economic transactions will likely increase exponentially in Asia in comparison to the North American market. Simply looking at the numbers, this makes sense: China has about twice the number of people online as does North America, and this number is set to double in the next decade.

Second, China has a population of more than one billion, or about 20 per cent of the world's entire population, making it one of the largest countries in the world. Hence, even if only a small proportion of its population is online, this actually represents a large amount of both Internet traffic and, more importantly, Internet content. The China Internet Network Information Center (CNNIC) has played an important role in documenting China's digital divide over the past decade and in pointing toward important social and economic trends. There are currently over 800 million Internet users in China, and 98 per cent access the web through mobile devices (McCarthy, 2018). This represents about 60 per cent of the country's population. This means that there are a further 500 million or so Chinese citizens who could potentially go online in the next decade. In comparison to other developing countries, the penetration rate in China is fairly high, although still much lower than in OECD countries. The majority of users are young (see Table 6.2): over half of users are between 20 and 39 years of age (CNNIC, 2018). About 5 per cent of users are in the 60-plus age group. Table 6.3 shows the main reasons why people are non-users; the main reason reported was lack of computer and Internet knowledge

Table 6.2 Internet Users in China by Age

Under 19	20–29	30–39	40–49	50–59	Over 60
22.9%	30%	23.5%	13.2%	5.2%	5.2%

Source: Modified from China Internet Network Information Centre (CNNIC), *41st Statistical Survey Report on the Internet Development in China* (Beijing: CNNIC, 2018), p. 35.

Table 6.3 Reasons for Not Using the Internet in China

Reason	Percentage
Lack of computer/Internet knowledge	54
Limitations in education level	38
Too old or too young	15
No need/interest	10
No computer or Internet devices	10
No time for Internet surfing	8
No local access to the Internet	5

Source: Modified from China Internet Network Information Centre (CNNIC), *41st Statistical Survey Report on the Internet Development in China* (Beijing: CNNIC, 2018), p. 35

followed by low education level. However, there is still insufficient broadband infrastructure in many remote locations, and high charges for Internet access are creating gaps between rural and urban areas in China (CNNIC, 2018; Flew, 2008).

Third, China is the world's fastest-growing economy with a nominal gross domestic product (GDP) of $12.24 trillion USD in 2017 according to World Bank Statistics, making it the second largest in the world after the United States (World Economic Forum, 2018). It is, thus, an important player in the telecommunications sector—as both a consumer and a producer of products and services. China has demonstrated similar success in worldwide retail consumer electronics with brand-name companies such as Huawei, Xiaomi, and Oppo rapidly breaking into the global market. These Chinese companies' unit sales are among the highest ranking in 2018, only behind Samsung and Apple (MarketLine, 2018). In recent years, Huawei's smartphones have gained traction in Western European and North American markets, though its sales have been subject to the same plateauing phenomenon as Apple and Samsung as the smartphone market matures (Euromonitor International, 2019).

Fourth, China's governmental policy has been to promote digitization, while at the same time limiting access to content. On the one hand, China wants to be a key player in the high-tech sector and benefit from the economic advantages provided by e-commerce, networking, and online services. On the other hand, it understands that the Internet's array of communication capabilities, decentralized nature, and ease of access to information can potentially undermine the Chinese Communist Party's rule. As a result, the government has implemented a range of censorship strategies both limiting the exchange of information nationally as well as regulating information flows between China and the world. Indeed, China has been criticized for its **Internet censorship**, which is enforced through laws, regulations, and repression of citizens.

In June 2014, the Chinese government started a comprehensive campaign to further tighten national and international security (Bradsher & Mozur, 2014; Han, 2018). On a day-to-day basis, this means difficulties with sending and receiving emails; limited access to Internet resources, such as Web pages, PDFs, and news; and restricted use of services. For instance, Twitter and Facebook were already censored, but now companies such as Line and Kakao Talk, which operate in Asia, are also censored. This policy approach has been referred to as **China's Great Firewall** and impacts worker productivity, e-commerce, and social contact among friends and family (Goldsmith & Wu, 2006). The Great Firewall takes place at various levels (Han, 2018). At the national level, a set of filters disrupts connections that the state evaluates as disruptive. Filters are algorithms set to disrupt the free flow of information by intercepting and removing content. Filters are also applied regionally by local authorities using keywords as a means to identify undesired content. ISPs also play a role in regulating information flows by scrutinizing posts prior to posting them for undesired content, creating yet another layer of censorship. In addition to automated means of filtering, human scrutiny of information also helps identify unwanted content. In addition to these measures, online surveillance also occurs centrally through monitoring popular social media, search term use, and other Internet traffic.

These four examples are just some of the many reasons why China is a unique case in terms of Internet diffusion (Han, 2018; Hong, 2017). China is a key player in telecommunications, and as it continues to grow not only as an e-commerce giant, but also as a producer of content, further examination is needed. Moreover, China's Great Firewall opens up many questions around the role of censorship in a digital society.

Critical Perspectives of the Digital Divide

There is no doubt that the digital divide is a central problem of our times, as it is inextricably intertwined with existing inequalities (Stevenson, 2009). Yet the digital divide concept has also become a tool used by developed nations to impose standards of industrialization on developing countries. Gurstein (2007) provides a thoughtful critique of the digital divide concept and points out four difficulties with research in the area:

1. A large majority of the studies of the digital divide document only the existence of a divide and fail to outline ways of addressing the problem.
2. Most analyses of the digital divide suggest that access alone is a solution to the problem without addressing the larger socio-economic issues that developing countries are struggling with, such as health care, education, and wealth disparities.
3. For Gurstein, the debate is ignoring "the underlying reasons for the impacts of the DD [digital divide] such as on-going trends towards increasing social and economic polarization—with the well-off getting better off and those behind falling even further behind as they find themselves unable to take advantage of ICT opportunities" (2007, p. 45). Providing access will certainly have a social

impact on communities, but whether or not access will provide the economic, social, cultural, and educational advantage that lies at the heart of inequality remains unclear. Can access close gaps in inequality?

4. Access needs to be accompanied by training, means of production and distribution, and an economic model of return. Without a more comprehensive plan of development, access will provide little positive return in countries where illiteracy prevails, basic needs are not met, and social unrest continues to exist.

Gurstein's (2007) central point is that the debate surrounding the digital divide should not obscure prevailing inequalities in society, which cannot easily be resolved through technology alone. Similarly, Stevenson (2009) argues that the digital divide is often used as a discursive resource to benefit governments, information capital, and public service professionals. Epstein, Nisbet, and Gillespie (2011) examined how the various definitions of the digital divide had an impact on policy. They found that framing the digital divide as a problem of access emphasized the provision of adequate infrastructure, largely neglecting more fundamental problems of information literacy.

By contrast, framing the problem in terms of skills moves responsibility for the digital divide from governments to citizens, who are perceived as needing to act in order to obtain the necessary proficiency to access Web resources. This shows that how the digital divide is defined and framed has important repercussions for policy initiatives, as the skills perspective may "diminish the public's call for public policies or collective efforts to address the problem," leading people to assume that it is the responsibility of individuals and educational institutions (Epstein et al., 2011, p. 101).

Conclusions

What conclusions can we draw about our current state of knowledge regarding the Internet's role in creating social change? This chapter has provided an analysis of the various attributes and characteristics that define and shape the digital divide. In an era in which the Internet is ubiquitous in everyday life, many would perceive the digital divide to be a relic of the recent past. Yet despite the rapid consumption and adoption of ICTs, digital inequality remains a pressing issue for both developed and developing nations. The digital divide can no longer simply be correlated with one's ability to access the Internet or own a computer. Rather, the digital divide can be attributed to a lack of digital skills to competently use the Internet or to the inability to seek out information necessary for being an active participant in contemporary politics or culture. Notably, many contemporary scholars and social theorists now view the digital divide in its many overt and distinct forms. These include, but are not limited to, geographical, economic, educational, social, cultural, and technical spheres. In addition, recent arguments suggest that it is necessary to look also at discrepancies in the use of social media, as these are important sources of social and cultural capital.

The closing of the digital divide is not simply solved, nor is it predicated on supplying marginalized groups with affordable or donated computer hardware and software. It is a project that primarily requires an understanding of the socio-economic factors defining the digital divide, as well as the unique local conditions affecting millions of people who are unfamiliar with the omnipresent and continued experiences of using information technologies as an integral component of everyday life. This issue has both short- and long-term implications, affecting how information is used, manipulated, consumed, and distributed.

Questions for Critical Thought

1. What are the key limitations of early examinations of the digital divide?
2. What are the central barriers to overcoming the digital divide in the Global South?
3. What are the unique challenges that China confronts as it moves into the information society?
4. Provide an in-depth critique of the digital divide concept. In your considerations, address the concept's strengths and weaknesses.

Suggested Readings

First Mile Connectivity Consortium (2018). *Stories from the First Mile: Digital technologies in remote and rural Indigenous communities*. First Nations Innovation and First Mile Connectivity Consortium. Fredericton: FMCC. http://firstmile.ca/wp-content/uploads/Stories-from-the-First-MIle-2018.pdf

This book is an important resource for understanding the challenges faced by First Nations communities in relation to digital connectivity and providing evidence of community self-reliance—hinged on the acquisition, ownership, and strategic deployment of information and communication technologies (ICTs).

Haight, M., Quan-Haase, A., & Corbett, B. (2014). Revisiting the digital divide in Canada: The impact of demographic factors on access to the Internet, level of online activity, and social networking site usage. *Information, Communication & Society, 17*(4), 503–519.

Examining access to the Internet, level of online activity, and social networking site usage in the Canadian context, the authors rely on data from the Canadian Internet Use Survey (CIUS), which is based on a national representative sample.

Hargittai, E. (2020). *The handbook on digital inequality*. London, UK: Edward Elgar Publishing.

The handbook provides a state-of-the-art overview of key topics linked to adoption and use of digital tools, and the required skill set.

Quan-Haase, A., Zhang, R., Wang, H., & Wellman, B. (2019). Older adults on digital media in a networked society: Enhancing and updating social connections. In M. Graham & W. H. Dutton (Eds.), *Society and the Internet: How networks of information and communication are changing our lives* (2nd ed.). London, UK: Oxford University Press.

This chapter provides an overview of the challenges and opportunities provided to seniors by digital media.

Online Resources

Digital Inclusion
http://sk.sagepub.com/video/digital-inclusion
This educational video featuring Dr Ellen Helsper from the London School of Economics provides a conceptual overview of the digital divide and its social, economic, and educational consequences.

K Net
http://meeting.knet.ca/mp19/
K Net is a meeting place to obtain knowledge about community-driven technology adoption and use. The site contains many resources and a free online social networking site based in Northern Ontario.

United Nations Science and Technology for Development Network (CSTD)
https://unctad.org/en/pages/cstd.aspx
The website contains reports from around the world about the current state of the digital divide as well as information on recent conferences addressing concerns around the issue.

Interactive Activities

Activity 1: Participating in Digital Competences Self-Assessment

Start by completing the self-assessment tool for digital competences developed with support from the European Commission.

The tool allows you to compare your own ranking with that of other users. Reflect on your score:

- How did you rank compared to the average score?
- What areas of digital competence did you excel in?
- What areas of digital competence were you lacking in?
- How could you benefit from increasing each of these skills?
- How would you go about increasing these skills?

The assessment tool is available at: http://www.digitalskillsaccelerator.eu/learning-portal/online-self-assessment-tool/

Activity 2: Can You Spot Fake News?

Fake news has received a lot of attention in the media recently. But how easy is it for users to detect fake news? Digital literacy provides consumers of information with the ability to identify key characteristics that flag a story as potentially misinformation. Play FACTitious, and complete one of the quizzes below on fake news.

- Were you able to spot the difference between real news articles and fake news?
- What makes a piece of fake news compelling?
- How can you spot the difference between the two (list the various elements that you should look for)?
- Why is it important that we learn to spot misinformation?
  Game: http://factitious.augamestudio.com/#/
  Quiz 1: https://akron.qualtrics.com/jfe/form/SV_2bhqIwpegOtj5yZ
  Quiz 2: https://www.channelone.com/feature/quiz-can-you-spot-the-fake-news-story/

7 The Labour of Technology

Learning Objectives

- to examine the role technology has played historically in the division of labour and resulting labour struggles;
- to become familiar with key labour theories of the twentieth century, including scientific management and Fordism, and understand their social implications for society;
- to analyze the relationship between technology and the emergence of immaterial and affective labour;
- to critically examine how technology via the sharing economy is leading to precarious labour and the displacement of traditional forms of work;
- to obtain an overview of contemporary approaches to the understanding of the complexities of digital labour, the link between labour and play, and the emergence of makerspaces.

Introduction

The goal of this chapter is to take a closer look at the ways in which technology and work intersect. We discuss changes that have occurred as a result of the Industrial Revolution and advances in technology in the nature of work processes, focusing in particular on **deskilling** and immaterial and affective labour. Additionally, we examine how information and communication technologies (ICTs) are facilitating the development of new organizational structures—often covered under the umbrella term **networked organization**. Workers are now located globally and connected to their managers and global teams 24/7 via mobile phones, tablets, and computers. How does this hyperconnectivity affect workers' private spheres, well-being, and mental health? Finally, the chapter reviews how Web 2.0 technologies and mobile phones facilitate new forms of production based on the principles of collaboration, sharing, and open source. The new forms of work are often placed under the umbrella term *sharing economy* and consist of very disparate forms of work such as selling a used item on Kijiji; driving for Uber; or listing a room, apartment, or house on Airbnb. Who engages in this type of work? How does it disrupt existing industries? We then discuss makerspaces as a new way of creative disruption that allows the public to get involved in making technology and thereby exploring the black box of design, discussed in Chapter 4. The discussion in this chapter makes it clear that technology is not a neutral mediator in conflicts arising from changes in work conditions. On the contrary, technology becomes an active force that shapes and influences the nature of work itself, working conditions, and the structure of society as a whole.

Technology and the Division of Labour

A central question of this book is whether technology is the central actor leading to social change; merely a tool for specific social, political, economic, and cultural purposes; or an integral, inseparable part of daily life. This question also frames our discussion about the intersection of technology and labour. We discuss in the following section how two trends in the early 1900s, scientific management and Fordism, led to the process of deskilling by technology through the division of labour. These two trends also illustrate how technology ceases to be merely a tool but instead becomes seamlessly integrated into the social and economic system of production.

Since the late nineteenth century, scientific management has emerged as a prevalent theory of work behaviour and management. Pioneered by American mechanical engineer Frederick Winslow Taylor and thus often referred to as **Taylorism**, scientific management aims to increase worker efficiency through the application of the scientific method to the understanding of labour. Its core principles are based on the idea that work processes can be systematically studied and, based on this knowledge, standardized in ways that make them more efficient and less prone to error.

Having closely observed industrial production at a number of manufacturing firms in the United States, Taylor (2003) deplored the inefficiency he saw, arguing that production could be increased significantly if it were under a better form of management. For Taylor, "the best management is a true science, resting upon clearly defined laws, rules, and principles" (2003, p. 119). Thus, he developed a system of scientific management which he believed would allow industrialists to minimize waste and maximize output. Taylor advised that an expanded and more involved management oversee the production process. Managers were to rationally and systematically organize the workplace, define specific and clear responsibilities for workers, monitor all work closely, and reward employees based on productivity. An important responsibility of managers was conducting time studies, which consisted of first recording a worker's movements in detail, then breaking the task down into smaller segments, and finally reassembling these segments with the aim of increasing productivity. In this way, management takes over "the burden of gathering all of the traditional knowledge which in the past has been possessed by the workmen and then of classifying, tabulating, and reducing this knowledge to rules, laws, and formulae" (Braverman, 1974, p. 112). This process often resulted in a division of labour where each worker was given a very specific task to complete for each item produced.

Scientific management radically streamlined work processes, leading to the development of mass production techniques by, for example, eliminating wasted time by optimizing workers' motions. As industrialists realized its potential, Taylor's system, or elements of it, was implemented around the world (Nelson, 1992). From the standpoint of business owners, scientific management dramatically helped to cut expenses and consequently increase profits. In many instances, productivity drastically improved, and companies were able to produce more products and sell them at potentially lower prices.

At the same time, however, the implementation of scientific management principles had a number of negative and wide-ranging consequences for work environments. Though Taylor (2003) had optimistically supposed that his ideas would benefit both employers and employees, in practice they tended to be much less favourable to the workers—or even detrimental to their working conditions. First, the standardization that was involved in streamlining production brought about further deskilling because it enabled the hiring of inexpensive, unskilled labourers (Braverman, 1974), to which workers reacted with resentment and opposition. Second, instead of workers becoming further specialized in their trade, scientific management resulted in the division of labour, thereby alienating workers from their craft (Pruijt, 1997). Third, workers lost control over their work as management imposed standardized production processes. They had less freedom to use their own discretion, and tensions between the working and managerial classes increased. Finally, the work often became very monotonous; workers felt disconnected as tasks became increasingly routine, standardized, and ultimately meaningless. All these factors together led to what Marx has referred to as alienation (*Entfremdung* in German), which describes the gap between workers' crafts and their actual work (Ollman, 1976). As the mid-twentieth century neared, scientific management became stigmatized in many academic circles, as scholars criticized the theory for its **dehumanization** of workers and neglect of social aspects of work and the workplace. Box 7.1 discusses a series of related studies, the Hawthorne Experiments, which suggest the need for a greater emphasis on the social dimensions of work.

Even though mechanization itself was less of a concern to Taylor's scientific management, its principles laid the foundation for the integration of technology in the management of work. Whereas Taylorism required control from management to guarantee that workers performed tasks with maximum efficiency, **Fordism** took the principles outlined in the scientific method a step further by introducing technology as a means for mechanizing, standardizing, and expediting work processes. At the Ford Motor Company, a system was developed where tasks were not only systematically divided to maximize efficiency but were, in addition, mechanically paced through an assembly line, where each worker was responsible for a single, repetitive task. The first successfully mass-produced consumer good was Ford's Model T in 1908, which epitomized the coming of a new social and economic era with the introduction of a **moving assembly line** at the manufacturing facility in Highland Park, Michigan.

Box 7.1 The Hawthorne Experiments

The Hawthorne Experiments were a group of research studies conducted between 1924 and 1932 at the Western Electric Company's Hawthorne plant in Chicago. Though their initial purpose was to find methods of increasing productivity through improvements to physical working conditions and remuneration (Pennock, 1930), the researchers concluded that social aspects of work had a much greater impact on worker efficiency (Carey, 1967, p. 404). It was less the physical changes themselves and more the perception among workers that they were receiving special treatment and attention from a concerned management that led to increased morale and productivity (Roethlisberger & Dickson, 2003). The studies proved very influential, and though their methods and conclusions have received considerable criticism (see, for example, Carey, 1967), they laid the foundation for the development of human relations management theory (Sonnenfeld, 1985).

The moving assembly line quickly revolutionized production, increasing productivity tenfold and reducing prices dramatically (Hounshell, 1985). Edwards (1979) describes how the assembly line "functions as a system of technical control, which means that the entire production process, or large segments of it, are based on a technology which regulates the working pace and controls the labor process" (pp. 112–113).

Not only did technological advancements impact on work processes as they took place at Ford Motor Company and factories around the world, but they also led to major social change. The prices of consumer goods decreased considerably as a result of the mass production of goods, creating a larger consumer base. In addition, central to Ford's economic model was the notion that workers could become consumers of the goods they produced if their wages were increased (Sward, 1948). This led to a cycle of production and consumption that would further feed into the **mass consumption** of goods. Hence, the term **mass production** has come to describe more than just the mechanization of the process of production; it also describes the "interrelated technical, social, and political elements that sustain a unique model of social and economic organization based on the mass consumption of standardized goods" (Lewchuk, 2005).

This section discussed scientific management and Fordism as two means of production that were made possible through technological advances. Not only did technology replace workers, but when the assembly line is considered, technology dictated the pace and nature of work processes. These two means of production show how in these factories technology becomes more than an external actor: it becomes part of the social and economic system of production. As a continuation of this discussion, the next section demonstrates how technology continued to affect society in the late twentieth century by creating new work structures referred to as networked organizations.

The Networked Organization

Most organizations follow a formal structure or hierarchy to describe work roles and the functions associated with these roles. In these organizational structures, power is distributed from the top down to the bottom levels of the hierarchy. Organizations that follow such a structure are referred to as **hierarchical organizations** and are the most prevalent form of management, in particular among large businesses. These organizations use an **organizational chart** to depict employees' roles, which often includes lengthy descriptions of work functions and reporting relationships, indicating who reports to whom.

The widespread use of the Internet and related information and communication technologies (ICTs) has transformed how people work and, more importantly, communicate in organizations. Arguments about the nature of these transformations range from subtle changes in the speed, volume, and ways in which people communicate, to more radical changes consisting of a shift in how power is distributed, how decision-making takes place, and how information flows (Bonabeau, 2009; Jarvenpaa & Ives, 1994). The term networked organization or network-centric organization is used to describe these new forms of work (Oberg & Walgenbach, 2008; Quan-Haase & Wellman, 2006). Networked organizations tend to have several unique features. Three key features include the following:

1. *Paperless work*: There is a trend toward the paperless office, where information and data are collected, stored, and managed in digital form (Sellen & Harper, 2002).
2. *Virtual teams*: These are teams that are located in different countries or continents that work on a project for specific periods of time, but never meet face-to-face. Once the project is completed, they are either assigned to a new project or they switch to a different job.
3. *Mobile reach*: The use of mobile technologies to facilitate communication. Smartphones, such as the BlackBerry and iPhone, have blurred the work–home boundary by providing flexibility, mobility, and constant accessibility to employees.

In addition to the changes that have taken place in terms of the use of technology, we can also observe changes in the **social structure** of these organizations. It is important to not only consider the pros of working in a networked organization but also to critically examine the cons of these new work structures, in particular in terms of surveillance practices, 24/7 availability, and changes in productivity.

Even though the concept of the networked organization has become popular, the results regarding the effects of ICTs on organizations are inconclusive (Markus & Robey, 1988). Certain kinds of effects, such as speed of communication and increased volume of messages, are apparent within most organizations (Oberg & Walgenbach, 2008; Sproull & Kiesler, 1991). With regard to changes in organizational structure, the results show that the effect of technology, as we have mentioned before, is not unidirectional and does not occur in predictable ways. ICTs have been found to both centralize and decentralize decision-making, and to have no effect when one was expected (Barrett, Grant, & Wailes, 2006; Franz, Roby, & Koeblitz, 1986). For example, in her study of a team of scientists, Roehrs (1998) found that ICTs did not help in making peripheral actors more central in the information network. In this group, technology supported existing work relations and hierarchical structures, but it did not change in either positive or negative ways how people were connected to each other.

An important ethical consideration when examining networked organizations and their heavy reliance on technology is the social and health consequences from an always-on society. To what extent is being "technologically tethered" to our jobs beneficial (Murray & Rostis, 2007)? Wireless technologies keep us always connected to our work, family, and friends 24/7, keeping us in a seemingly constant state of busyness—we are in a hyperconnected, hyper-digitized society (Quan-Haase & Wellman, 2006). When your employer provides you with a company cellphone and pays for your phone bills, these are often accompanied by occupational expectations around the clock. As a result of this fast pace and sense of over-connectivity, people often report feeling overwhelmed, exhausted, fragmented, and drained. Chesley (2014) has noted that individuals experience more distress when they have to take their work home with them and it overlaps with their personal lives. She found that work-related technology often facilitates interruptions and multitasking, which increase both perceived productivity and stress. When using such technologies at home for work purposes, employees reported more distress partly as a result of increased hours. This is alarming when considering how common taking work home has become in recent years. Based on a report from 2010, about 8 to 9 per cent of US workers said they brought their work home with them (Eldridge & Pabilonia, 2010). This kind of alienation was captured in Brigid Schulte's book *Overwhelmed* (2014), where she describes her busy life, constantly rushing from one thing to another. As a reporter for the *Washington Post*, Schulte has many work obligations and tight deadlines; at the same time, she is a mother and wants to be fully involved in her children's lives. She is clearly not alone in her time angst; rather, this is a reflection of Nowotny's (1994) assertion 20 years earlier that modern citizens struggle to find time for themselves and as a result often feel rushed, unsatisfied, and perhaps even unproductive despite their never-ending busyness.

Furthermore, work that follows you home is often unpaid and can set a precedent of perpetual accessibility in that your boss assumes you are available whenever needed. Moreover, cellphones can also reinforce a stigma of unproductivity when workers use them on the job, as employers often assume that workers are engaging in private matters via their devices while at work. However, Chesley (2014) also found that personal technology use at work has been linked to more effective stress management, as technologies often connect us to resources of social support or provide us with ways to temporarily mentally escape the pressures on the job.

The key appears to be a balance of technology use at home and at work. A study of e-health technology users in Hong Kong found that e-health could be beneficial. The most common activities were watching health tutorials and engaging in health information seeking (Leung & Chen, 2019). The biggest impact on well-being came from the perceived usefulness of the technology combined with the use of e-health activities for recording/monitoring, health tutorials, medical services, and sharing experiences. E-health can be a means for individuals who struggle with work–life balance to improve their health and well-being.

In conclusion, the analyses of how ICTs lead to organizational change show that this is a complex social process in which many cultural, organizational, and social factors need consideration. ICTs have not only shaped the structure of organizations but have also led to the creation of a new type of worker, one that moves away from industrial-based labour to immaterial labour.

The Immaterial Labour of Technology

Autonomous Marxism, also known as autonomism, is a political movement as well as a theoretical perspective that originated from 1960s Italian Marxist ideology. Antonio Negri, Paolo Virno, and others later developed it into a variant of Marxist social theory with an emphasis on workers' ability to self-organize with the aim of creating changes in the workplace and throughout society at large. The term *autonome* has Greek roots and refers to living within society, following one's own rules.

One of the key thinkers of the autonomous movement was Lazzarato (1996), whose major contribution to social theory was to recognize the social and work changes taking place in certain sectors of the economy. He observed that since the 1960s, new forms of labour had been emerging that could no longer be classified as industrial-based but, rather, existed around the outputs of the industrial era. These changes in labour resulted from new developments within the production system. With the new systems of production in place, the market was inundated with inexpensive consumer goods. Once most Americans owned a Model T, for example, Ford Motor Company saw demand stall. It was at this point that producers realized that an important part of the production cycle was to create **markets** for their products. For example, General Motors, on the advice of Alfred Sloan, developed five lines of cars—Chevrolet, Pontiac, Oldsmobile, Buick, and Cadillac—that increased in price, reflecting the owners' economic and social status; this was referred to as the ladder of success. As a result, an entire industry emerged around marketing, which includes branding a product, developing an advertisement campaign, and finding consumer or niche markets. Lazzarato (1996) employed the term **immaterial labour** to describe the industries that support industrial work and encompass "the labor that produces the informational and cultural content of the commodity" (p. 133). Lazzarato (1996) further distinguished between two kinds of immaterial labour.

The first kind of immaterial labour describes labour that does not entail manual labour. Lazzarato (1996) observed that in addition to the work being done in factories, an increasing number of workers were being employed to perform information-related tasks. The shift consisted of these new workers focusing on "selling" rather than "manufacturing" products. The term **white-collar worker** was introduced to describe these professionals or educated workers. The work they perform is "immediately collective, and we might say that it exists only in the form of networks and flows" (p. 136). And the move away from manufacturing toward a service or information economy is often described as **post-Fordist** or **post-industrial**.

Bell (1973) characterized this kind of post-industrial society as consisting of three core elements: (1) an increase in services over manufacturing; (2) a dominance of science-based industries; and (3) the creation of a new social class—the **technical** or **technocratic elite**—who have expertise in the technical areas. Later, with the technology boom of the 1990s, Richard Florida introduced the term *the creative class*, as discussed in Chapter 4, to describe workers in the high-tech sector (Florida, 2001; Reese, Faist, & Sands, 2010). He sees these workers as central for the economic development of post-industrial cities in North America because they are usually educated, creative, open to new ideas, and have higher-than-average incomes.

The second kind of immaterial labour describes the activities and processes that are necessary to shape culture, fashion, tastes, consumer behaviours, and public opinion. Marketing firms became a part of North American culture through their clever and pervasive branding approaches. For example, Canadian brand President's Choice put together a marketing campaign "#Eattogetherday" that encourages people to move away from technology and focus on the experience of sharing food with family and friends (Loblaws Company, 2019).

In the industrial era, technology radically transformed the nature and pace of work. By contrast, in the post-industrial society, technology had a much more pervasive effect on work itself, creating a radically new form of work. Immaterial labour directly exists in relation to technology, which helps in creating, transmitting, repackaging, and diffusing information about products on a global scale (Dyer-Witheford, 2001). As we will learn with the Instafame example later in this chapter, the product can include the person and their self-presentation practices. The aim is no longer to produce new merchandise but to create a savvy marketing strategy around a product, which is aimed at promoting and selling it. It was not technology alone that created these changes, though: the social and political landscape was such that it allowed for these social transformations to occur.

The Role of the Prosumer

ICTs have not only changed the nature of labour; they have also profoundly modified the relationship among the consumer, the producer, and the product. The first to acknowledge this change was Alvin Toffler (1970, 1980), who introduced the concept of **prosumer** in the 1980s to describe the merging of producer and consumer.

Consumers become active in the production process by performing tasks that used to be delegated to producers. Many do-it-yourself (DIY) kits are available that allow consumers to be empowered and independent from producers. For example, the IKEA model of putting furniture together oneself without the help of a service person, sometimes accompanied by high levels of frustration and low levels of success, puts this process into the hands of consumers.

Following Toffler, in 2006 Don Tapscott and Anthony Williams introduced the idea of prosumption by combining the words production and consumption. **Prosumption** describes new modes of production where customers play a central role in the design, development, and use of the end product (Tapscott & Williams, 2006). An example is *Second Life*, a virtual world in which its users are given a great degree of freedom to shape the product by creating their own avatars and building digital artifacts in a 3D environment. In prosumption business models, corporations will often provide only the infrastructure, and prosumers will be in charge of producing content. In these cases, prosumers not only are co-producers but often also drive the creation of the product because there would be no product without their active participation.

Produsage is a term coined by Axel Bruns (2008) and is a modification to the concept of prosumption. Whereas prosumption and other similar models conceptualize content production as a unidirectional process, from production to distribution, with few channels for feedback along the way, produsage encapsulates the collaborative nature of content production. Produsage describes the high levels of interactivity between produsers, whereby produsers can interact with and respond to the contributions of other produsers in a wide variety of ways such as discussion or direct edits in the process of crowdsourcing information. Bruns uses the term *produsage* specifically to describe the shift in the mode of production that is characteristic of the labour taking place within Web 2.0 environments. Web 2.0 developed as an alternative form of communicating on the Web; instead of information being static, Web 2.0 offers a range of features that facilitate, among other things, interactivity, collaboration, and feedback. This new model blurs the line between producers and consumers and empowers users as they take control over the production and the distribution of content. In the produsage model, the end goal is the creation of an **information commons** (Hippel, 2005), which provides the social structure for supporting the core activities of the community, such as sharing, collaborating, negotiating, and developing. This information commons—an amalgamation of nodes consisting of content, users, and producers—then ultimately allows the information to continue to be relevant and up to date in the context of the community. Any online platform in which people actively collaborate to generate content can be considered an information commons, including **Wikipedia**, Facebook, and Instagram. For instance, hashtags on Instagram comprise an ever updated stream of photos relevant to the subject of the hashtag that all users are able to contribute to, and each photo post itself contains a wealth of co-generated information such as tags, likes, and comments (Olifirenko, 2019).

Most of the labour performed by produsage communities is offered for free, without expectation of a wage, benefits, or any other kind of return. This kind of work differs fundamentally from the kind of work done by waged immaterial labourers in corporate environments, as discussed in the section earlier in the chapter. Involvement in produsage communities is motivated by an interest in the content itself, by the affective relations that develop among participants in a produsage project, and by the satisfaction of creating a product that will serve the community.

There are exceptions, however, as with Amazon's Mechanical Turk (see www.mturk.com/mturk/welcome), which pays participants for performing small problem-oriented tasks. Here, a global workforce comes together to perform any digital task necessary, from responding to surveys, to analyzing marketing strategies, to providing suggestions for slogans. Mechanical Turk pays its employees per task and facilitates access to a global, diverse, and on-demand workforce that has no contracts, no benefits, no job security, no boss, and no structure.

Key Principles of Produsage

There exist a wide range of produsage models. Bruns (2008) proposes four key principles that are characteristic across different types of produsage projects. Not all principles are present in all produsage projects, but at least some of them need to be in place for such projects to be successful. The four key principles are highlighted in Table 7.1.

Bruns (2008) proposed the four key principles as a means to analyze work and work structures as they take place in digital environments. It is important to also note the roots of some of these concepts. The concept of ad hoc meritocracy comes

Table 7.1 Principles of Bruns's Model of Produsage

Principles of Produsage	Key Features
1. Open participation, communal evaluation	• The idea or contribution is proposed, then evaluated by the community. • Evaluation by multiple community members leads toward a better outcome. • Communities are highly inclusive and heterogeneous.
2. Fluid heterarchy, ad hoc meritocracy	• Communities are based on input and expertise. • Individual participation occurs when needed and when expertise aligns to a project. • Individuals or small teams can make decisions regarding projects without top-down approval.
3. Unfinished artifacts, continuing process	• The fluid nature of the organization naturally leads to projects that do not yield finished end projects. • Projects remain works-in-progress, with members continuing to improve the product.
4. Common property, individual rewards	• Content created by the community is then available to all members, regardless of their participation in the project. • Projects that grow out of or expand upon the original are encouraged. • Community-based copyright standards have been created to guarantee intellectual property rights.

from the work of Alvin Toffler (1970), who described the coming of **adhocracy** as a new form of organization. In adhocracy, individuals or teams are assembled as they are needed to solve narrowly defined, short-term problems instead of having permanently assigned roles and functions based on organizational charts, as described in the earlier section on the networked organization. In the context of produsage, these ad hoc teams are also based on the reputation that participants build as leaders and as experts in the community; hence, participation and relevance are based on merit.

While produsage communities do not follow strict hierarchies, they still require some form of regulation to operate. Regulations are particularly important to solve disputes among contributors. For example, in Wikipedia it is common for individuals or groups to emerge with divergent views on sensitive or controversial topics. When Michael Jackson died on 25 June 2009, his Wikipedia page was being constantly updated (about 100–200 changes per day). A battle emerged between those who revered him and wanted to portray him in the best possible light and those who were critical of him and wanted to emphasize the accusations of child molestation. To help the Wikipedia community to function smoothly, a comprehensive list of rules has been developed that users need to follow if they do not want to be banned from participation. There are a number of ways in which disputes among participants can be solved. For example, participants can discuss their differences "through comments and annotations 'in the margins,' and by the repeated overwriting of existing passages in a shared effort to arrive at a better representation of communally held values and ideas" (Bruns, 2008, p. 27). As well, people may look at the history of individual entries and participants' past contributions to determine the evolution of the content. The most fundamental principle guiding participation in Wikipedia is the **neutral point of view (NPOV)**, which expects participants to represent in each article "fairly, proportionately, and as far as possible without bias, all significant views that have been published by reliable sources" (Wikipedia, 2011). Hence, a combination of community- and technology-based processes provides the necessary context for produsage communities to function.

When we examine the extreme case of unfinished artifacts, it is central to look at software that is referred to as **perpetual beta**. This is software released to users under the understanding that it is incomplete and in a state of improvement. For example, Google products are often released as beta versions, while companies like Apple tend to stay away from this approach. The main rationale for releasing software before its completion is to receive feedback from users as the product is being developed and to alter the website or service to reflect some of the suggestions made by users. This approach can have several advantages for software companies. It can help them get input from users early in the process of development. It can also help them identify unforeseen problems with a product. Further, it yields buy-in from the community, as they get to see the product early. If perpetual beta is released first to early adopters, this will increase their loyalty to the product, as they see their input as relevant and their position as tech savvy validated. Perpetual beta is a good approach within software development.

The Sharing Economy

We have discussed earlier immaterial labour and produsage; however, there is also an ever-growing influx of individuals earning money through the monetization of their daily digital activities; the selling, reselling or "sharing" of underused personal possessions; and the performance of work-related tasks that are distributed online (Kenney & Zysman, 2016). Box 7.2 discusses the monetization of Instagram users who are famous as a result of their Instagram activities and benefit from the attention they garner from a global audience.

Box 7.2 Instafamous as a New Type of Work

Much labour goes into creating and maintaining an Instagram account and this labour becomes even more involved if the goal is to reach celebrity status. **Microcelebrities** are individuals who have a substantial number of followers in a specific niche area, be it sports, celebrities, healthy lifestyle, or music genres. Microcelebrities have a specific mindset aimed at employing self-presentation and self-disclosure practices to gain followers and attain celebrity status (Senft, 2013). For an account to become popular a lot of immaterial labour has to be conducted, such as taking and editing selfies, portraying unique aspects of the self, engaging with followers, etc. Often engaging in self-disclosure is considered a key part of microcelebrity; that is, sharing information about the self that will attract attention and keep a large, diverse audience engaged. Marwick (2015) studied 40 **Instafame** accounts, which are highly followed Instagram accounts, with the goal of learning why these specific accounts had gained notoriety. Marwick found that microcelebrities used Instagram to provide followers with glimpses into their lives that fit the different personae they project.

The unique affordances of Instagram facilitates the creation of microcelebrities because of its always-on, mobile nature which provides a sense of spontaneity, authenticity, and truthfulness to profiles that other social media can't provide (Marwick, 2015).

Microcelebrities on social media have a strong influence on consumers because their users can recommend products to their friends directly. Sheryl Sandberg (as quoted in Moretti, 2010) states that "[a] recommendation by a friend is the best kind of marketing," showing the power of peer-to-peer recommendations. Another value of Instagram is that it allows third parties, such as marketing companies, to better understand users and consumers through their interactions with the content. Instagram provides data on users' opinions about content and their likes and dislikes of advertisements, companies, and products. This is very much the kind of information that would be difficult for marketers to obtain from such large numbers of individuals. About 37 per cent of Canadians use Instagram, of which 61 per cent are daily users who like, share, and comment on content (Gruzd et al., 2018). Instagram users provide important information for marketers about product trends, consumer preferences and opinions, and the value of products.

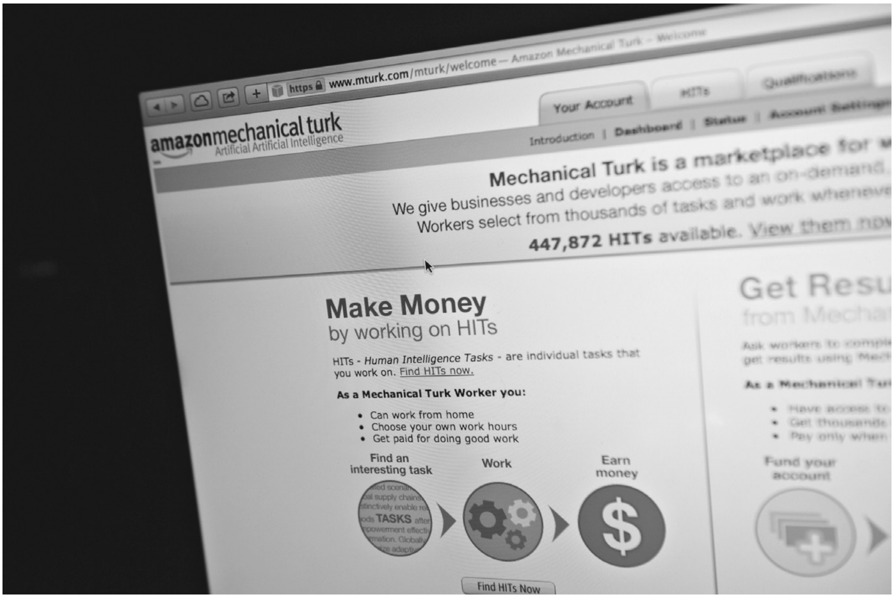
These income earning opportunities represent the "digitalization of the economy" where a new sector of work and employment has emerged under the umbrella term the **sharing economy** (Drahokoupil & Jepsen, 2017). Because digital platforms facilitate and encourage communication on a local and global scale, these sites act as an open marketplace for selling goods and a matching service that connects labour opportunities with available workers (European Commission, 2016). Some of the most well-known companies in the sharing economy include eBay, Uber, and Airbnb. Together these companies form the **platform economy**; that is, an economy that works exclusively through digital platforms that manage and encompass all transactions, often via a combination of computers and mobile devices. Most of us participate in the sharing economy as consumers, booking accommodation via Airbnb, buying something on eBay, or booking a car ride via Uber. Yet yearly the number of individuals who participate as workers has been dramatically increasing. For example, a 2017 study shows that about a quarter of the population in Austria, the United States, the Netherlands, Sweden, and the United Kingdom is earning remuneration from digital work (De Groen, Kilhoffer, Lenaerts & Salez, 2017; Huws, Spencer, & Syrdal, 2018; Smith, 2016). The European Commission (2016) estimates that the sharing economy is worth about $17 billion USD and showing exponential growth (De Groen et al., 2017). Next we discuss gig work, which is a big part of the sharing economy.

Gig Work

Gig work is distinct from traditional industrial work. Traditional industrial work is geographically bound to places like factories and areas of resource extraction like mines. More importantly, traditional industrial work is structured according to the "tyranny of the clock" where employees' daily lives are organized around working hours, the speed of production lines, and shifts (Graham, Hjorth, & Lehdonvirta, 2017; Lehdonvirta, 2018). The reliance on ICTs for work has led to three interrelated trends that have disrupted how people structure and conduct their working lives (Kässi & Lehdonvirta, 2018):

1. ICTs make it possible for people to work remotely (e.g., telework, digital nomad, or outsourcing);
2. technologies have made work schedules, arrangements, and duties more flexible; and
3. there has been an increase in casual or project-based contracts and positions.

Companies such as Mechanical Turk (or MTurk), TaskRabbit, Uber, Lyft, MobileWorks, and Cloud Factory epitomize these three trends. These companies are digital platforms that function by connecting employers, paid opportunities, and interested workers. The role of these companies is as **brokers** between those who seek work and those who offer work. Thus, gig work is defined as any paid activity or



Daniel Acker/Bloomberg via Getty Images

Amazon Mechanical Turk functions as a broker by connecting on a global scale those who seek employment with those who need microtasks completed for pay.

task that is outsourced using an online platform to a **surplus population** of qualified workers (Harmon & Silberman, 2018). These jobs are referred to as "gigs" because they are temporary and determined on the basis of demand and availability (Hoang, Quan-Haase, & Grant, 2019; Drahokoupil & Piasna, 2018).

Gig work encompasses a variety of different jobs and pay rates. Gig work is not always remote work. Localized gig work requires in-person duties from the digital worker such as cleaning homes, delivering items, or driving/transporting persons. What makes it gig work is that the job is obtained through a platform. **Online piecework**, also known as **crowdwork** or **microtask**, such as completing surveys, entering data, and writing product reviews/descriptions, are not bound by location and can be performed remotely and digitally (Lehdonvirta, 2018). Regardless of whether the job is localized or remote, these platforms match work opportunities to potential workers. For instance, Uber connects available drivers (referred to as driver partners) with transportation requests. The driver has control over whether they work or not by accepting or ignoring the request.

Gig work can either be ongoing (i.e., performing rides and deliveries) or one-off events (i.e., completing a survey). The pay rate for gig work varies considerably depending on the type of work that is performed. Gig workers can be paid hourly, or remunerated based on a pre-established per-task pay rate. Regardless of the method of payment, digital labour is considered to be low paid work, with workers earning significantly less than they would if the job was performed through traditional channels.

Gig work alters the nature of the relationship between the worker and the employer. Very few companies consider gig workers to be employees. Instead, companies regard these workers as **e-Lancers** as they are not bound to long-term employment, but rather can switch between jobs at their leisure (Stewart & Stanford, 2017). Gig workers embrace the e-Lancer label because it enables them to simultaneously work for a variety of different employers. For example, many Uber drivers concurrently work for other competing ride-hailing services such as Lyft. By servicing both companies, these gig workers maximize their working hours because they are connected to a greater pool of transportation requests.

These non-standard, atypical work opportunities are appealing for some workers (Hoang, Quan-Haase, & Grant, 2019). Gig work has lowered barriers to job entry, reduced transaction costs, enabled one-off transactions between strangers, and increased competition among workers and companies (Drahokoupil & Jepsen, 2017). For many, gig work provides additional, supplemental income. The evidence shows that only a minority of individuals rely on gig work as their main

Box 7.3 Gig Work as the Millennial Side Hustle

Have you ever searched for ways to make money online? Or sold an item you no longer used on platforms such as Kijiji or Craigslist? Or maybe you considered becoming a social media influencer by starting a channel on YouTube. All of these activities are part of what is known as the sharing economy. Although this digital area of commerce is still in its infancy, it is becoming increasingly harnessed by the millennial generation who have grown up with new technologies and ICTs, and often consider these digital tools to be extensions of themselves. Consider the Toronto-based app Hyr. Hyr markets itself as appealing to the needs of the "Bucket List Generation" who value time over money, and the ability to choose their hours and pick their shifts in a pinch (Hyr Inc., 2018). The app connects restaurants, bars, and retail stores to available on-demand staff. Employers create posts listing shift vacancies that could have resulted from unexpected rushes of customers or understaffing due to regular workers calling in sick. Interested workers apply for the shifts that interest them, and owners are then able to choose from the pool of prospective applicants (Hyr Inc., 2018). Payment is done completely through the app, with Hyr taking a cut of about 19 per cent to 30 per cent of the earnings (Simmons, 2018). Both parties rate each other, which then becomes part of the profile and can influence future opportunities. Hyr has been successful at connecting employers and employees in Toronto. Yet the success of the platform masks bigger issues surrounding the increasing unemployment and underemployment among the young and educated. Co-founder Erika Mozes indicates that workers on the app are generally women between 19 and 29 years of age (Simmons, 2018). To what extent are users of Hyr going to the app because they are unable to find stable and well-paid employment?

or sole source of income; rather, workers boost their regular income with gig work (Huws et al., 2018). Many also like that gig work offers flexibility in terms of when individuals can work and therefore it suits a variety of diverse and changing life situations (Lehdonvirta, 2018). These flexible work schedules give individuals more control over how they balance their work with other activities, and can increase or decrease how much gig work they perform depending on their changing needs.

Social and Ethical Implications of the Sharing Economy

The digitalization of paid work is highly disruptive. There are many social, economic, societal, and ethical issues that arise due to these new trends. Many argue that digital work is the modern precarious work, characterized by low pay, deskilling, lack of job security, irregular work schedules, absence of regulatory compliance and worker protections, and non-existent workplaces (Stewart & Stanford, 2017). We discuss next problems often discussed in relation to the sharing economy and gig work specifically.

1. **Outsourcing.** A key problem is that it has intensified already existing issues surrounding the outsourcing of labour such as the offshoring of work from local labour markets to the global market (Fabo, Karanovic, & Dukova, 2017). This creates enormous pressures, as it increases unemployment and moves young workers into precarious work or **underemployment**. Underemployment describes when a person takes a job that does not match their educational credentials and skills.
2. **Deconstruction of work tasks.** Another key concern is that digital platforms have deconstructed once-whole activities into microtasks. These microtasks require less skill to complete and are compensated poorly. Another issue with digital platforms is that they transcend geographic location and force deskilled workers to compete against one another in an even larger global pool of workers (Drahokoupil & Jepsen, 2017). For instance, Uber's drivers must compete against taxi drivers, drivers of other ride-hailing apps, and against other Uber drivers for transportation requests. This competition has led to many disputes and forced many cities to update their policies in order to regulate ride-sharing or ban it entirely. Moreover, while Uber accommodates the need for flexible schedules, Hall and Krueger (2018) find that in order to earn adequate wages, drivers must make themselves frequently available, especially during peak times. Thus, the so-called flexibility may not actually be accommodating at all.
3. Disruption of traditional industries. Another cause for concern is the displacement caused by digital jobs, and how they threaten existing jobs within traditional industries (Kenney & Zysman, 2016). The automated management service that allocates transportation requests has led to the job loss of

thousands of taxi dispatchers all over the world (Harmon & Silberman, 2018). Similarly, Uber has caused significant loss of revenue for many taxi drivers who feel cheated because they paid high costs for medallions.

4. Deconstruction of the employer–worker relationship. Another issue is the deconstruction of the employer–worker relationship. While the status of independent contractor provides workers some autonomy to control the work they perform, this status simultaneously comes with significant issues. For instance, by classifying workers as contractors, companies are able to evade the responsibilities and obligations expected of employer and exclude workers from the rights and benefits afforded to employees such as minimum wage, paid sick/vacation leave, parental leave, overtime pay, health insurance, pension systems, compensation from work-related illness or injury, and even safe working conditions (Harmon & Silberman, 2018).

The sharing economy has been beneficial to individuals in some of the most disadvantaged positions due to its large-scale job creation and employment, and the lowering of barriers to job entry. The sharing economy has also benefitted microentrepreneurs and small-scale businesses by connecting them to a global mass of customers and allowing them to compete against retail stores while maintaining profitability. Despite this, the growth of the sharing economy has also brought with it many social, economic, and societal dilemmas. Although these changes may not appear troubling or upsetting to younger generations who have grown up with technology and possess the knowledge and skills to maneuver around the digital sphere, these changes have displaced older generations and increasingly make traditional ways of working obsolete.

Makerspaces: The DIY Community Gone Viral

The Internet and the use of ICTs have also lent themselves well to another type of community: makers. The maker community is a **subculture** of do-it-yourselfers who work together on various projects, often involving new and upcoming technologies. **Makerspaces**, also called hackerspaces or fab labs, are the meeting places of these communities and usually include workbenches and desk space, and tools for woodworking, metal working, and electronics (Anderson, 2012; Burke, 2014). There is often a nominal monthly fee to belong to a makerspace, which grants you round-the-clock access not only to the space but also to the tools that have either been contributed by other community members or purchased with members' dues. Some of the most common technologies found in makerspaces are laser-cutters and **3D printers**.

3D printers are one technology that has the potential to change people's buying and selling habits. By enabling people to design, duplicate, and create objects that they would previously have purchased, the 3D printing revolution could change consumerism. 3D printers work by an additive process, placing small layers of material (often ABS plastic, a low-cost engineering plastic that is easy to machine fabricate) down until the entire object is recreated from a single digital file. Often found in makerspaces, and becoming common in both public and academic libraries, 3D printers let people to print everything from that missing IKEA screw to jewellery, and even human body parts.

Of course, with any new technology there are ethical questions that arise, safety concerns that emerge, and lessons to be learned. One of the main debates that has arisen regarding 3D printing is the ability of a user to create potentially harmful and illegal objects, such as guns, in the comfort of their own home. When a US citizen first uploaded to the Web the instructions for printing a gun, known as the Liberator, with a 3D printer in 2013, the American government was quick to remove the files, but not before they had been downloaded more than 100,000 times (Greenberg, 2014). Questions regarding the ethics of using 3D printers to fabricate guns, in the larger context of gun laws and restrictions in Canada, were raised when the Liberator gun was replicated in the Critical Making Lab at the University of Toronto.

3D printing also has a positive side: it drastically reduces **technological waste**. ABS plastic, and other materials that are used in these printers, can be melted down and reused to make other objects. Old toys, household goods, and even milk jugs can be melted down and made into filament for 3D printers, bringing new meaning to the phrase "everything old is new again" (Gilpin, 2014). Another plus is convenience—for example, imagine going camping and being able to print any object you may have forgotten. Although 3D printing is one technology that is often found in makerspaces, recently more regular consumers have started purchasing the technology as well.

As a result of having to maintain various cutting-edge technologies, makerspaces are expensive to run, and the various projects that take place within them can also prove to be costly. One solution to this problem has been the development of online **crowdfunding** platforms such as **KickStarter**. Chris Anderson (2012) notes three ways that crowdfunding platforms provide solutions for makers: (1) they move the revenue stream for a project forward in time, by turning sales into pre-sales; (2) they turn the customer base into a community through a sense of participation in a project and word of mouth about its successes; and (3) they complete market research on an idea or concept for the makers before they have invested in bringing the project to its completion. The makerspace community would not exist in the same capacity if it were not for the Internet and various social media applications. Makers come together and participate in maker fairs, **hack-a-thons**, and coding conferences both online and offline to support each other in building, creating, destroying, and rebuilding. Information on these gatherings is posted and distributed online. In a well-known TED Talk (link below), *Make Magazine* founder Dale Dougherty explains the details and social benefits of makerspaces.

"We Are Makers"
www.ted.com/talks/dale_dougherty_we_are_makers

Conclusions

This chapter has shown that the relationship between technology and work is not at all straightforward. The introduction of mechanized technologies during the Industrial Revolution alienated labourers from their work and created new tensions between workers and employers. Prior to industrialization, tools had been a part of craftsmanship, and had been used as extensions of the human body. Industrialization brought about radical change by directly substituting human labour with machinery, as well as skilled workers with cheap labour. With scientific management, the process of deskilling continued with further standardization and division of labour. Fordism not only took deskilling to the next level but introduced technology as a means of controlling work processes. Under these conditions, workers no longer had agency over their work; instead, they became simply a cog in the wheel.

In post-industrial societies, technology is no longer a substitute for the worker but a vehicle that allows individuals to apply information-based skills in order to develop, produce, and enhance their labour. The advent of immaterial labour represented a turning point, where instead of further deskilling workers, technology created labour around the creation, transmission, diffusion, and repackaging of information. This is particularly true today in the context of affective labour, where for example, social media workers themselves and their self-presentation practices become the labour and product. Yet again this has led to numerous consequences including greater work flexibility and creative output combined with an increase in the precariousness of labour.

In Web 2.0 environments, we see new forms of digital labour emerge through participation in produsage projects. These new forms of work are in stark opposition to hierarchical forms of organizations in that they emphasize collaboration, sharing of resources, and increased communication. Technological advances have reshaped the nature of work as well as the conditions and relations within these environments. We learn that ICTs can change social structures in organizations toward networked forms of work where workers are not necessarily collocated and much communication and coordination occur digitally. Despite allowing for more rapid and flexible communication, it also erases the boundaries of work time and private time, creating new challenges for workers' well-being and their ability to switch off.

The introduction of technologies into the workplace has created new vocations in the sharing economy, at the same time creating disruption in traditional industries. Another good example of this is the creation of makerspaces—digital and physical places where people of all ages come together to explore, design, and literally make objects. This leads to close interactions of the digital global sphere with the local and the emergence of materiality as an important dimension of technological design. As we shall discuss in later chapters, the conditions upon which the success of a technology rests often reside within the socio-economic and cultural dynamics inherent within a community.

Questions for Critical Thought

1. As more workers own cellphones, they can be available 24/7 to solve work problems. Discuss the pros and cons for workers of this "always" availability.
2. Explain how the concept of the networked organization contrasts with hierarchical forms of work. Do you think that some level of organizational structure is still needed in organizations for the purpose of coordination? Explain.
3. Who can benefit the most from the sharing economy? Can the sharing economy reverse social and economic inequality by providing additional sources of income to those who need it most? Or do you think that the sharing economy is benefiting individuals who are already economically well-off? Provide support for your argument.
4. Most gig work platforms encourage worker accountability by enabling customers to rate services and vice versa. What are some of the ethical issues with rating? How do companies ensure that these rating systems reflect the service experienced and are not biased by factors such as a worker's ethnicity, sex, and sexual orientation? How might consumers modify their behaviour with the goal of getting good ratings?

Suggested Readings

Anderson, C. (2012). *Makers: The new industrial revolution*. New York: Crown Business.

This book, written by the editor of *Wired* magazine, explains the new revolution that open-source design and 3D printing has brought about.

Burke, J. J. (2018). *Makerspaces: A practical guide for librarians* (2nd ed.). Lanham, MD: Rowman & Littlefield.

This resource looks at makerspaces and how they are changing the mandate and appeal of public libraries around the world.

Gallagher, L. (2017). *The Airbnb story: How three ordinary guys disrupted an industry, made billions and created plenty of controversy*. Boston, MA: Houghton Mifflin Harcourt.

Through a discussion of both the advantages of the sharing economy and the disadvantages, this book looks at Airbnb as a case study of how the hospitality industry is being disrupted.

Hermida, A. (2016). *Tell everyone: Why we share and why it matters.* Toronto: Doubleday Canada.

This publication discusses why we interact with information on social media via shares, likes, and mentions and how social media are changing media industries—in particular, the news media—creating new opportunities for information to spread but also new challenges such as misinformation and fake news.

Sundararajan, A. (2016). *The sharing economy: The end of employment and the rise of crowd-based capitalism*. Cambridge, MA: MIT Press.

This is a critical look at the sharing economy and how it has changed the nature of work and created new forms of capitalism.

Online Resources

A Librarian's Guide to Makerspaces: 16 Resources
https://oedb.org/ilibrarian/a-librarians-guide-to-makerspaces/
This website provides access to key resources about makerspaces and how they can benefit local communities, in particular children.

Chip Conley, TED Talk: What Baby Boomers Can Learn from Millennials at Work and Vice Versa
https://www.ted.com/talks/chip_conley_what_baby_boomers_can_learn_from_millennials_at_work_and_vice_versa
This TED Talk presents a fascinating look at how work in sharing-economy businesses can benefit from diverse work environments that also include wide age ranges to bridge knowledge across generations.

Mashable
http://mashable.com/
The site provides up-to-date information on the technology industry.

The Conversation
https://theconversation.com
This is a crowdsourced project that brings together academics and researchers online to provide the public with access to high-quality journalism in the form of news, commentary, and reports.

Interactive Activities

Activity 1: Uber Driving

The *Financial Times* has developed a game in which the gamer becomes an Uber driver. The game was awarded the 2018 Gold Medal Award at the Serious Play Awards. To learn about the experiences from Uber drivers first-hand, play the game and consider the following questions.

1. As you start working, consider what the motivations are for a young person to choose Uber driving as their profession of choice.
2. As you continue playing the game, check if those motivations have come true.
3. When you finish playing, consider what the key difficulties are that Uber drivers need to deal with. Why do you think so many people are considering the sharing economy as an option despite the challenges?

Game available at: https://ig.ft.com/uber-game/

Activity 2: Hyr and Hourly Paid Work Apps

In Toronto a new app was developed—Hyr—that connects employers to employees.
Visit Hyr's website here: https://hyr.work/

Learn more about Hyr here by reading this CBC story: https://www.cbc.ca/news/canada/toronto/hyr-app-toronto-1.4662620

Hyr is considered the Airbnb of for hourly paid work (Simmons, 2018). Consider how useful it would be for you if a similar app existed in your city. Would you use this app to find hourly employment and boost your current income? Who do you think would benefit the most from these kinds of apps? Consider age, gender, socio-economic status, life stage, etc. as factors. What problems do you see with hiring via these kinds of apps?

Hyr is also working as a social safety net. For example, workers can earn points for every dollar they earned using the app. These points can later be exchanged for sick days or vacation days. The inclusion of these points suggests that Hyr is making sure it supports workers as much as employers in the transaction.

If you want to get a better sense of how the app works, go to Hyr and set up an account. See what information the app expects you to provide to set up a profile. Evaluate how easy or difficult your past work experiences and educational credentials make it for you to obtain employment via Hyr.

Listen to the following interview with Matt Gurney at *Global News* and consider to what extent the gig economy may be creating new challenges for workers today and increasing precarious work.

https://omny.fm/shows/the-exchange-with-matt-gurney/toronto-based-app-helps-you-find-temporary-work

8 Genders and Technology

Learning Objectives

- to examine the meaning of the term genders and the range of conceptualizations available in the academic literature;
- to look at historical and contemporary theoretical and methodological approaches to the study and critique of gendered technologies;
- to investigate the relation between household technologies and physical and mental labour, and call into question perspectives of technological determinism;
- to examine the role of women in the IT industry and obtain an overview of current interventions aimed at increasing gender equality in this field;
- to take a closer look at how the gendered body becomes reintegrated into the digital world in the form of images, discourse, media depictions, and user-generated content.

Introduction

In technology design, use, and implementation, gender is often invisible. It is not invisible because it is purposefully erased but simply because gender is not viewed as an important consideration. Why would tools, techniques, and even software, cellphones, and the Internet need a gendered perspective? In this chapter, we investigate the nuanced and bold ways in which gender influences technological innovation and implementation. Through a review of how key theorists of gendered technology have come to see the link between technology and gender, we open the opportunity for more mature discussions of what gender is and how it shapes the study and development of technology. In a world that embraces multiple perspectives, diversity, and gender equality, the plurality of genders in the social world also needs to be considered. We emphasize the need to see gender not as a dichotomy, one where bodies can be placed in easily recognizable boxes, but instead as a complex interplay of biological and physiological features and interactions with the social world. We show how there is a need for both dichotomous understandings of gender—i.e., large-scale studies that examine differences between women and men—and more nuanced studies of diversely gendered lives, as they play out in our digital world.

Talking about Gender and Technology

Erasing Genders from the Technology Debate

Understanding sex and gender has been a vibrant area of investigation in disciplines such as sociology, women's studies, and anthropology, to name a few. This interest in unpacking sex and gender is, however, fairly recent. The *Oxford Dictionary of Sociology* writes that this area "was not a major concern in sociology until late in the twentieth century" (Scott & Marshall, 2005, p. 595). Before this, scholars often disregarded gender as an important subject of study, particularly in the study of technology.

Gender refers to more than an individual's identity and personality, but it also refers, at the symbolic level, to "cultural ideals and stereotypes of masculinity and femininity and, at the structural level, to the sexual division of labour in institutions and organizations" (Scott, 2014, p. 274). Also related to this concept is **gender identity**, an individual's personal experience of their gender, which may or may not align with their sex, and may include or be defined along a spectrum of unique identities "in between" or outside of male and female. For example, individuals may identify as both male and female, neither male nor female, genderqueer, genderfluid, or a variety of descriptions of personal gender identity (Stryker, 2008; Brill & Kenney, 2016). Noteworthy is that unique to some Indigenous communities in Canada (and around the world) are the two-spirited individuals, people who possess both mixed gender characteristics. Cameron (2005) writes that "[a]boriginal sexuality was based on multiple genders, at least three, but up to six. For example, there were male, female, and not-male/not-female (two-spirited)" (p. 124). While gender and gender identity are private and personal spheres, it is important to study how they influence the social world and how people experience the social world and the opportunities they have (England, 2014). We need only to scan the Web for the latest news to realize that "contemporary politics are full of contentious debates about abortion, sex education, same-sex marriage, pornography, sex work, sexual harassment, systematic rape as a weapon in wars, and female genital cutting" (England, 2014).

When we look at the study of technology with this in mind, then, we realize that often gender is absent from these discussions. Three key observations can be made:

1. Technologies are often treated as neutral objects and are designed with neither a specific gender nor a specific user in mind.
2. Technologies are perceived as impacting all sexes equally, without taking into account that people's bodies are different.
3. Debates around gender issues are often initiated only after the design of a tool is completed instead of encompassing all aspects of technological development, use, and implications.

There has been remarkably little critical debate around the role of gender and technology design, use, and implementation until recently. However, a vibrant area of study has emerged that tackles these questions. There is a need, though, to move away from simplistic understandings of gender and sex as dichotomies and open scholarly debate further to allow for a plurality of perspectives, genders, and sexualities in the social and digital world.

Theories for Understanding Genders in Technology Design and Use

The debate around women and technology is historically grounded in discussions of women in science (Wajcman, 2013), women's household work (Oakley, 1974), and women and paid labour (Huws, 2003). Two starkly opposing views have informed our understanding of the relation between women and technology (Wajcman, 2013). The **women's liberation view** advocates that technology can liberate women by (a) supporting fertility choices; (b) easing the burden of household work; and (c) creating alternative, flexible work environments particularly suited for women. By contrast, the **women's oppression view** states that women will (a) be enslaved through these technological advances; (b) have fewer choices in general; and (c) become more reliant on the existing technologies.

How technologies are perceived as oppressive is exemplified in the debate around **reproductive technology**. Stanworth (1987) provides an overview of what kinds of technologies are commonly grouped under reproductive technology and includes birth control, foetal monitoring, and infertility programs. Central to the argument of the role of reproductive technologies in the lives of women are the assumptions about how they influence the lives of women. Generally only the positive changes that these bring to women's lives are emphasized. Wajcman (2013) stresses that most discussions view technology as solely responsible for social change in society and hence also responsible for the well-being of women. The reason advances in reproductive technology are so contested is that birth control is perceived as part of the overarching patriarchal structure, further enabling the male domination of women and their bodies. Women and their struggles for self-determination are often absent from these discussions. For instance, historian Shorter (1991) sees women as victims of their own bodies and reiterates that reproductive technologies have allowed them to become equal to men. These types of arguments tend to neglect the active role of women in shaping how technologies affect their bodies and in the collaboration of men and women when looking at, for instance, infertility programs. A study on the use of cellphones by midwives in rural Indonesia, for example, shows that technologies can be re-appropriated in the context of reproduction; here, cellphones became key to the work of midwives as they engaged with their child-bearing clients (Chib & Chen, 2011). This type of argument also neglects to consider that some women are not able to get or stay pregnant. Thus, the idea that technologies are a solution to all problems in all cases negates the experiences of these women and their fertility realities, increasing the stigma around fertility and blame even further.

Along these lines, a third perspective could advocate for an active role for women in shaping technological design, development, and implementation and in appropriating technologies for their own purposes. The **women inclusion view** tries to move away from simple deterministic perspectives and instead advocates that women need to be more integrated into the technology debate not only as users, but also as active participants. This includes women taking on leadership roles in IT companies, becoming, for example, chief executive officers (CEOs) and chief information officers (CIOs). In order to more fully understand the current debate on women and IT, it is important to examine historical, theoretical, and methodological approaches. Of particular relevance is the debate around women and household technology.

Household Technology

The kinds of **household** or **domestic technology** continue to proliferate, including things like vacuum cleaners, dishwashers, and irons. This list can probably be greatly expanded and shows a large reliance on household technologies and how deeply interwoven they are into our lives, but in particular in those of women. In fact, until the 1970s, unpaid household labour was primarily the domain of women and few studies looked at the implications of this imbalance. Ann Oakley's (1974) influential book *The Sociology of Housework* shows a fundamental shift in how industrial sociology views housework by arguing that it is also work, even if unpaid. One key implication of this shift in attitude is the assertion that women's work in the home is, in fact, work, even if it is unpaid labour, and that this solitary form of work, even if not physically highly demanding, can be repetitive and unfulfilling. This links directly to our discussion in Chapter 7 on Marx's concept of **alienation**, the deep separation between labour and identity. Wajcman (2013) has described housework in terms of three characteristics.

1. *Privatized*: Housework is not visible and as a result is not directly compensated or acknowledged in the same way as other forms of work are. There is no final product that is celebrated by a community.
2. *Decentralized*: Unlike paid labour, which is often embedded in a hierarchical structure, housework is dependent only on the homemaker. There are no established formal roles, tasks, or deadlines, making it difficult to determine when work is complete.
3. *Labour intensive*: Many jobs in the service sector require long hours but are not necessarily physically demanding. Housework is physically labour intensive and also has no pre-established beginning and end.

But how do technologies play a role in domestic work? The introduction of household technology opened a new era for homemakers and signified a revolution in how housework was done. First, household technology was endorsed because it facilitated the work of homemakers. This led to the term **labour-saving technology**, which denoted the direct impact of technology on housework. The most significant change, though, was perceived to be the speed at which housework would be accomplished. Again, the assumption was that technology would diminish the physical demands on homemakers, particularly women, and also expedite tasks, freeing up leisure time (this idea was discussed further in Chapter 7). The home, once a private place, became industrialized and subsumed under the principles of **scientific management** as a result of technological change. However, a crucial study by Vanek (1974) demonstrated that despite the increased reliance on household technology by homemakers, no conclusive evidence could be found of actual savings of labour and time. Moreover, McGaw (1982) in her analysis concludes that "substantial changes in household technology left the sex, hours, efficiency, and status of the household worker essentially unaltered" (p. 814). While a shift occurred in terms of how much time was spent on various tasks, little change occurred in terms of the amount of time spent on housework overall.

How can we explain these contradictory findings about the effects of household technology on domestic work? From a technological determinism perspective, technology freed up time and reduced the amount of work to be done at home, a welcome change. Nonetheless, technological change is never straightforward, and as Cowan (1983) has argued, the industrialization of the home occurred in a more complex way and hand in hand with other social changes. For example, the mechanization of the home consisted mainly of replacing previously physically demanding jobs with other more mechanized tasks but did not necessarily save much time (Cowan, 1983; Wajcman, 2013). But more fundamentally, there was a switch in expectations and in the division of labour. A combination of the development of the **domestic science movement** and **germ theory** increased expectations around cleanliness and tidiness, which quickly became representations of social status, happiness, and well-being (Wajcman, 2013). In addition, in the early twentieth century many households still had outside help, and the modernization of the home largely reduced the reliance on personnel. As Wajcman (2013) puts it, "[t]he split between public and private meant that the home was expected to provide a haven from the alienated, stressful technological order of the workplace and was expected to provide entertainment, emotional support, and sexual gratification" (p. 100).

To further question and understand the relation of specific genders to household technology, we need to explore in more detail notions of use and competency vis-à-vis household technologies. This gap can be referred to as the **user-actor gender gap**: women are represented as users, but not as engaged actors in the process of tool development. To understand the full impact of household technologies on the division of housework, an analysis is needed of (a) men's and women's relationship to housework and (b) men's and women's relationship to technology. Wajcman (2013) states that "[c]ultural notions of masculinity stress competency in the use and repair of machines" (p. 104), while the role of women is often seen as that of users of technology. In this context, household machines further reinforce female stereotypes and also do not allow for men to take over tasks that are perceived as being in the domain of women. Thus, men repair and maintain machines but do not see themselves as users of household technologies. The lack of discussion of a wide range of genders and their roles also demonstrates how this discussion is simplified. For example, how about transgender individuals? What is their relation to household machines? Even though many of the notions from the 1970s and 1980s about gender roles are changing, some evidence suggests that women, even when employed outside the home, continue to do most of the housework, whereas men are more likely to contribute to non-routine tasks, such as gardening, car repairs, snow removal, etc. Moreover, many same-sex couples must negotiate their relationship to household technologies, as gender roles are less prescribed around stereotypical expectations (Connidis & McMullin, 2002).

In your opinion, what are the latest household technologies that are making their way into the home? Do you think that cellphones can be considered household technologies? How about tablets that help the user access and organize recipes? In Box 8.1 we discuss the movie *Her* (2013, Director: Spike Jonze), which pushes the limits in terms of what defines a household technology and how that technology impacts both the home and social relations. The movie shows how women continue to be the providers of support, emotional connectivity, and understanding—even in the form of an intelligent agent.

Box 8.1 New Household Technologies: The Virtual Agent "Her" Speaks to a User's Emotions

Central to the making of *Her* was the idea that technology should be invisible but not non-existent. That is, in a futuristic world technology is so ubiquitous and embedded in everyday life that it fades into the background, becoming seamlessly integrated into our environments (Vanhemert, 2014). In *Her*, the main character, Theo, purchases a new operating system—a female by the name of Samantha—that is embedded in his cellphone and which is designed to help him with various tasks. While Samantha is charming and understanding, and challenges Theo to look at the world differently, she is not your average household technology, as she does not clean or chop veggies. She does, however, fill Theo's need for sociability and emotional connectedness, for example, by greeting him in the morning and helping him to get his day started. Samantha resembles the chatterbots and intelligent agents discussed in Chapter 1, as she calls into question the boundary between human and machine. Vanhemert (2014) speculates that we will interact with computers in the

continued

future not by sitting down to pay attention to our screens but rather by interacting with our **user interface** (UI) anywhere, at any time, through natural language.

(See "Why *Her* will dominate UI design even more than *Minority Report*," Wired online: www.wired.com/2014/01/will-influential-ui-design-minority-report/)

Annapurna Pictures/Kobal/Shutterstock

The virtual avatar—Samantha—flexibly adjusts to the emotional state of her user, Theo.

Gender and IT Use

How we understand gender and technology is not limited to how women use and understand household technology and the impact of these technologies on their lives. Since the introduction of the World Wide Web (WWW) in 1994 by Tim Berners Lee, there has been an intense ongoing debate about how women use, and make sense of, the Internet and related mobile technologies differently from men (Fallows, 2005; Shade, 2014). This debate intensified when women went to social media using the #MeToo hashtag to express outrage around sexual violence and harassment in the workplace. #MeToo is not the first use of social media to voice marginalized perspectives. In Canada the hashtag #MMIWG has served as an outlet to draw public attention to crises in policing and misogyny affecting Indigenous communities (see Box 8.2 below). As part of this move, critiques have emerged around how the Internet, mobile technologies, and gaming apps all reflect binary assumptions of gender. For example, Preciado (2013) asks "whether we want to be docile consumers of biopolitical techniques and complicit producers of our own bodies, or, alternatively, if we want to become conscious of the technological processes of which we are made" (p. 276). This is a call to engage with trans subjectivities and move away from simplified ways of thinking around gender online.

Use of Computers and the Internet

Early research on computers consistently demonstrated that men were more likely to own and use a computer than women were (Brosnan & Lee, 1998; Durndell, Glissov, & Siann, 1995). This gap is somewhat surprising considering that in the 1980s and 1990s women were primary users of computers in the workplace and often responsible for data entry and processing. A study from 1999 by the US National Center for Education Statistics showed that 56 per cent of women and 44 per cent of men used a computer at work (as cited in Fountain, 2000). Similar trends have also been observed in terms of access to the Internet, supporting the notion of a digital divide in terms of gender. This trend, however, has reversed and there exists no difference in access to the Internet between men and women in the Global North (Haight et al., 2014; Ono & Zavodny, 2003).

Men and women have equal levels of access, yet some differences persist. In a study of gender differences in content editing or contribution on the website Wikipedia, the findings showed that only one in five females have ever made Wikipedia edits, compared to one-third of males (Hargittai & Shaw, 2015). This demonstrates that gender inequality still persists in many domains of content production, online as well as offline. These findings are in tandem with a larger problem: women and men are not equally represented in digital production roles. Despite efforts by the Wikipedia Media Foundation, there has been little success in closing this gap (Hargittai & Shaw, 2015, p. 424). According to the authors of the study, "gender disparities in who authors the material on the site are increasingly a matter of public concern as the content disproportionately reflects the interests and perspectives of its most active contributors who are mainly men" (p. 424).

The content on Wikipedia plays a role in the life of transgender individuals. In a study of how Jen navigated the complexities of undergoing a male-to-female gender transition at the age of 16, Wikipedia was an instrumental source for supporting "routine decisions such as what finger to wear a ring on, and major life decisions regarding hormone therapy and how to present as female in public, [which all] required deep thought and research (Cavalcante, 2016, p. 110). Cavalcante (2016) argues that digital media has put in place virtual **counterpublics** that provide feelings of belonging and affiliation for those who are marginalized in everyday life. She argues that digital media also functions as **care structures**, or digital spaces of organized care and concern, which together aid in transgender identity work and everyday survival.

Another example of how the Internet functions as a counterpublic and care structure is the support Gigi Loren Lazzarato, better known as Gigi Gorgeous, has received on YouTube. Gigi Gorgeous is a Canadian transgender YouTuber, model, and actress. Gigi Gorgeous became famous for documenting her life on YouTube, particularly through her transition from presenting as male to presenting as female. On 16 December 2013, in a YouTube video called "I Am Transgender," Gigi Gorgeous announced that she felt like she was indeed a woman, albeit trapped in a

Gigi Gorgeous (far left) at New York Fashion Week. Gender shapes not only our bodies but also how we look at and experience the social world.

man's body. While the mainstream media attempts to find its footing in accurately portraying and reporting on transgender individuals that does not rely upon stereotyping or uniquely focuses on the "salacious details" (Ryan, 2009), YouTube has served as a place where Gigi Gorgeous has found a sense of belonging and acceptance.

Use of Social Media for Social Change

Women use social media extensively. Some statistics suggest that women use some types of social media, such as Facebook, more than men (Haight et al., 2014; Hargittai, 2018). Women have used social media not simply for fun, but to draw attention to key social problems. A very effective use of social media has been to give voice to women who have been sexually harassed or assaulted. The hashtag #MeToo, a hashtag first used by African American women's rights activist Tarana Burke in 2006, has received global attention. In 2017, Alyssa Milano used the hashtag to provide support to victims of sexual assault allegations against American movie producer Harvey Weinstein (Mendes, Ringrose, & Keller, 2018). Within 10 days, #MeToo had been used 1.7 million times in 85 countries (Park, 2017). The significant scale, volume, and endurance of #MeToo makes it stand out from other online conversations about misogyny and violence against women and makes it more comparable to other hashtags motivated by a cause or political issue, such as #BlackLivesMatter (Ohlheiser, 2018). Box 8.2 shows how in Canada several hashtags have served to draw attention to the disproportionate violence against Indigenous girls and women with the aim to mobilize institutions and effect positive social change.

Box 8.2 #NoMoreStolenSisters: Social Media as Tool for Social Change in the Lives of Indigenous Women

A national conversation has taken Canada by storm. Shocking reports over the number of missing and murdered Indigenous women and girls (MMIWG) has outraged communities across the country and led to the publication of a report in 2019. Research suggests that Indigenous women are five to eight times more likely to be murdered or to experience a violent death in Canada than non-Indigenous women (Gilchrist, 2010; Pedersen, Malcoe, & Pulkingham, 2013; Daoud et al., 2013). Social media and blogs have emerged as alternative spaces for debate. Using hashtags such as #NoMoreStolenSisters, #MMIW, #MMIWG, and #ourinquiry or #inquiry, alternative narratives and stories are shared, bringing much-needed attention to the issue, circumventing the traditional media. Scholars are studying the use of social media as part of a larger movement that stands in solidarity with the communities that are calling for justice and pressuring the government and institutions like the police force to take action through the Truth and Reconciliation document (Truth and Reconciliation Commission [TRC], 2015). For example, Moeke-Pickering, Cote-Meek, and Pegoraro (2018) conclude, based on their research of the hashtag, that:

> By sharing information via workshops, conferences, tweeting or via articles, we keep the MMIW stories alive and up-to-date. This is important because for the longest time narratives around MMIW were obscured from broader society. It also assists with maintaining political pressure to ensure change happens. (p. 62)

This demonstrates that social media can facilitate mobilization through a common hashtag that brings a community together and draws attention to social injustice. What remains uncertain is whether this kind of attention to a social issue will lead to structural changes in the long run.

Yet change in social media can be slow and often discrimination is coded into the very design of these tools. As discussed throughout this chapter, technology is "never merely technical or social" (Wajcman, 2010, p. 149); rather, it reflects the assumptions, social norms, and cultures in which it is designed and used. This is particularly true, even if not always apparently visible, in how social media is coded, as "lines of code are not value-neutral" (Marino, 2006). For example, if we look at Facebook, the implicit bias toward binary understandings of gender becomes apparent in the design of its user interface. Bivens (2017) studied how gender was coded into Facebook through a historical analysis of its interface. She found that until 2014, Facebook gave users few choices, as they had to select from a binary: female or male. By 2014, Facebook made changes and provided a much more diverse set of options; however, this only provided the illusion of choice, as users were recoded into a binary for data purposes regardless of their own choice.

As Bivens (2017) concludes "[t]he 2014 custom gender project offers the illusion of inclusion since surface changes to profile pages mask the binary regulation that continues underneath, at a deeper level of the software" (p. 885). Creating a mandatory gender field and coding it into binaries often fits the needs of marketers, who use Facebook as a system to promote products and customize messages.

Women Working in IT-Related Fields

The Lack of Women in IT-Related Fields

There have been dramatic changes in employment in fields related to IT. The US Department of Commerce in 1999 developed a list to describe occupations in the information technology sector and included computer scientists, computer engineers, system analysts, and computer programmers. Since this list was developed, the number of job titles has skyrocketed to include, among others, software design/development, testing/quality assurance, and knowledge management, as well as jobs in the service industry and medical fields. Not only has the range of jobs encompassing IT-related work expanded, but the number of individuals working in these fields has also grown rapidly. Even though men have traditionally occupied the majority of jobs in the IT sector, this growth also opens up opportunities for women, as Fountain (2000) indicates: "[t]he extensive reach and penetration of information technology into virtually every area of society creates enormous opportunities for women" (p. 45). Despite the rapid growth of the industry and the potential for the employment of women (Landivar, 2013), a consistent critique has been the lack of women working in the industry as designers, developers, CEOs, and CIOs.

What is interesting about this trend is that while there is no lack of female representation in the paid labour force, particular industries still continue to show persistent gender segregation (Erickson, Albanese, & Drakulic, 2000). This process is complex, because it often takes the form of **gender resegregation**, in which women are placed in positions perceived as more feminine and jobs that women occupy are also redefined as "women's work" (Reskin & Roos, 2009).

From the 1920s to the 1980s, secretaries were primarily women who helped with office jobs. A secretarial position was considered an excellent job with responsibilities ranging from typing letters and documents to organizing events and hosting visitors. The introduction of computing technology and networked computers not only changed the responsibilities of a secretarial job, but also created a myriad of new forms of related employment, many with less status, low pay, and long hours. For instance, many companies outsource data entry to China, India, or Taiwan, where **cybertariats** (Huws, 2003) work day and night shifts inputting information about credit card usage, insurance policies, and medical records. Cybertariats are often women, commonly working in the Global South, who are paid minimum wage for routine data-entry jobs. These types of low-wage technology jobs do not influence the design or uptake of technology; more women are needed to help provide valuable input and perspectives that can help shape the future of the IT sector.

A report by the US National Center for Women and Information Technology (2014b) indicates that in 2011, 25 per cent of the computing workforce in the United States consisted of women. When one looks at leadership positions, that number drops. A 2014 report put together by the Information Technology Association of Canada (ITAC) shows that women constitute about 16 per cent of the board members of Canadian public Internet and computing technology (ICT) corporations. These figures suggest that more women are needed to increase female representation at the leadership level. Also in 2014, ITAC started a review of its own board membership and increased women's representation strategically; 32 per cent of its board members are now women. These kind of strategic moves are needed in the industry to ensure that women have an input into how design, development, and implementation of IT occurs.

The US National Center for Women and Information Technology (2013) reported that in 2012 women occupied only about 20 per cent of CIO positions at Fortune 250 companies. This absence of women will likely continue in the next decade, as this gap is also present in STEM (science, technology, engineering, and math) studies at the university level (National Center for Women & Information Technology, 2014a). In 2010, women represented about 57 per cent of the undergraduate body, but only 14 per cent of women took computer science as their major (National Center for Women & Information Technology, 2014a).

Why do we see a trend toward fewer women choosing IT careers when this sector is growing and providing increasingly well-paid employment, and when the statistics for IT adoption consistently show that women are using a wide range of technologies in their daily life? Genevieve Bell, a technology analyst, stresses that women between 40 and 60 years of age are an important segment of the population, as they help shape the direction the IT field will take. She finds that these women not only are more likely to adopt new technology but are also engaging with these technologies more. Listen to her talk at www.abc.net.au/radionational/programs/bigideas/what-does-our-technology-future-look-like3f/4003568.

The fact that women are heavy users of IT is an important trend, as it shows that women are comfortable engaging with new gadgets. At the same time, though, it is important to stress that their role should not be only as users. There are many reasons why more women are needed in the IT industry as active agents. Fountain (2000) writes, "the influence of users, though important and far-reaching, is limited. Designers fashion technology more deeply, pervasively and fundamentally" (p. 47). Fountain's critique shows that it is important for women to be users of IT and to have the skills to use and understand IT, but that it is also important for women to take leadership roles as designers, developers, and chief financial officers (CFOs) of IT companies. It is only through this active engagement that gender diversity will be achieved.

The big question that scholars, feminist researchers, and sociologists have been pondering is, why is there such an absence of women from these kinds of jobs? There are many potential explanations, but three have gained most notoriety:

1. ***Gendered socialization***: Gender construction often occurs early in socialization and in many cases is hidden rather than overt. Thorne (1993) was among the first to point out how gender construction occurs in schools, leading students toward different social roles and identities. The effect of socialization is evident in how teachers behave toward girls and boys in elementary and secondary schools, often placing different expectations on girls and boys. This is often termed the hidden curriculum, as it is not explicit; it is only implicitly perceptible in expectations and approaches (Hafferty, 1998). Today, more efforts are being made to get girls involved in robotics, biology, and technology at younger ages.
2. *Gendered roles/school departments:* Many jobs are gendered and this can influence career choices. For example, nursing is often still considered a more feminine job, while computing is often considered more masculine. When making career decisions, feeling in the minority in male-dominated fields may discourage females from applying. Statistics Canada data shows that women remain underrepresented in occupations in natural and applied sciences but overrepresented in occupations in elementary and secondary education and health care (Dionne-Simard, Galarneau, & LaRochelle-Côté, 2016). In fact, the most common occupation among young women with a university degree is elementary/kindergarten teacher (Ferguson, 2016).
3. ***Toxic workplace environments***: Some work environments are male dominant and females struggle to feel accepted. This is often the case in game development, where men game developers still outnumber women; in the UK only 4 per cent of developers are women (Skillset, 2009). Often the long hours are problematic for women and can discourage women from pursuing a career in the industry (Prescott & Bogg, 2011). Women see fewer opportunities in male-dominated fields, as the "old boys' network" can be a significant barrier to career progression (Prescott & Bogg, 2011).

This question is not a trivial one and has led to much debate in academic circles and policy discussions. To address the lack of women in the IT sector, a wide range of initiatives and policies have been developed—some targeted at women in the Global South, some at high-school students, and still others at women in the Global North. A few of these initiatives and their intentions are listed in Box 8.3.

There are several complexities concerning the interventions listed in Box 8.3. Although courses like Ladies Learning Code are providing a space for women to come and learn programming skills, there is not as of yet any substantial proof that these classes help attendees achieve their goals. What kinds of approaches can help women learn IT skills without feeling marginalized?

There are other ways that the gender divide in technology could be surmounted. Mitch Resnick of the LifeLong Kindergarten group at MIT's Media Laboratory has long argued for the need to teach children to code. By introducing these skills at an early age, there is a greater chance that girls and boys alike will feel able to take on this type of learning. Resnick and his team (2018) created Scratch, a programming language that is designed for children to learn to code and which has an online community that has created over 4.5 million projects since its launch in 2007. When they become part of this community, Resnick (2018) notes, children "start to think of themselves differently. They begin to see themselves as creators and designers, as people who can make things and express themselves with digital media, not just browse, chat, and play games. While many people can read digital media, Scratchers

Female Conference Speaker				
B	I	N	G	O
Women just aren't interested in this field	There aren't enough qualified female speakers	We need big-name speakers, and few of those are women	It's a male-dominated field	There aren't a lot of women in C-level positons
Both women we called were booked that weekend	Both women we booked bailed at the last minute	All the women were probably busy	Female speakers are always burnt out from speaking so much	Trying to get more female speakers is sexist
The organizers just wanted to get the best speakers they could find	You can't kick out a male speaker just to fit a woman in there	FREE	You can't shoehorn in a woman where she doesn't fit	Women never volunteer to present
You have to be bold; people aren't just going to invite you to present	Women are shy	Women only ever want to talk about woman-stuff	Women need to act more like men	No one has complained about this before
Attendees want to hear from people like themselves	Well, there aren't that many female attendees, either	We're only responding to demand	Fine, YOU tell me who they should have invited	Who? I've never heard of her.

Figure 8.1 Female Conference Speaker Bingo in STEM Research
Source: Caperton Gillett/Feministe

can write digital media and are thus prepared to become full participants in today's digital society." You can hear more from Resnick here in his TEDx Talk from 2012 at www.ted.com/talks/mitch_resnick_let_s_teach_kids_to_code#t-637536.

Box 8.3 Bringing Women into IT Jobs: Diversity of Interventions

There have been several attempts to make technology, and coding in particular, more inclusive for women.

Ladies Learning Code

The Ladies Learning Code initiative was started in Toronto, Ontario, by Heather Payne, whose goal for the organization was to "create an environment where women can come and learn beginner-friendly computer programming and other technical skills in a social and collaborative way" (Geier, 2012). After having difficulty finding useful and approachable sources while attempting to learn how to create her own website, Payne asked the Toronto Twitter community for ideas about how to solve this problem. The idea for Ladies Learning Code came out of a brainstorming session with 80 other interested people. As of 2014, Ladies Learning Code had held 289 events in 18 Canadian cities, with over 8,000 attendees taking classes on Javascript, Photoshop, and even 3D printing. The demand for their courses runs high, and they now offer classes for various age groups. Additionally, they now work within the larger framework of Canada Learning Code which allows their reach to extend even further.

Website: http://canadalearningcode.com/experiences

The ADA Initiative

The ADA Initiative was founded in 2011 by Valerie Aurora and Mary Gardiner. Named after Ada Lovelace, the world's first computer programmer, the goals of the ADA Initiative are to "support women in open technology and culture through activities such as producing codes of conduct and anti-harassment policies, advocating for gender diversity, teaching ally skills, and hosting conferences for women in open tech/culture" (ADA Initiative, 2014). By helping women to feel more comfortable at technology conferences, and to be involved in all aspects of technology, the ADA Foundation hopes to raise the numbers of women in the IT sector workforce. You can learn more about the ADA Initiative in this video of Mary Gardiner's talk at Wikimedia 2012:

Video: www.youtube.com/watch?v=o0NsY48OQdc#t=786

Because of the relevance of and interest in these programs, the list of similar initiatives is rapidly growing. Many of these new programs have different intended audiences. Below is a list of some other programs that might be of interest:

Black Girls Code: www.blackgirlscode.com/

Mother Coders: www.mothercoders.org/

PyLadies: www.pyladies.com/

Resnick is not alone in these thoughts. Libraries are changing to include more hands-on learning and **makerspaces** are quickly becoming places that girls and boys can visit to pick up skills they might not get in the traditional classroom. These spaces are changing the way that people think about all types of things, from commodification to education, by providing access to technology, training, and information to all groups in society.

Technology and the Body

When it comes to the design and development of technological artifacts, the body is often erased. **Body erasure** is defined as the neglect of considerations related to the body in the design and use of technology, including a person's body shape, ethnicity, and specific gender characteristics and features. Bringing the body back into discussions of technology is relevant for three reasons.

- *Technology interacts with the body*: Technology directly interacts and integrates with the body, often becoming closely entangled with it. McLuhan eloquently stated this in 1964, saying that we become our tools and our tools become us. For him, there was a close interplay between what our bodies do and what our technologies allow our bodies to do. For McLuhan, for instance, watching television was much more than just entertainment. He saw television as deeply affecting how we process and make sense of information and compared this with how these processes occur when we interact with other media, such as books and newspapers, for instance. Even though he could not provide direct empirical evidence to support this, he understood at a basic level that our information processing varied depending on the medium, leading to his well-known saying "the medium is the message" (see also Chapter 2).
- *Not all bodies are the same*: The assumption that the body can be erased is problematic simply because not all bodies are the same. A striking example of this can be found in the development of the bicycle. Pinch and Bijker's (1987) case study of how the bicycle was invented and developed shows how bicycles were designed around the 1810s and 1820s with young men in mind for the purpose of sports. Women, who wore elaborate dresses, were discouraged from riding. Also, the bikes were designed in such a way that it was basically impossible to ride a bike while wearing typical women's clothing. It was not until the 1880s that the *safety bicycle* was invented, which changed people's attitudes toward bicycles. They were no longer seen as dangerous sport vehicles for young men only; instead, they became a mode of transportation for both men and women.
- *Technology does not determine the body*: Often assumptions of technological determinism are responsible for body erasure. In the case of reproductive technologies, the introduction of the birth control pill was seen as a major positive change for women (Wajcman, 2013). Judy Wajcman has provided

a critical examination of the discourse around the positive and unilateral change that reproductive technologies provide. She writes that "[t]he real dangers for women that accompany medical and scientific advances in the sphere of reproduction are directly related to the different circumstances of women's position in society" (Wajcman, 2013, p. 74). For example, not all women can afford reproductive technologies, such as in vitro fertilization, 3D rendering of babies, and amniocentesis. Are these technologies, then, a further divide between affluent and marginalized? This debate is ongoing and there is a plurality of feminist perspectives. The take-away message is that the effects of reproductive technology are not completely positive; they also reproduce existing inequalities of power, wealth, and marginalization. Moreover, some of these technologies may have secondary effects on women's bodies that are difficult to quantify and may be unexpected. As such, there is a call for critical analysis of how technologies affect and intersect with the human body—whether male, female, intersex, or other.

In Box 8.4 we discuss the pro-ana community as a case study of a controversial online community that has brought the body back to the Internet. The Internet tends to be text-based, and as such, the body is often not present in interactions over chat or via **blogs** and Web pages. This creates an artificial neutrality in terms of who is presenting certain arguments and whose voice and viewpoints stand behind a particular debate/issue.

Box 8.4 The Pro-Ana Community: The Presentation of Self through the Digital Body

The Internet is an important information resource for young people on health-related topics, including mental health (Ging & Garvey, 2018). One topic that is frequently Googled is *anorexia nervosa*, as it is of relevance to teenagers and young adults. Anorexia nervosa, an eating disorder, is a potentially life-threatening condition. While the Internet has facilitated easier access to information about the disease, this accessibility has also led to the emergence of a community, referred to as the *pro-ana community*, that promotes and supports the negative behaviours associated with anorexia nervosa. The websites that promote anorexia nervosa often contain content (images and stories) that is disturbing to view. Therefore, no links to these websites are included in this book, but a search on the key word "pro-ana" will yield several relevant hits. Pro-ana websites, similar to celebrity gossip sites like TMZ.com, bring the female body back into the Internet by not only focusing their websites directly on the body, but also by including images of individual users and of models, movie stars, and women in the media who are thin. Not surprisingly, concerns have been raised by the media, therapists, and scholars about the potential social effect of pro-ana websites on young people (Holland, Dickson, & Dickson, 2018). Do they provide a means of social support for people who are struggling with eating disorders? Or do they further promote ideal bodies and put further pressure on women to fulfill an ideal that our society, and in particular the mass media, promotes?

Several studies have emerged in recent years with the aim of understanding this community better. A study by Norris et al. (2006) found that pro-ana websites tended to include similar elements. A key part is the inclusion of "A Letter from Ana," which is a personal letter directed at community members. The text tends to read as follows: "I expect a lot from you. You are not allowed to eat much. I will expect you to drop your caloric intake and increase your exercise." These websites also included "thinspiration" content, which consists of pictures, messages, and stories that promoted a "desire to engage in ID behaviours without any indication that … disordered eating [is] a negative behavior" (Branley & Covey, 2017). Many websites also feature tips that help weight loss, as well as links to resources such as support groups, medical information, and other pro-ana communities. Some sites, as noted by Cobb (2017), deny that they are pro-ana, disguising their sites under the idea of "healthy" weight loss.

In terms of the neutrality of technology debate, it is essential to consider these types of ethical questions. Censoring these types of sites is not an ideal solution vis-à-vis freedom of expression and freedom of information, of course. The reason why this topic is important and needs further attention is that "the issue of body image has been named as a central issue in third wave feminism because all women, feminist or not, 'offer heartfelt and complex emotions on the topic' (Richards 198)" (Dias, 2003, p. 32). Without supporting the ideas of pro-ana, Dias (2003) recognizes that bringing women's agency into the debate about eating disorders is central, instead of silencing women's voices and their struggles. Further, in an analysis of user posts after Tumblr considered censoring this content, Schott, Spring, and Langan (2016) found that many users who spend time on these sites "saw the sites as a venue that was helpful to those struggling with eating and body image issues" (p. 101).

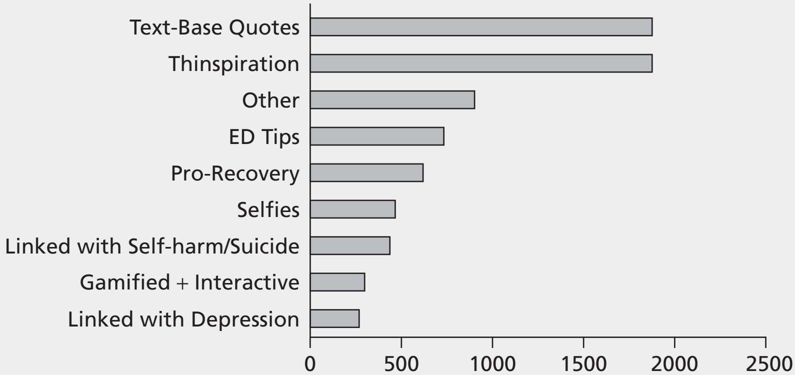


Figure 8.2 Pro-Ana posts on Instagram by type.

Adapted from: Ging, D., & Garvey, S. (2018). "Written in these scars are the stories I can't explain": A content analysis of pro-ana and thinspiration image sharing on Instagram. *New Media & Society, 20*(3), 1181–1200.

The pro-ana community is an example of how the body is brought back into the virtual realm. A study by Boero and Pascoe (2012) shows that boundary work in pro-ana communities is also embodiment work. Boundary work refers to the establishment of boundaries around who is a member of the pro-ana community and who is an outsider. Embodiment work describes the work done to bring discussions around the body to the forefront through the display of images, text referring to the body, and discussions around ideal body shapes. That is, the creation of rituals and the use of tools that reinforce community boundaries also help make the realness of the body a central aspect of the community. The rituals that signal who is a member of the community and who is an outsider include photo sharing, updates, and posts. The kinds of tools used to demarcate community boundaries include the use of aggression and knowledge as a means to question others' claims to belonging to the community. If a person does not have the knowledge around what it means to live with anorexia then they are excluded from the community. Yeshua-Katz and Martins (2013) argue that the body serves as a means to demonstrate membership in the online community and that members seek social support from others online. Often these women get little support in their physical, everyday communities because of the stigma surrounding individuals living with anorexia nervosa and may withhold information that they feel will not meet society's standards.

This links to what Goffman (1963) has described as the type of support that stigmatized individuals look for. This often includes "information control techniques" that encourage them to open up to a community that understands their struggles (Goffman, 1963; Yeshua-Katz & Martins, 2013). Goffman has described how stigmatized individuals will seek support from people like themselves to evade further marginalization; it is their own community of like-minded individuals that can provide social support, a sense of belonging, and understanding.

Conclusions

This chapter argues that even though gender and sexuality are deeply private and personal spheres, they closely intersect with the social world around us. This necessitates the development of innovative research methods and comprehensive theoretical frameworks that allow us to investigate how technology is gendered and how genders interplay with technological design, development, and implementation. There is much need for further research to examine a wide range of core societal issues. The chapter also stressed that technological determinism is a framework that often simplifies complex societal processes. An example of this reductionism was discussed in the section on household technologies, which were promoted as being labour and time saving. We learned that technological change occurred simultaneously with other changes in society, including the advancement of germ theory and the domestic science movement. As a result, the promises of time saving were replaced by increases in the expectations placed on women regarding cleanliness and tidiness in the home. Hence, technologies did not have a direct impact on household work: their effect was moderated by other factors. We showed that women are often key users of a wide range of technologies and often adopt these technologies early. We also discussed the #MeToo movement which relies on social media to build community on a global scale and draw attention to sexual violence against women. In the Canadian context, a large proportion of Indigenous women have been the target of violence and are now taking to social media to raise awareness and advocate for social change with hashtags such as #idlenomore, #NoMoreStolenSisters, and #MMIW. While women are using technology in many domains of life, statistics show there is a lack of women working in the IT sector and in particular in leadership positions. We examined current initiatives to bring women into IT-related work and discussed their merits and challenges. Finally, the chapter ended with a section on the body online. Much of the research tends to erase the body from discussions of the virtual. We argued that recent approaches try to bring the body back into research on virtual communities. An example of this was the research around the pro-ana community and their use of text, image, and video to talk about and problematize the female body.

Questions for Critical Thought

1. Why has the discussion of gender and technology only started in the late twentieth century?
2. Why has there not been more progress toward gender equality in other spheres of work than in IT and its related fields?
3. What factors are responsible for the underrepresentation of women in IT work? What barriers exist for women in these fields?
4. How have women used social media to create awareness around sexual harassment and sexual abuse at work?
5. How do different genders represent their bodies on digital platforms? What do these differences in expression tell us about the link between body and gender?
6. What interventions do you see as most effective for helping women become more integrated into IT-related fields? Do you support gender-segregated approaches toward learning IT-related skills, such as writing computer code? Explain your position.

Suggested Readings

Branley, D. B., & Covey, J. (2017). Pro-ana versus pro-recovery: A content analytic comparison of social media users' communication about eating disorders on Twitter and Tumblr. *Frontiers in Psychology, 8*, 1356. https://www.frontiersin.org/articles/10.3389/fpsyg.2017.01356/full

This analysis of Twitter and Tumblr found that pro-ana, anti-ana, and pro-recovery content was posted on the sites; in particular Twitter had a large number of thinspiration posts.

Cain Miller, C. (2018). How social media gives women a voice. *The New York Times*, 9 February. Retrieved from https://www.nytimes.com/interactive/2018/02/09/technology/social-media-gives-women-a-voice.html

This is a short piece on how women have used blog posts, Facebook, and Twitter to share stories of sexual abuse and harassment at work.

Carter, C., Steiner, L., & McLaughlin, L. (Eds). (2013). *The Routledge companion to media and gender*. New York: Routledge.

This comprehensive volume includes contributions from scholars around the world on the topic of media and gender, including issues of production and policy making, representation, audience engagement, and the place of gender in media studies.

Mendes, K., Ringrose, J., & Keller, J. (2018). #MeToo and the promise and pitfalls of challenging rape culture through digital feminist activism. *European Journal of Women's Studies, 25*(2), 236–246.

In this article, the authors investigate how feminists turn to digital technologies and social media platforms to dialogue, network, and organize against contemporary sexism, misogyny, and rape culture.

Wajcman, J. (2007). From women and technology to gendered technoscience. *Information, Communication & Society, 10*(3), 287–298. doi: 10.1080/13691180701409770.

This work presents a classic exploration and critical analysis of the tensions between technology and gender.

Whitehouse, G. (2006). Women, careers and information technology: An introduction. *Labour & Industry, 16*(3), 1–6.

This is a comprehensive overview of and introduction to the topic of women and IT-related work.

Online Resources

Alyssa Milano Reflects on #MeToo Movement One Year Later
https://www.youtube.com/watch?v=2Et6O4XREU4
This video provides a historical overview of the #MeToo movement on social media and how Alyssa Milano's tweet restarted the debate around sexual harassment against women.

Anita Borg Institute
http://anitaborg.org/
Founded by Dr. Anita Borg in 1997, this institute brings together women with an interest in technology. It promotes the representation of women in the IT sector and the development of technology by women. It hosts a mailing list to support women in the technology field, referred to as Systers (http://anitaborg.org/get-involved/systers/).

Taken
https://www.takentheseries.com/
This is a documentary series that aims to bring awareness about and solve the mysteries behind Canada's missing and murdered Indigenous women and girls (MMIWG).

The #metoo Movement Website
https://metoomvmt.org/
This website provides resources for survivors of sexual violence and sexual harassment with the aim of building a global community that provides social support, shares stories, and finds real-world solutions.

Interactive Activities

Activity 1: Facebook, Job Ads, and Gender Bias

Facebook created a platform to connect those looking to fill a job with those seeking employment. Posting a job on Facebook is inexpensive in comparison to other strategies and can reach a large and relevant group quickly and easily. Companies and governments often turned to Facebook because it enabled targeting very specific workers by taking advantage of the information available in a user's Facebook profile. While advantageous to reach a large audience via Facebook, the use of specific user data violated equity laws. Often companies and governments opted to show an ad only to certain demographics that they saw as desirable, for example, showing ads only to men.

- How can Facebook and its algorithms make job ads more inclusive and supportive of equity rights?
- On the other hand, how does Facebook and its algorithms potentially recreate existing biases in society and exclude certain social groups from opportunities?

Read about the changes Facebook made in 2019 to how its ads are shared with users to counter the criticism raised around gender and racial biases:
https://www.nytimes.com/2019/03/19/technology/facebook-discrimination-ads.html

Activity 2: Gender and Code on Platforms

Look for the gender field on your Facebook account. Check what gender options are available to users. Are you satisfied with the available options or do you think that technology platforms need to provide additional options? After much input from the LGBTQ+ community, Facebook now allows users to customize their gender, and add information on their preferred pronoun. How important do you think it is for users to be able to customize their gender? How about adding a preferred pronoun? Similarly, Snapchat released a gender swap feature.

- Have you used Snapchat's gender swap feature?
- To what extent does the feature allow you to experiment with gender?
- Does the feature go beyond a gender binary?
- Do think Snapchat's gender swap feature can create more understanding and support for transgender people?

9 Community in the Network Society

Learning Objectives

- to investigate "the community question" and its link to technological change;
- to examine Tönnies's and Durkheim's concepts of community and to show how these apply to current conceptualizations of a network society;
- to discuss and critically examine the concept of social capital and how digital media have influenced the social capital available in communities;
- to introduce the theory of the Triple Revolution and to show how it intersects with new structural forms such as networked individualism; and
- to re-examine the concept of the public sphere in light of widespread use of digital media for the support of protests and social movements.

Introduction

In this chapter, we examine technology's impact on how societies are structured. The chapter starts with a brief overview of definitions of **community** and introduces two key theoretical concepts proposed by Tönnies (1957/1963) that help readers to better understand the basic structuring of society—***Gesellschaft*** and ***Gemeinschaft***. What follows is a critical examination of the debate over how communities, and our concept of what constitutes them, have changed due to industrialization, urbanization, and globalization. We do this by comparing three perspectives: community lost, community saved, and community liberated. This chapter also further discusses Bourdieu's concept of social capital by reviewing two types of social capital—private and public—and arguing that each contributes to the well-being of communities. Next, we discuss Putnam's (2000) theorization that social capital is in decline and consider the consequences of this assertion. For Putnam, technologies like television and the Internet are a key factor affecting the decline and compromise democratic debate.

The chapter also considers the impact of digital media on community. On the one hand, early analysts such as Rheingold (2000) characterized the Internet as a utopian place where new communities could be formed without the constraints of space and time. On the other hand, skeptics, such as Turkle, saw digital media as a technology that would draw people away from family and friends and alienate them from society. We contrast and critically examine utopian and dystopian views of digital media, arguing that developing new perspectives is necessary to better understand how they have affected social structures. After introducing the Durkheimian notion of organic solidarity, the chapter explores Rainie's and Wellman's (2019) related concept of the **Triple Revolution** and their theory of **networked individualism** as one such alternative. The chapter concludes with a discussion of how digital media have affected our understanding of the public sphere. As part of this discussion, we take an in-depth look at the events that unfolded in Egypt in February 2011 and analyze the role that social media played in initiating, supporting, and helping organize these social movements and protests.

What Is Community?

We can study communities from a number of different perspectives. Traditionally, researchers have studied communities in terms of location; that is, a community is a group of people who live in a bounded geographic area; well-known geographic communities include Soho in NYC and the Annex in Toronto. However, we can also study community in terms of smaller social units that come together because of shared interests, such as the medical community, the foodie community, etc. By contrast, some very broad definitions include all of society as community.

Tönnies (1957/1963) was the first to study the fundamentals of community and proposed the distinction between *Gemeinschaft* and *Gesellschaft*. *Gemeinschaft* is generally translated from German as "community" and refers to a cohesive social entity that is united by pre-existing bonds. *Gemeinschaft*-based affiliations are ends in and of themselves and do not directly serve a utilitarian purpose even though people gain benefits from belonging to the group. *Gemeinschaft* has three key characteristics. First, bonds are strong and meaningful. Family ties are a perfect example of a form of *Gemeinschaft* that connects people in tightly knit groups. Second, members of *Gemeinschaft* usually belong to few social networks; most of their socialization occurs within their primary social group. Third, people who belong to a *Gemeinschaft* know each other, trust each other, and exchange a range of social support such as help moving, baking a cake, etc. By contrast, *Gesellschaft* is translated as "society" or "association," describing the coexistence of individuals who are self-serving units and come together because of an overarching goal. The key characteristics of *Gesellschaft* are that people are only loosely connected through bonds that are often goal-oriented. That is, people come together because there are direct benefits to be gained from belonging. Second, *Gesellschaft*-based bonds are not close, as people have little investment in these bonds. Third, these types of communities are large and thus, not everybody knows everybody else. Awareness only exists because of the loose association. The **nation-state** is an example of *Gesellschaft* because its members are grouped together as a result of sharing the same geographic boundaries and national identity.

Gemeinschaft and *Gesellschaft* represent ideal types or archetypes of social relationships; that is, most social groups cannot be categorized into either pure *Gemeinschaft* or *Gesellschaft* but tend to have elements resembling one or the other. Tönnies (1957/1963) shows through his analysis of social life that both forms of social organization—*Gemeinschaft* and *Gesellschaft*—can coexist at a single point in history as each describes a different aspect of social organization. Individuals live in narrowly defined groups based on kinship, location, and affiliation (e.g., religion), but at the same time can be part of larger social structures (e.g., nation-states, jurisdictions).

Gemeinschaft is often used to represent the utopian kind of society, one where people are closely connected, share an identity, and engage in reciprocity. This contrasts with *Gesellschaft*, which is perceived as an inferior form of social organization because members are only loosely connected, there is little willingness for co-operation and collaboration, and people live segregated from one another. Next, we focus our discussion on how industrialization, urbanization, and bureaucratization have affected community.

Theories of Community

Wellman (1979) has used the term "**the community question**" to summarize the debate around how community has changed over time and the role played by technology. He argues that this is a pressing issue because it addresses how individuals are integrated into a social system and the interpersonal means by which its members have access to scarce resources such as job information. The central question has been whether communities are declining or thriving and how this impacts the flow of essential resources such as social and economic support, current information, and the exchange of goods and services. Wellman (1979) distinguishes between three theoretical views: community lost, community saved, and community liberated.

Community Lost

Analysts who belong to the **community-lost view** have painted a bleak picture of the state of community in the Global North. They see industrialization as the cause of a decline in community, resulting from long work hours that leave little time for other activities. For instance, women have moved in large numbers into the workforce with increasingly long work hours, changing how socialization takes place at home and in neighbourhoods (Costa & Kahn, 2001). Urbanization, in conjunction with urban sprawl, creates isolation and a general lack of public spaces, further reducing opportunities for socialization. New modes of transportation and communication (e.g., smartphones) that support distant interactions have removed people from their immediate vicinities and, ultimately, created loose-knit communities. Technology combined with urbanization allows us to live in our own solitary bubbles. Turkle (2011) referred to this new form of socialization as **alone**

together and contrasted it with **togetherness**. She sees "alone together" as having many negative repercussions for socialization and the maintenance of social relations. While digital technologies allow each person to watch their favourite show, read the news at their own pace, and engage in immersive global multiplayer gaming environments, these technologies do not cultivate shared experiences that contribute to socialization and the transmission of family values and beliefs across generations (Turkle, 2011). Turkle is particularly concerned about the disruption to family ties and peer networks. Similarly, Dotson (2017) sees Facebook and smartphones as culpable in the disintegration of community, suggesting a need to counter these technologies' negative effects on social interaction. For example, parents can reduce screen time to motivate kids and teens to help around the house and spent more time socializing.

At the centre of the community-lost view is the comparison between contemporary urban living and pastoral community of the past (Hampton & Wellman, 2018). Supporters of the community-lost perspective see pastoral community as composed primarily of local social interactions in closely bounded groups. In these communities, people are primarily involved with fellow members of the few groups to which they belong: at home, in the neighbourhood, or at work. These networks are fairly homogenous, with members sharing a common geography, identity, and belief system, as well as common social ties. In part, people idealize pastoral community by portraying it as a simple but happy way of life, not considering the many limitations such as lack of privacy or limited possibility of breaking with established norms. This view typically disregards the constraints placed on identity formation and self-expression through shared norms and beliefs.

Tassii/iStockphoto

Friends spending time together but each immersed in their own technological bubble.

Community Saved

The **community-saved view** was developed in opposition to the community-lost view. This perspective focuses on how friendship and family networks continue to be dominant forms of social organization even in modern societies. Part of this argument is that a shift is taking place whereby loosely bounded networks increase their level of connectivity, leading to close-knit clusters similar to those of the pre-industrial era. Evidence has shown that close-knit groups continue to exist, in particular within poorer neighbourhoods where people need to rely on one another for emotional, economic, and social support (Espinoza, 1999). Hence, despite the social changes taking place as a result of modernization, there is some evidence supporting the idea of community saved. In fact, these close-knit neighbourhoods benefit from technological developments, as they allow community members to be in frequent contact.

The community-lost and community-saved views, however, have several limitations. Wellman (1979) has criticized the community-saved view because of its narrow focus on documenting the continued existence of pre-industrialized forms of community without considering the changes that have occurred since the Industrial Revolution. In addition, Wellman criticizes both community-lost and community-saved views because of their disregard of the social networks that develop and form outside geographic boundaries (e.g., online communities). For him, both approaches confound the existence of family relations with the persistence of solidary sentiments and territorial cohesiveness. This suggests that the community-lost view tends to focus on the loss of geographically bound ties without giving much consideration to social ties formed outside the core groups of the neighbourhood and family. By contrast, the community-saved view tends to disregard changes in the structuring of society as a result of modernization by emphasizing the continued existence of geographically bounded ties.

Community Liberated

A third perspective is the **community-liberated view**, which argues that community life is not lost, but rather has undergone radical transformations. In this view, communities continue to exist in society but with new dimensions. Instead of socialization taking place within narrowly defined geographic boundaries only, people socialize outside of local neighbourhoods and family ties (Rainie & Wellman, 2012). Indeed, while immediate neighbours may not know each other or may not socialize as frequently as those in the pastoral communities of the eighteenth century, socialization does continue with friends and family who live often at a distance (Fischer, 1992; Mok, Wellman, & Carrasco, 2010).

The car and the telephone facilitate the formation of these new social structures, where emphasis is placed on establishing and maintaining unbounded networks. While in-person visits continue to be the primary form of socializing, mediated communication promotes distant communication (Wellman & Wortley, 1990). For example, like-minded communities form online and reinforce a subset of social norms and have their own set of standards, often outside those of the mainstream culture. One example of such a community is people who voluntarily undergo cosmetic surgical procedures that fall outside the norm of mainstream acceptability (i.e., extreme body modifications). Many of the members of these communities use online forums to communicate insider information about the legality of procedures, trusted practitioners, and personal experiences (Lingel & Boyd, 2013). As members of a subculture who often encounter stigmatization in face-to-face interactions with the general public, technology enables them to overcome geographic distance and negative experiences related to soliciting information (Lingel & Boyd, 2013). This also means that social norms such as secrecy that constrain behaviour within the community are shared by group members.

The community-liberated view provides unique insights into the structuring of society and how mediated communication can make it possible to maintain simultaneously strong local bonds as well as global bonds that are based on shared interests and norms. Clearly, industrialization, urbanization, and bureaucracy have left their marks on society. What is necessary, then, is to understand the nature of community in modern life and its pros and cons.

Social Capital and Its Relevance to Community

To further explore the community question, this section focuses on social capital. Definitions of **social capital** abound. Bourdieu (1977/1998) describes it as the accumulated actual and potential resources to which individuals have access through their membership in groups and connections to networks. Bourdieu explains that these relations provide a collectively shared capital of credentials that allow people to exchange favours, credits, and resources. Social capital, thus, is the sum of valuable resources that can be obtained through a person's relationships with friends and relatives and the **social networks** that these relationships form (Quan-Haase, Mo, & Wellman, 2017). The focus in the social capital perspective, then, is not only on the formation of community, but also on how members of a community manage their resources. These resources are of greatest importance when building a healthy community because, according to Putnam (2000), where trust and social networks thrive, individuals, firms, neighbourhoods, and even nations succeed. In communities where social capital is high, trust among individuals is high, as is reciprocity. That is, people give without expecting immediate returns, creating an atmosphere of mutuality. Therefore, we must understand the concept of social capital and its role as a building block holding societies together.

The benefits derived from social capital are both private and public. **Private effects** are benefits brought to individuals through their ties, while **public effects** are all those positive characteristics of living in densely knit and reciprocal communities. For example, a person finding a job with the help of a friend reaps the benefits of private effects, whereas a person feeling safe at night on the streets because they know their neighbours are watching out for each other benefits from the advantages of public effects.

TV and the Decline of Social Capital in the United States

A decline in social capital can have serious implications for community, solidarity, and ultimately the vitality of a democratic society (Putnam, 2000). To document the decline of social capital in the United States, Putnam examined the extent to which Americans were involved in a number of social behaviours, including whether or not they attended church services, visited relatives, gave or attended a dinner party, attended a sports event, and visited neighbours. Using US General Social Survey (GSS) data, Putnam demonstrated that people are less engaged in their communities than they were in the 1960s and 1970s. For instance, Figure 9.1 shows a steady decline in informal socializing, that is, visiting friends, attending celebrations, visiting bars, and participating in informal conversations. Are these numbers further declining in the 2020s?

Each social or community activity can increase private and public social capital. Through these interactions, a person can learn about job opportunities and discover information about the community. Therefore, the social capital obtained through formal as well as informal relations is relevant for both the prosperity of individual members as well as the community as a whole. If social capital declines, as the GSS data shows, societies lose their vitality.

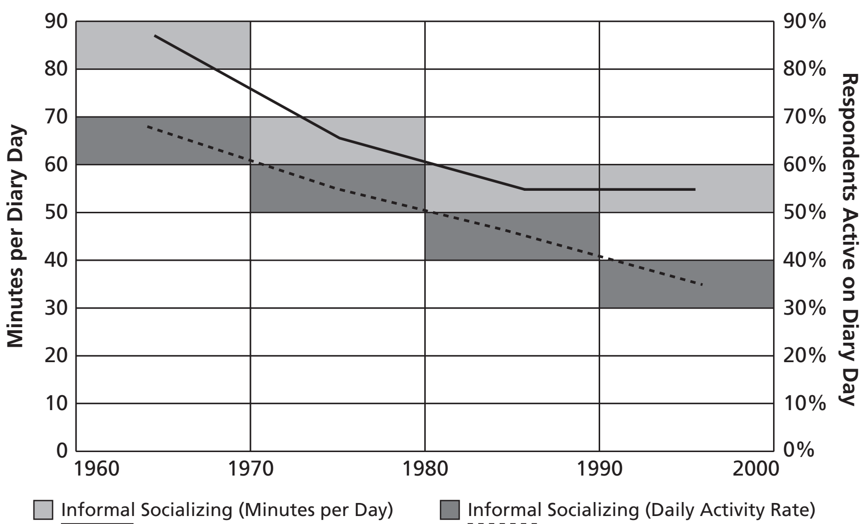


Figure 9.1 Informal Socializing, 1965–1995

Source: Adapted from Putnam, R.D. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon and Schuster, p. 109.

For Putnam (2000), technology has directly contributed to this decline. He argues that with industrialization came increased participation in more individualistic activities, such as watching television. The move toward individualized activities meant that entertainment occurred more within the home, reducing opportunities for socialization, for meeting neighbours, and for getting involved in community activities. Putnam (2000) further argues that watching television is a passive form of entertainment that does not involve chatting, debating, or interacting. In addition, television has an absorptive effect that even reduces social exchanges among family members in the home, further contributing to the demise of family life (Steiner, 1963). Although television has indeed had a considerable effect on socialization, scholars see the impact of digital media with its 24/7 individualized content streaming and ubiquitous videogaming as more pronounced and transformational.

Revisiting Community in the Internet Era

What impact has the Internet had on community? Since the 1990s, there has been an ongoing debate about how the Internet has affected socialization, communication, and civic participation. We discuss three competing perspectives proposed by Wellman, Quan-Haase, Witte, and Hampton (2001): (1) utopian, (2) dystopian, and (3) supplement.

1. Utopian Perspective

In the **utopian perspective of the Internet**, analysts see the Internet as stimulating positive change in people's lives. According to this perspective, the Internet has changed our concept of community because it spans geographic boundaries and connects individuals across time and space. Similarly, digital media lead to new forms of community that allow people with common interests to meet. Rheingold defines **online communities** as "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace" (2000, p. xx). Consider the many videogaming communities that exist online on games like **Fortnite**, Clash Royale, etc. From a utopian point of view, the Internet positively affects many social realms, like e-democracy, e-learning, and e-health, helping individuals connect, meet new people, and join diverse communities of interest.

2. Dystopian Perspective

The key argument of the **dystopian perspective of the Internet** is that the Internet draws people away from their immediate, local environments, potentially alienating them from social engagement and civic participation. Early theorists focused on the Internet's anonymous nature, the numerous possibilities for deception, and the shallow relationships that are formed online. Dystopians argue that in-person communication is richer, is more fulfilling, and provides interactivity, whereas online, text-based exchanges are less rewarding. Putnam (2000) argued that online interactions, like television viewing, can be immersive, taking people away from their immediate in-person contacts. Putnam also feared that the Internet could have detrimental effects on social capital as people moved to the Internet for entertainment and socializing and away from public spaces.

One key argument of this perspective is that smartphones remove individuals from their communities and immediate public spaces by enticing them to spend time on screens. Part of the worry is that when individuals are in public spaces, like parks and malls, they tend to focus on and interact with their devices instead of paying attention to their surroundings. While much speculation has arisen about these negative effects, little evidence exists to show whether social change has occurred and, if so, the nature of this change. In a recent study, Hampton, Goulet, and Albanesius (2014) examined how cellphones influence the way in which individuals interact with one another in public spaces such as parks, malls, and libraries. They used digital cameras and laptops to record human interaction in these public spaces. The study followed the approach taken by renowned sociologist William H. Whyte by documenting people's behaviour in different public spaces in New York City.

Using film, photography, and detailed note taking, Hampton et al. (2014) found that people's use of cellphones in public spaces was much lower than expected. On the steps of the Metropolitan Museum of Art (Met) in NYC, for example, only 3 per cent of individuals were seen using their devices. When individuals did use their cellphones or tablets, they were alone. They also observed that individuals who were in groups rarely used cellphones. This indicates that cellphone use fills gaps between face-to-face communications and does not necessarily replace it. The study provides concrete evidence against the dystopian perspective. It suggests that mobile technologies connect individuals across space and time but have not taken people away from interacting in groups and hanging out in public spaces. Technology seems to be a way for individuals to maintain social ties even when they are alone in a public space: they can participate in social media (e.g., check Facebook pages), answer emails, and coordinate meetings and gatherings on the go. The study further suggests that the widespread impression of high cellphone use in public spaces can actually be attributed to the observation that lone persons are both more likely to use cellphones and to linger in a given area, unwittingly making themselves indicators of obnoxious technological immersion in public.

3. Supplement Perspective

The utopian and dystopian perspectives both provide rather simplistic views of the impact of digital media on the structuring of society. Perhaps these perspectives have given too much weight to digital media's ability to radically transform community.

Richard Levine/Alamy Stock Photo

In New York City's Bryant Park, cellphone users can now take advantage of solar-powered charging stations like this one.

While digital media can provide the means for increased interaction and community involvement, they can also isolate individuals and deprive them from social exchanges. To better understand how digital media have affected society, we need to consider several mediating factors:

- a user's previous experience with digital media;
- a user's personal characteristics (e.g., age, gender, and personality);
- the existence of prior forms of community, whether online or offline;
- the type of Internet use (e.g., surfing, gaming, emailing, or chatting); and
- life events (e.g., going to university, losing a loved one).

Only by carefully analyzing these factors will we be able to better understand how the Internet impacts society.

Overall, the evidence suggests that the Internet provides an important and central means of communication. However, as a medium it *adds* to other forms of communication rather than replacing them. This third perspective has been termed the **supplement argument of the Internet** (Wellman et al., 2001). Box 9.1 reviews a study that provides evidence in support of the supplement argument.

The evidence so far suggests two trends regarding how the Internet has affected community, social networks, and communication: (1) the "rich get richer" hypothesis and (2) networked individualism.

Box 9.1 Social Capital in the Internet Era

Evidence suggests that the Internet neither decreases nor increases social capital. In a study of US and Canadian Internet users, Wellman et al. (2001) found that email had become an important means of keeping in touch with friends and family. However, as the amount of email sent and received increased, face-to-face interactions and phone calls did not decrease. This strongly suggests that email supports existing social networks but does not replace telephone and in-person communication. Indeed, people continue to use the telephone the most for contact with friends and family regardless of geographic proximity. This is followed by email for friends both near and far (Quan-Haase & Wellman, 2004).

In contrast, face-to-face meetings continue to be used more frequently than email exchanges for communicating with family members who live nearby. People use email to keep in touch with family who live far away because of distance constraints. Interestingly, individuals who have little social contact via telephone or in person are also unlikely to use email for socializing. Similarly, people who visit and telephone frequently also email frequently, suggesting that those who already have established communication patterns carry these seamlessly over to the Internet.

The data show that the Internet has joined the telephone and in-person communication as a main means of staying in touch—but one that can be more convenient and affordable. The Internet offers a new array of communication possibilities, including real-time communication via chat, Twitter, Facebook, and blogs (Klemens, 2010). Clearly, this affords new possibilities in terms of the ease in connecting geographically dispersed people and organizations bonded by shared interests (Quan-Haase & Wellman, 2004). In sum, not all pre-established social behaviours have been revolutionized; the capabilities of the Internet add to and supplement interactions with other media rather than replacing them.

Table 9.1 Social Contact with Friends and Family, Near and Far

	Phone (Days/Year)	F2F (Days/Year)	Email (Days/Year)	Letters (Days/Year)
Friends Near	126	92	118	9
Family Near	114	58	49	7
Friends Far	25	10	85	8
Family Far	43	10	72	10

F2F = face-to-face.
Source: Huysman, M., and Wulf, V. (Eds.). *Social capital and information technology*, Figure 9.2, Social Contact with Friends and Family, Near and Far, © 2004 Massachusetts Institute of Technology, by permission of the MIT Press.

The "Rich Get Richer" Hypothesis

The **"rich get richer" hypothesis** argues that the Internet does not have the same effect on all users; instead, for those users who are already socially involved and who have existing social support, the Internet will further strengthen and expand these networks (Kraut et al., 2002; Tufekci, 2010). In other words, the Internet will benefit these people because it will provide an additional medium to keep in touch. Kraut et al. argue that "[t]hose who already have social support can use the Internet to reinforce ties with those in their support networks. [T]hese groups would gain more social involvement and well-being from using the Internet than those who are introverted or have limited networks" (2002, p. 58). Furthermore, the "rich get richer" hypothesis predicts that those who already have large networks can use the Internet both to maintain these networks more efficiently and to continue increasing their network size.

Ellison et al. (2006) investigated the link between the use of Facebook, a platform that is specifically geared toward not only supporting existing ties but also increasing an individual's social network size, and social capital. The authors investigated two forms of social capital: bonding and bridging. **Bonding social capital** describes connections with strong ties, those individuals with whom one shares an intimate bond. **Bridging social capital** indicates linkages with weak ties, people one associates with but who are not close. Not surprisingly, individuals who engage with their Facebook networks and use the site frequently show greater levels of both bonding and bridging social capital. This suggests that Facebook use facilitates the building of social capital online, which then translates into the mobilization of resources both online and offline.

Networked Individualism

The networked individualism argument provides twenty-first-century context for Durkheim's notion of organic solidarity. In the *Division of Labor in Society* (1893/1960), Durkheim describes an early form of society with few divisions, where people come together based on **mechanical solidarity**. This form of solidarity is based on shared understandings around social roles, revealing a cohesive social structure with a strong collective conscious. Durkheim explains a **collective conscious** as "shared beliefs, ideas and moral attitudes which operate as a unifying force within society" (Jary & Jary, 2000). Durkheim contrasts mechanical solidarity with **organic solidarity**, which describes a society in which individuals occupy specialized social roles that evolve around labour, social status, and other defining variables. Organic solidarity consists of multiple partial networks that exchange resources and goods. More importantly, the role of the collective conscience diminishes as organic solidarity grows; this liberates individuals to develop their own identities free from shared beliefs and potentially oppressive norms.

Furthering the debate around the community question first addressed above, Rainie and Wellman (2012) take up Castells's (1996) notion of the networked society and strongly argue against dystopian views favouring the "death of community." Specifically, Rainie and Wellman (2019) argue that a Triple Revolution is taking place, as shown by the following:

1. the long-term turn away from being bound up in solidary groups to manoeuvring among social networks;

2. the proliferation of the personalized Internet as a powerful means to communicate and acquire information with fewer distance constraints; and
3. the rapid spread of mobile devices, such as cellphones and tablets, providing always-accessible communication and information.

This Triple Revolution, they contend, has led to networked individualism: people are well connected but no longer clustered in kinship groups, workplaces, and village-like, geographically based neighbourhoods.

Networked individualism indicates a society that has moved away from a model where people are embedded in groups, what Tönnies called *Gemeinschaft* and Durkheim referred to as *mechanical solidarity*, to more loosely connected networks, that is, a society that looks like Tönnies's *Gesellschaft* and Durkheim's *organic solidarity* (Rainie & Wellman, 2012; Wellman, 2001). Individuals no longer feel a strong commitment to groups but instead tend to build and maintain their own personalized networks (Rainie & Wellman, 2012). Barry Wellman (2001) writes that "[t]his is a time for individuals and their networks, not for groups. The all-embracing collectivity (Parsons, 1951; Braga & Menosky, 1999) has become a fragmented, personalized network. Autonomy, opportunity, and uncertainty rule today's community game" (p. 248). Social media facilitate a networked structure of interaction because they allow each person to maintain his or her individualized social network. For example, Instagram allows each user to follow friends from different spheres of life—friends of friends, celebrities, influencers—without any restraints of group affiliation. While networks in digital space may overlap, they are still distinct enough to arguably represent a social structure where people move between various groups and networks over time, instead of being a member of a single network. Yet, what is less clear is to what extent individuals today live as networked individuals. As the community-saved perspective discussed above would argue, some individuals continue to live in bounded groups. Wellman, Quan-Haase, and Harper (2019) have proposed a typology to examine in what types of network structures individuals fall. They propose three types of social connectivity:

1. ***Networked individuals*** have a diverse variety of roles within larger networks, using more digital channels. With sizable social networks, they turn to digital media open minded about making new connections to expand their networks, to have ease of connectivity, and to maintain both personal and professional ties.
2. ***Socially connected individuals*** are not networked but not limited either. Despite having a sizable number of social ties and appreciating digital media, their use is bounded within a small set of groups and they socialize with the same people for different activities. Socially connected individuals differ from networked individuals in the scope, magnitude, and breadth of their networks. Their activity on digital media is focused and making new connections is less an aim of their ICT use.

3. ***Socially limited individuals*** have much smaller and less diverse networks, rarely participate in groups, and are very limited in their use of digital media. Digital media is a way to keep up to date, but cannot replace traditional, offline forms of communication. Socially limited individuals are skeptical about using ICTs to facilitate meaningful communication and are hesitant to adopt newer technologies.

But to what extent do individuals operate as networked individuals? Box 9.2 examines this question by looking at a sample from East York, Toronto.

Box 9.2 Networked Individuals across the Life Course

To what extent do people today function as networked individuals? To test people's social connectivity, Wellman, Quan-Haase, and Harper (2019) employed data from East York, Toronto. The sample included 101 adult participants (55 women and 46 men), ranging in age from 27 to 93 years. They examined the percentage of individuals in each of the three groups (networked individuals, socially connected individuals, and socially limited individuals). They found that 35 per cent were networked individuals, 36 per cent were socially connected individuals, and 29 per cent socially limited individuals. This finding allows us to draw two conclusions: (1) There is considerable variability in how individuals are socially connected, with about one-third falling in each of the three groups; and (2) much debate has focused on how digital media is radically changing how people socialize. While it is true that one-third of individuals included in the study were networked individuals, two-thirds were not.

This shows that technology does not have a deterministic effect on social connectivity, but rather different social groups use digital media for different purposes. Some use digital media to expand their social networks, while others use it to maintain connections with their socially bounded groups. The study also examined individuals' belonging to the three groups by age group. Figure 9.2 shows that networked individuals tended to be younger (under 35), with 67 per cent of those under 35 belonging to the networked individual group. In the 35–50 age group, 41 per cent were networked individuals and 41 per cent were socially connected individuals; only about one-fifth were more socially limited. The proportion of networked individuals was lowest among the 51–64 age group, and not as perhaps expected in the 65+ age group. This is probably because individuals in the 51–64 age group are focused on work and family and have less time to belong to multiple social groups and to engage in diverse networks. This trend changed for people 65+, a group that has generally more time to socialize and participate in social groups (like book clubs) as a result of retirement. The 65+ age group had about one-third belonging to each of the groupings, which again shows significant variability.

The East York study suggests that technology influences but does not determine how people socialize, the groups they participate in, and how they are socially connected. Age influences who becomes a networked individual, with younger adults

continued

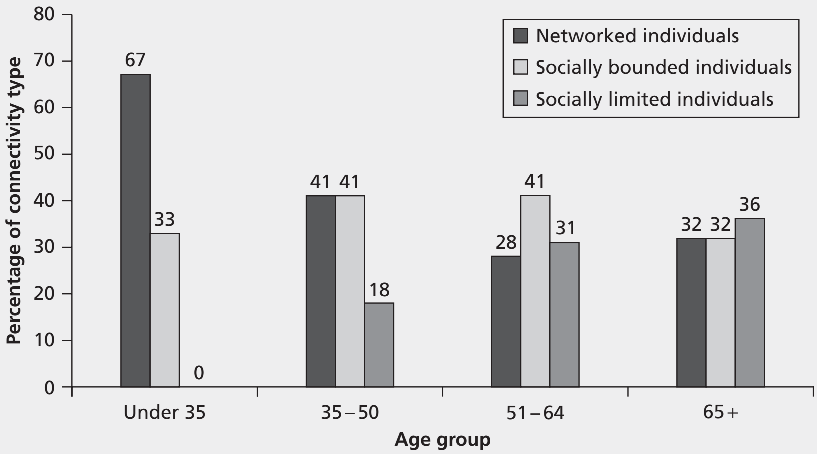


Figure 9.2 Type of connectivity (networked, bounded, and limited individuals) by age group. Copyright: Quan-Haase, 2019

Source: Wellman, B., Quan-Haase, A., & Harper, G. M. (2019). The networked question in the digital era: How do networked, bounded, and limited individuals connect at different stages in the life course? *Network Science*, *8*(1), 1–22. https://doi.org/https://doi.org/10.1017/nws.2019.28.

more likely to fall in the networked individual group. Yet not all individuals under 35 are networked individuals; in fact, about one-third of 65+ are networked individuals, suggesting that personal preferences for socialization, mobility, time available for social connectivity, and other contextual circumstances also impact the structure of society in the twenty-first century.

How Is Technology Transforming the Public Sphere?

To what extent is technology eroding the existence of the **public sphere**? The public sphere is essential for democracy because it provides "a discursive space in which individuals and groups congregate to discuss matters of mutual interest and, where possible, to reach a common judgment. Public spheres are discursive sites where society deliberates about normative standards and even develops new frameworks for expressing and evaluating social reality" (Hauser, 1998, p. 86). Habermas (1962/1989) developed the notion of the public sphere based on a historical analysis of the social processes underlying the creation, flourishing, and collapse of the **bourgeois public sphere** of eighteenth-century Central Europe. Three areas compose the bourgeois sphere of debate:

1. ***Status***: For public debates to be open, opinions need to be voiced regardless of a person's status.
2. ***Domain of common concern***: The issues addressed in the public sphere need to be of relevance to a larger social group and not restricted to the interests of small, influential groups.

3. ***Inclusivity***: The issues discussed must be open and accessible to everyone in terms of their content. That is, cliques or closed groups do not represent the public sphere.

While public spaces—such as plazas, parks, and centres—were once the heart of the public sphere, an increasing reliance on technology means that these places have become less relevant. Urbanization, industrialization, and the spread of suburbs have all contributed to the erosion of the public sphere. Recent debate has focused on how the introduction of new digital technologies will further transform the public sphere.

Theories of the Demise of the Public Sphere

Sunstein (2001) has warned about the problems that arise from using technology to access information. While technology allows people to filter information and customize their selections, this limits people's exposure to information. Because users tend to visit websites that are very specialized and often geared toward specific audiences, people's exposure to a variety of views and perspectives is reduced, potentially creating biased worldviews. For Sunstein (2001), digital technologies can lead to a reduction of information in the public sphere, which creates a new form of society in which it is easy to filter, personalize, and customize content. Sunstein terms this society *Republic.com*, and digital technologies contribute to the demise of the public sphere. Instead of connecting citizens and facilitating conversation, debate, the flow of information, and the organization of political and social movements, digital technologies narrow perspectives and further isolate citizens.

To describe how debates take place in the public sphere, Habermas (1984/2001) introduced the notion of the **ideal speech situation**, in which implied rules structure debate and allow all individuals the equal and unbiased opportunity to voice their opinion. At the centre of the ideal speech situation is the lack of coercion that could influence participants' willingness to voice an opinion. Noelle-Neumann (1974) builds on this concept to propose her theory of the **spiral of silence**. In this view, participants of the public sphere are willing to share their opinions if they believe they are in accordance with those of the majority. That is, if most people think that stigmatization is no longer a major concern to society, then people will agree with and voice this opinion. People whose opinion is in the minority (i.e., who believe that stigmatization continues to be of central relevance to society) will tend to refrain from expressing it in public. The Internet—particularly social media—have been seen as an alternative means of engaging in public discourse, one that is more open to a plurality of opinions. In Box 9.3, however, we discuss a 2014 Pew study that suggests social media do not, in fact, provide a much-hoped-for forum for democratic debate.

Box 9.3 Social Media and the Digital Public Sphere

A 2014 study by the Pew Research Center investigated the extent to which social media platforms facilitate democratic debate and aid in the creation of a new digital public sphere. Pew conducted a survey of 1,801 adults in the United States and asked them about Edward Snowden's 2013 revelations of widespread government surveillance of cellphone and email records. The key findings indicate that people were more willing to discuss the Snowden–National Security Agency (NSA) story in person than on social media like Facebook and Twitter. (Discussed in more detail in Chapter 11, Edward Snowden is an ex-NSA contractor who leaked thousands of classified documents to the media, sparking a global debate about the surveillance practices of intelligence services and citizens' rights to privacy.) As many as 86 per cent of Americans indicated that they would discuss the case with a friend or family member, but only 42 per cent indicated that they would voice their opinions on a social media site. Hence, for the average American, the Internet does not function as an alternative digital public sphere, nor is it deemed to be more suited for democratic debate than in-person interactions. The survey also found that those who were not willing to discuss the story in person were also not willing to discuss it on social media. That is, social media did not provide an alternative discussion platform for individuals who were reluctant to share their opinions with others. Finally, people were a lot more willing to share their views about the Snowden–NSA story, both in person and on social media, like Facebook, if they thought their audience agreed with them. This study illustrates the spiral of silence theory and its presence on the Internet.

Third Places

Another important element of the public sphere is the notion of the **third place**. For Oldenburg (1999), the home is the first place, where family and friends come together. Work is the second place, where people spend a lot of their time and have a distinct set of co-workers and friends. Third places are coffee houses, taverns, restaurants, bars, libraries, and other locations that people visit routinely. These places ground people in their neighbourhoods and communities, allowing them to interact and develop a sense of place. Third places are important locations for public opinion to form and for civil society to thrive. For example, a critical third place in eighteenth-century Europe was the Enlightenment salon, which served as a venue for philosophical, political, and academic conversation (Goodman, 1989).

How do digital technologies impact the role of third places in our technological society? Putnam (2000) argues that television has pulled people away from third places; from his viewpoint, the Internet will have similar effects, immersing people in a world of information that has little overlap with their local communities.

It is true that the data show fewer people engaging in local organizations, attending church, and participating in politics, as discussed earlier; however, digital technologies seem to be filling the gap left by traditional third places by providing alternative spaces to hang out, meet people, exchange ideas, debate social and political topics, and post and exchange information. While television seemed to contribute to the erosion of the public sphere (Putnam, 2000), the Internet as a medium provides much greater capacity for citizen engagement. (See the discussion of produsage in Chapter 7.)

Digital Media as a Tool of Political and Social Engagement

Indeed, digital media are not only a source of entertainment, but also a powerful tool for political and social engagement and a place for civil society to emerge. The interactive nature of digital communication allows users to engage with material in a different manner than what TV affords. Not only can debate arise online, but community can form around political, social, and economic issues of concern to citizens. We will discuss this in Box 9.4, where we consider the uprising in the Middle East, popularly known as the Arab Spring, and the role social media played in this particular social movement.

The role of digital media both before and during the uprising (Howard, 2011) has been a key issue for people looking to understand the Arab Spring. The Western media have been quick to conclude that this revolution was caused by social media. However, analysts have cautioned people about making conjectures about how social media affected the process. Indeed, Zuckerman writes about how other factors were central leading up to the uprising: ". . . [A]ny attempt to credit a massive political shift to a single factor—technological, economic, or otherwise—is simply untrue. Tunisians took to the streets due to decades of frustration, not in reaction to a WikiLeaks cable, a denial-of-service attack, or a Facebook update" (2011).

Even though Zuckerman highlights social media is not the single factor in creating social change, he acknowledges that social media played an intrinsic role in how

Box 9.4 Social Media in the Middle East

In 2010, protests across the Middle East started not in the streets but with short tweets and Facebook posts. The uprisings have been labelled a **Twitter Revolution** because the Internet provided a platform for citizens to organize, mobilize, and voice their opinions. In an eerily accurate prediction of the soon-to-take-place Twitter Revolution, Philip Howard titled the prologue of his 2011 book, *The Digital Origins of Dictatorship and Democracy*, "Revolution in the Middle East Will Be Digitized." Howard's prescience shows how ICTs have become an integral part of political and social debate in the Middle East, adding to traditional forms of exchange taking place in coffee and tea shops, in taverns, on the streets, and in markets.

As the tension on the streets of Cairo increased, the Egyptian government felt pressure to act quickly to avoid a digital revolution. Its strategy was to shut down

continued

Anti-Mubarak protester holding a sign praising Facebook for helping to organize the 2011 protest in Tahrir Square, Cairo, Egypt.

the Internet to freeze the masses and stop them from organizing and taking to the streets. This shutdown has been referred to as the use of the **Internet kill switch** and has opened a debate about the possibility of governments using their power and legislation to shut down the Web. The Egyptian government correctly recognized the power of social media to influence people to protest. The movement was not a small group of people in isolation rallying for change but, rather, the digital sphere mobilizing for social and political transformations. While the government identified the role of social media in initiating the protests, it mistakenly assumed that flipping the Internet kill switch would stop them. The government not only cut citizens off from current information about how the events were unfolding but also halted protesters' ability to communicate and organize. In addition, the government cut off citizens from their cellphones, which meant Egypt was basically a zone of zero information and connectivity. That is, no emails, Facebook posts, or tweets could be received or sent from Egypt, effectively preventing citizens from communicating with one another and from exchanging news with the rest of the world. Surprisingly, this isolation did not stop the movement but gave it further momentum. After people were cut off from all telecommunications, they went to the streets to express their anger and discontent about what they felt was an abuse of power on the part of their government. As a result, this change in government strategy infused a social movement with renewed strength and focus.

After the Arab Spring, many countries, including Iran, China, and Turkey, banned Twitter either temporarily or for longer periods of time (Shaheed, 2014; Bamman, O'Connor, & Smith, 2012). In 2014, news service France 24 reported that Turkish citizens were bypassing the Twitter ban in that country by learning how to change their DNS numbers and IP addresses and by using VPNs (virtual private networks). Interestingly, the instructions were spread using graffiti—by people physically writing Google's public DNS numbers on walls and other surfaces all over Istanbul.

the protests unfolded: "[A]s we learn more about the events of the past few weeks, we'll discover that online media did play a role in helping Tunisians learn about the actions their fellow citizens were taking and in making the decision to mobilize" (2011). Some analysts argue that social media were particularly critical in enabling protest leaders to mobilize; these leaders are referred to as **digital revolutionaries**. Wael Ghonim, a Google executive who played a role in the early stages of the uprising, saw great value in social media, saying, "[T]he revolution started on Facebook," and "[I]f you want to liberate a society just give them the Internet" (MacKinnon, 2011). The Arab Spring movement used social media extensively to voice opinions, exchange information, and organize during the early stages of the protests.

Srinivasan (2011) argues that we cannot deny the impact of the Internet on politics: "With four billion mobile phone users and 30% of the world's population with basic Internet access, it's absurd to dispute the implications of these technologies on social, political, and economic life." Even individuals who are not connected are affected by such technological changes. The Internet in and of itself is not a political tool; what is unique about social media, however, is its ability to connect people in real-time in an organic and networked structure, which requires little centralization and command. New ICTs have allowed citizens to voice their political discontent, organize on a large scale, and increase awareness of political causes through movements like the Umbrella Movement in Hong Kong (Lee & Chan, 2018).

The term **digital public sphere** describes the new forms of association that are developed online and the possibilities that they provide for citizens to organize and mobilize. Some of the central changes that have occurred as a result of the digitization of the public sphere, according to Gripsrud, Moe, and Splichal (2010), are:

1. Changes and processes occur on a global scale.
2. Various media converge and blur.
3. The commercialization of the media.

The use of digital media for political and social action has contributed to the creation of a digital public sphere. As Day and Schuler have noted, the "increasing communication and collaboration between social movements, civil society and community networks does . . . possess the potential for an emerging counterculture" (2006, p. 20). Many of these initiatives are created and organized from the bottom up using participatory tools that empower the community (Day & Schuler, 2006). These communities are diverse and vary in purpose: "[t]hey are not like organisational structures—the boundaries of which can be identified, quantified and measured—communities are messy, hard to pin down and problematic" (Day & Schuler, 2006, p. 27). Our discussion of the digital public sphere concludes with a comment by Srinivasan: "Even if new technologies can serve both democratic and repressive purposes, no one disputes their continued growth as the economic, social, political, and cultural substrate of our times" (2011, n.p.).

Slacktivism

Even though thousands can engage with a campaign and help spread its message via social media, this type of online activism has received considerable criticism. Dismissively termed "**slacktivism**" or "**clicktivism**" (Schomerus, Allen, & Vlassenroot, 2012) for the laissez-faire attitude and simplistic actions they require to show support for a campaign, some argue these forms of online participation—like retweeting a message on Twitter or liking a post on Facebook—are barely political or social activism. Indeed, people have expressed concern about individuals feeling they are social activists or have contributed to a social cause by simply sharing, retweeting, or posting about an issue on social media, rather than participating in more direct forms of collective action. This gives online participation a bad reputation for being a "feel good" measure that does not prompt meaningful, long-term forms of engagement (Hogben & Cownie, 2017).

Nayar (2018) argues that despite the former's negative connotation, online and offline activism work together. Consider the #SupportIslandWomen initiative started by reproduction rights activists in Prince Edward Island, Canada. This initiative gained popularity in 2016 due to both online and offline participation, encouraging debate on abortion access (Myles, 2019). White and Kristofferson (2018) further argue that online activism has the power to spread awareness to a cause and can lead people to form stronger connections to it. What motivates individuals to participate in social activism, how they participate, and their trajectory of participation are all important themes in better understanding the nature of the digital public sphere and the role of digital media.

Conclusions

Community and its forms of expression are in constant flux, shifting as social, technological, and economic changes take place. While much of the debate around the concept of community has focused on how much it has changed from the early pastoral communities of the eighteenth century to our current high-tech society, this comparison does not really address the more important issue of what current forms of community are. As people change their communication and socializing patterns, new theories and measurements of community must develop as well.

Early writings emphasized either the Internet's negative or positive impact on social structure. The utopian perspective saw new communities of solidarity unconstrained by space and time, while the dystopian perspective emphasized potential negative effects of text-based communications that did not afford the rich contextual forms of in-person exchange. Both perspectives tend to provide a limited understanding of the impact of the Internet on the structuring of society. The Internet is blending into the rhythms of everyday life, both supporting mundane activities such as banking, searching for information, planning vacations, etc., as well as creating new forms of socialization. Snapchat and Twitter, for example, provide new platforms for staying in touch with people from various spheres of a person's life, from family, close friends, and acquaintances to co-workers and co-activists. These tools are changing the structure of society. People are no longer embedded in narrowly defined local clusters, but instead socialize with heterogeneous, global social networks. These networks are characterized by constant change as people shift locations, interests, and jobs. This has been referred to as networked individualism because each person has their own unique network of family, friends, co-workers, and acquaintances. Overall, evidence suggests that industrialization, urbanization, bureaucracy, and digital media have not destroyed community, but rather have transformed community.

The public sphere is also transforming as a result of digital technologies that provide alternative means of voicing, sharing, and debating opinions. Yet with these new opportunities come new challenges. For example, in many countries, expressing dissent and alternative opinions about controversial topics via Twitter circumvents censorship and oppression. From this, new challenges emerge as Twitter and other social media need to provide secure environments for dissidents to safely express their views (MacKinnon, 2011). No doubt more opportunities and challenges will arise as the use of social media becomes more integrated into society.

Questions for Critical Thought

1. Does the Internet resemble a social structure similar to *Gemeinschaft* or *Gesellschaft*?
2. The networked individual type in comparison to the socially limited type is represented as a fairly idealistic type. Can you think of the pros and cons to this type of social connectivity?
3. In comparison with in-person discussions, does social media provide its users with an opportunity to engage in open debate? Explain your response.
4. Define *slacktivism* and list reasons why online campaigns have been criticized.

Suggested Readings

Anderson, M., Toor, S., & Rainie, L. (2018). *Activism in the social media age*. Washington, DC. Retrieved from http://www.pewinternet.org/2018/07/11/activism-in-the-social-media-age/
This report looks at the evolution of the #BlackLivesMatter hashtag and how Americans use social media for political and social participation.

Hampton, K. N., & Wellman, B. (2018). Lost and saved. . . again: The moral panic about the loss of community takes hold of social media. *Contemporary Sociology, 47*(6), 643–651.
This article takes a renewed look at the loss of community argument taking into account new evidence.

Lee, F.L.F., & Chan, J.M. (2018). *Media and protest logics in the digital era: The Umbrella Movement in Hong Kong*. New York, NY: Oxford University Press.
This book provides new insights into collective action in the digital age by examining the Umbrella Movement in Hong Kong and the role of digital media.

Twenge, J. M. (2017). IGen: *Why today's super-connected kids are growing up less rebellious, more tolerant, less happy—and completely unprepared for adulthood—and what that means for the rest of us*. New York: Atria Books.
This book looks at generational differences showing how iGen (born 1995–2002) are socially different and engage differently with community.

Online Resources

Activism in the Social Media Age, #BlackLivesMatter hashtag
https://www.pewinternet.org/2018/07/11/activism-in-the-social-media-age/
This report looks at the evolution of the #BlackLivesMatter hashtag and how North Americans use social media for political and social participation.

TED Talk on iGen by Jean Twenge
https://www.youtube.com/watch?v=UA8kZZS_bzc
In this TED Talk Jean Twenge talks about the challenges of Generation iGen as they show heavy reliance on smartphones often at the expense of face-to-face interactions.

Toronto Social Capital Study
https://torontofoundation.ca/wp-content/uploads/2018/11/TF-SocialCapitalStudy-Final-Clean-min.pdf
This report, created by Toronto Community Foundation, examines the social capital that exists in Toronto neighbourhoods.

We Matter
https://wemattercampaign.org/about/
We Matter is an Indigenous youth-led non-profit organization working to support Indigenous youth and organizers of the Canada-wide We Matter multimedia campaign.

Interactive Activities

Activity 1: Digital Stories of Immigration Come Together Online Under #immigrationmatters

Through storytelling and digital media activism, Refugees and Citizenship Canada (IRCC) has started a digital campaign with #immigrationmatters hashtag. The goal of the campaign is for citizens to share their own stories of how immigration, their family's story of immigration, or how immigration has changed their communities. Stories can be shared on social media using the hashtag #immigrationmatters. IRCC has been selecting stories from social media to create video and written content on their website. Current submissions are viewable on the IRCC website: http://www.canada.ca/immigration-matters

1. Read the stories that are available.
2. Write a response to the question: How effective is this digital campaign?
3. Consider adding your own story to contribute to Canada's understanding of immigration.

Activity 2: Engaging with #BellLetsTalk: Activism or Slacktivism?

A Canadian campaign that has received much attention is Bell's "Let's Talk" Day with the #BellLetsTalk hashtag. The motto of the campaign is "small action, big impact." The company recorded a total of 1,013,915,275 interactions across all social media platforms and the hashtag was the most popular one on Twitter in all of 2018. A survey showed that 87 per cent of Canadians reported that they were more aware of mental health concerns as a result of the campaign. Let's take a closer look at the campaign.

1. Do you think it is fair to characterize the campaign as slacktivism? Or, has this particular campaign yielded important social change by increasing awareness around mental health? Support your argument.
2. Describe your participation in the #BellLetsTalk campaign. To what extent has it made a difference for you or a friend? What do you like about your participation?
3. What additional actions could individuals participating online make in order to make the campaign more relevant in their lives and move away from criticisms of slacktivism? List both additional actions online and additional actions offline that could be taken. Think about examples such as looking up information about anxiety, taking a walk with a friend to talk things through, etc.

10 Technology-Mediated Social Relationships

Learning Objectives

- to discuss how the introduction of the telephone helped redraw social boundaries and shift our understanding of social space;
- to examine current understandings of socialization and friendship in the context of digital media;
- to investigate how digital media have affected the formation, maintenance, and dissolution of romantic relationships;
- to unpack the concept of cyberbullying, review its effects, and outline different types of intervention; and to explore the concept of virtual mourning and how it shifts our understanding of death.

Introduction

In this chapter, we briefly outline the beginnings of mediated communication and investigate the kinds of social change they have sparked. After providing an overview of how the telephone transformed communication, we review modern trends in mediated communication, showing the complexities of crafting a virtual self that is open to scrutiny by a large, networked audience. It follows with a discussion of the complex ways in which these trends affect social relationships. The chapter then engages with how social media have redefined friendship and examines the implications of these changes for social networking. This leads to an analysis of how people use social media to form and terminate romantic relations, including how digital media have complicated breakups. The chapter also addresses the concept of virtual mourning and how people are renegotiating the meaning of death online. Finally, the chapter ends by addressing cyberbullying: the types that exist, the long-term effects for victims, and the potential types of intervention.

Early Beginnings of Mediated Communication

The study of how mediated communication becomes integrated into daily life and impacts society has a long tradition, starting with the early investigations from the **Toronto School of Communication**, a loosely connected network of scholars at the University of Toronto. Key intellectuals of the school include Eric A. Havelock, Walter J. Ong, Harold A. Innis, and Marshall McLuhan. Havelock's work investigated early methods of communication, in particular the effects of print literacy. Havelock's theorizing stressed the political, social, and cultural changes brought about by the move from **oral societies** to **literate societies** (Crowley & Heyer, 2011). In oral societies, memory is the primary means for recording historical events and transmitting knowledge and traditions. In literate societies, the written word becomes the authoritative means of recording and storing information (Havelock, 1963). Ong (1991) continued in Havelock's footsteps, investigating social change resulting from electronic media such as television, the telephone, and radio. Ong moved away from this simple oral–written dichotomy. He argued that different notions of orality could exist, some of which are directly linked to print culture. Print culture refers to a complex system including written documents, social practices emerging around written documents, and oral forms of exchange. Ong distinguished between **primary** and **secondary orality** to understand communication. He argued that secondary orality represents a form of **post-typography** because in it oral communication is dominant over the written word. For him, secondary orality describes a verbal era that integrates elements from both oral and literate societies; that is, it exists in the context of and makes reference to print culture. An example of this would be a CBC news report on television that makes reference to a tweet by a politician (print culture on social media). This is similar to Innis' (1951) work on the structural changes resulting from literacy. Central to his theorizing is the concept of **media bias**, which refers to the transforming power of media in human affairs. He distinguishes between forms of communication that have a **time bias** versus those that have a **space bias**. Time bias describes oral societies that emphasize community building. In these societies, change occurs slowly because culture, information, and knowledge are only transferred through oral means. Hence, memory and memorization played a crucial role in the transmission of information over time, increasing the sheer amount and redundancy of information. By contrast, space bias describes literate societies that favoured imperialism and commerce because writing allowed for the easy dissemination of ideas and information over vast distances.

The Toronto School of Communication provided many early insights into how media become integrated into and transform society, but it only scratched the surface of the many interrelationships that exist between prevalent modes of communication and the structuring of society. Moreover, they tended to examine communication from a standpoint of technological determinism, assuming technology has a strong, unidirectional impact on society—instead of thinking of the relationship as a coming together of technological and societal trends. In the next sections, we consider this coming together, first by examining North America's slow adoption of the telephone and, later, the effects of the Internet on forming, maintaining, and ending social relationships.

North America Calling: The Impact of the Telephone on Social Relationships

The telephone has undergone many transformations since Alexander Graham Bell developed the first prototype (Klemens, 2010). The initial model allowed only for the transmission of sounds: speech could not be discerned. Claude S. Fischer (1992) writes about the initial resistance to the telephone and how it fundamentally changed American society. For him, this transformation occurred through a mutual shaping process between the technology and social actors: "[a]s much as people adapt their lives to the changed circumstances created by a new technology, they also adapt that technology to their lives" (Fischer, 1992, p. 5). Hence, the impact of the telephone was not radical; instead, people came to rely on the telephone gradually, over time, as the technology became embedded in existing social norms and practices, eventually functioning as an additional form of communication to in-person exchanges.

One social change that the telephone brought about was the rewriting of social boundaries set out by class, race, and status (Marvin, 1988). The telephone created different forms of **social accessibility**, where people who were previously inaccessible, such as public figures, could suddenly be reached directly and instantly. As technology and its features evolve, advanced features continue to allow for greater control. With the telephone, people gained more control over how they could be reached and by whom. For instance, the introduction of call display to screen calls and the use of answering machines to record messages afforded more flexibility and social control. This is also true of more contemporary communication technologies. A 2008 study examining how university students use instant messaging for negotiating social accessibility found that people have more control with instant messaging than with the telephone because the user can determine when to log on the system, when to log out, whom to ignore, and with whom to communicate (Quan-Haase & Collins, 2008). This shows how features in technology provide users with more control over their social accessibility.

The telephone also opened up previously sheltered social realms, such as the home: "Home was the protected place, carefully shielded from the world and its dangerous influences. New communications technologies . . . lessened the family's control over what was admitted within its walls" (Marvin, 1988, p. 76). Despite people's initial apprehension, the telephone became widely adopted in Western societies and has had widespread social consequences. Nonetheless, the telephone was just the beginning of the close link between telecommunications and society. The Internet would diffuse much more rapidly, and its effects would be more profound and all-encompassing.

Penetration Rates: The Impact of Digital and Mobile Media on Social Relationships

Digital and mobile media have come to occupy a predominant role in our society, structuring much of our social life. Figure 10.1 shows how penetration rates have changed in the United States from 2000 to 2018. While there are some minor

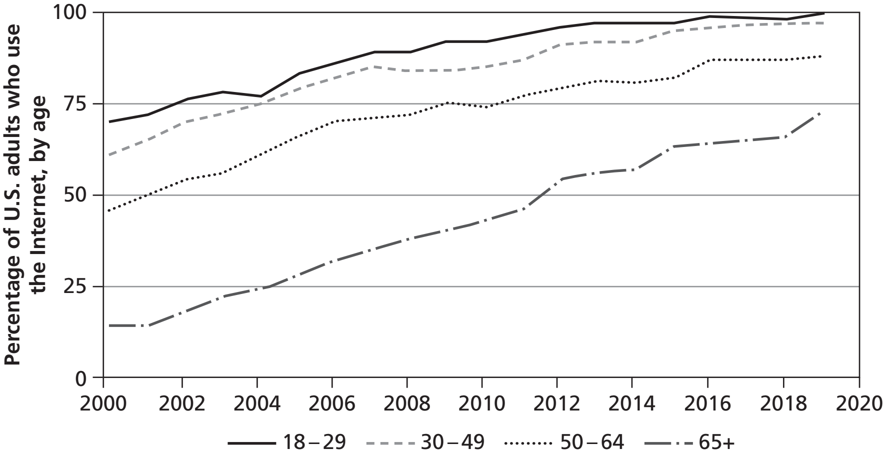


Figure 10.1 Percentage of US Adults Using the Internet Over Time, by Age
Source: https://www.pewresearch.org/internet/fact-sheet/internet-broadband/

peaks in the data, the trend is an increase in Internet use among all age groups. Adults 65 and older are still the slowest to adopt the Internet as a communication tool, with 66 per cent online in 2018; they are particularly slow in the adoption of social media (Haight et al., 2014). This group of users is often referred to as **digital immigrants** because they came to the Internet late in life and have been generally slow and apprehensive in adopting novel forms of communication (Prensky, 2001; Quan-Haase et al., 2018). In the 18- to 29-year-old age group, 98 per cent of Americans were Internet users in 2018. This group is usually referred to as **digital natives** because they have grown up with the Internet and are unfamiliar with a pre-Internet time (Palfrey & Gasser, 2008; Prensky, 2001). In Canada, nearly all Canadians under 45 years of age use the Internet every day (Statistics Canada, 2017).

Further, with the wide availability of smartphones, Internet users have immediate and constant access to the online world anywhere they go. This has changed social accessibility in even more profound ways than the telephone did in the early twentieth century. With cellphones we are accessible to our social networks no matter where we are 24/7, creating a new sense of social connectivity (Chayko, 2018). As with the Internet, the adoption of smartphone technology is more prominent in the younger population. Statistics Canada (2017) reports that 76 per cent of all Canadians own a smartphone; yet smartphone ownership is not equally distributed across age groups: 94 per cent of the younger population (15–34 years old) own a smartphone, but this number goes down in older age groups with 69 per cent of Canadians in the 55- to 64-year-old age group and only 18 per cent of Canadians aged 75+ owning one. Smartphones are followed by laptops, which are owned by 71 per cent of Canadians (see Figure 10.2). Most Canadians own multiple devices, with 90 per cent owning more than two devices and as much as 80 per cent owning three or more.

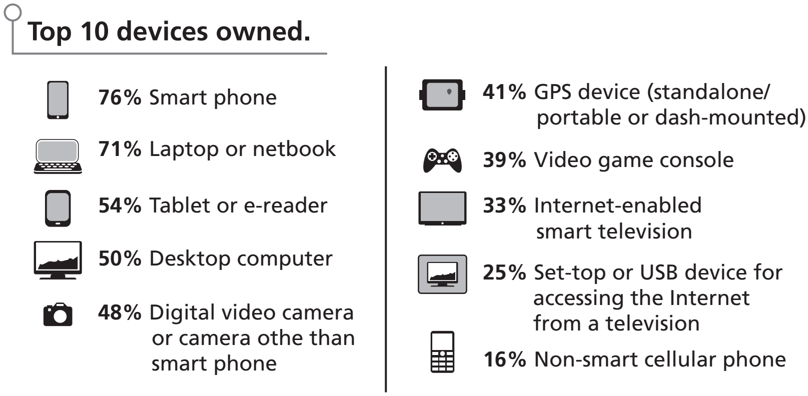


Figure 10.2 Device ownership in Canada, 2016

Source: The Internet and Digital Technology, Statistics Canada. https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2017032-eng.htm

The adoption of mobile technology is not equally distributed around the globe. As society becomes increasingly more dependent on mobile technology, those without access miss out on many social and economic opportunities. When we look at advanced economies, smartphone ownership ranges from 95 per cent in South Korea to 59 per cent in Greece (Pew Research Center, 2019). By contrast, emerging economies lag behind, with India for example having a penetration rate of smartphones of only 24 per cent. Arora (2019) has written about how the Internet will radically be transformed as the next billion users join, most of whom will come from emerging economies. In advanced economies, younger adults lead the way, but seniors are slowly catching up. In emerging economies, most of the use of smartphone technologies comes from younger age groups and seniors are much less likely to own a smartphone. This demonstrates some similarities and differences in adoption patterns between emerging and advanced economies when it comes to smartphone ownership. In Canada, seniors often own a smartphone, but continue to use it exclusively for phone calls rather than downloading apps and taking advantage of their many features (Quan-Haase et al., 2018). It is also worth noting that while we may think that in advanced economies like Canada access is a given, this is not the case. For example, regions of Canada's North and rural areas continue to lag behind (Office of the Auditor General of Canada, 2018).

Since 2005, we have observed a shift in how people use media for communication. Email—even though it continues to be used for specific purposes—has been largely displaced by social media (Wellman, Quan-Haase, & Harper, 2019). Among online Canadians 18 and older, 94 per cent use at least one social networking site (Gruzd et al., 2018). Facebook is by far the most popular, with 84 per cent of online Canadians having an account, followed by YouTube, with 59 per cent using it. Figure 10.3 shows that Facebook is also the most frequently used social networking site, as 79 per cent of Facebook users log in daily, followed by Instagram with 61

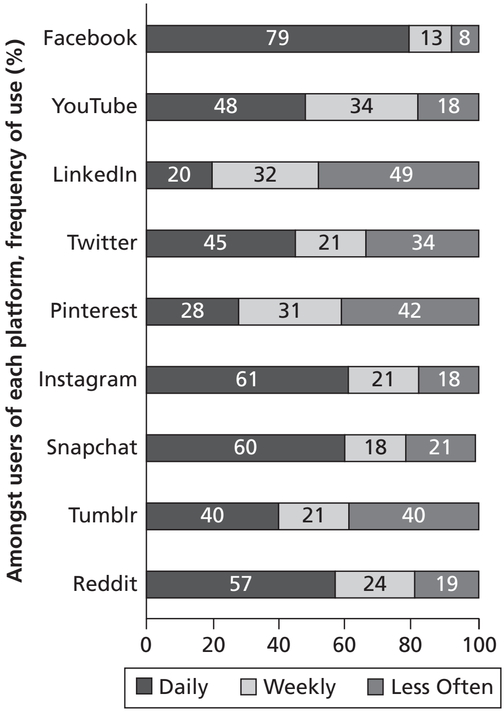


Figure 10.3 Frequency of Social Media Use, 2017.
Source: The state of social media in Canada, The Social Media Lab, Ryerson University (February 2018) https://socialmedialab.ca/2018/02/25/state-of-social-media-in-canada/ (with permission).

per cent of daily log-ins. Woman significantly outnumber men in the use of popular social media; for example, 56 per cent of women have an account on Pinterest in comparison to 18 per cent of men, and 46 per cent of women use Instagram in comparison to 28 per cent of men.

How Has Technology Affected Our Relationships?

Social media have revolutionized the communication landscape, becoming an integral part of how we interact with others and disseminate information. Four central topics illustrate how these tools become integrated into our daily lives: how we present ourselves online, form friendships, negotiate relations with romantic partners, and mourn loved ones.

1. Presentation of the Self Online

Our digital lives include an element of self-presentation. But what is the self? The self contains a range of information on a person such as one's name, how one perceives oneself, one's likes and dislikes, one's personal beliefs and values, and other aspects that are important to who one is as a person (Sedikides & Spencer, 2011). These attributes are not stable, but rather change over time depending on new life experiences that are integrated into the self (Anthis, 2002; Marcia, 1966; McCrae & Costa, 1990). The notion of a single self has been dismissed by Coser (1975), who has shown that individuals have multiple selves that are displayed in different social roles and networks. That is, different attributes and behaviours come to light when a person interacts with their peers than when they interact with their professional colleagues. For Higgins (1987), the self can be divided into three core components:

1. an actual self, determined by a person's attributes;
2. an ideal self, based on how a person wants to be perceived; and
3. an "ought to be" self that expresses a person's moral expectations.

These three core components shape a person's behaviours and attitudes. But how does the self operate online? Often the acronym **IRL**, meaning "**in real life**," is used to denote people, events, and actions that exist offline. Yet given the difference between the two spaces, is the **virtual self** different from the real-life self? Is the online self simply a replica of one's offline self? Or is it a newly crafted self?

Sherry Turkle (1995) argued that the Internet allows for identity exploration of and experimentation with variations of the self. That is, one can explore aspects of the self in a safe environment without feeling judged. This may be particularly important for young people in the process of developing their identities; for example it provides LGBTQ youth space to explore their sexual and gender orientations. In her seminal book *The Second Self* (1984), Turkle discusses identity play on the Internet and writes about the effects technology has on our social and psychological lives. Using interviews with hackers, she finds that her interviewees' participation in online communities fills a void in their personal lives and fulfills a need for escape from daily routines.

Online environments provide endless opportunities for exploring, constructing, and experimenting with one's sense of self. As a result, the self is no longer restricted because new media allow for changes in the ways people express themselves and new tools for self-presentation and self-exploration (Marwick, 2013; Herring & Kapidzie, 2015). For example, on the virtual world **Second Life**, a user can create an avatar of a different gender or with a different age. Self-presentation is a process of making strategic choices while online where users are active agents in deciding how they want to present themselves, or elements of themselves, to those in their online networks. Online self-presentation behaviours not only contribute to the present self, but also to people's past and future selves (Bacev-Giles & Haji, 2017).

Diefenbach and Christoforakos (2017) argue that the removal of physical cues and increased control over environments have made it easier to foster a specific impression online. The audience is very important to self-presentation online because they view, interpret, and form opinions based on the content an individual chooses to post. Online, multiple audiences who were traditionally distinct from one another come together (Meyrowitz, 1985), which causes **context collapse** (boyd, 2014) and makes it even more complex and crucial to control one's self-presentation (Litt, 2012; Vogel & Rose, 2016). Context collapse is defined as the coming together of different social roles and identities that would usually not overlap. For example, Instagram may include followers who are work colleagues, family, friends, peers from university, etc. These various spheres of life would usually not connect physically, but they can easily connect digitally and create new challenges for self-presentation. Young people use a range of strategies to control their self-presentation. With these, young people can shape their reputations, manage their social networks, and mask information they do not want others to know (Madden et al., 2013; Chou & Edge, 2012). For example, when tagged in undesirable content (i.e., embarrassing or inappropriate photos), users might untag themselves from the picture in attempt to control their self-presentation (Birnholtz, Burke, & Steele, 2017).

With the rise in social media and its need for self-presentation came the rise of "selfie" culture—the practice of posting "photos from the most flattering angles and poses, as well as using filters, selfie sticks, cropping, and photo shopping to capture a flawless image for posting" (Derenne & Beresin, 2018, p. 129). Selfies are a key tool for self-presentation, as they express unique characteristics of a person's identity and let people choose what they want to highlight about themselves. Diefenbach and Christoforakos (2017) found that young people take selfies with how others will perceive them in mind.

Although selfies can be posted on almost any social networking site, selfie culture is most prevalent on Snapchat. Key to this is that images on Snapchat are temporary in nature; even with changes that allow for prolonged viewing of an image—rather than the previous limit of 10 seconds—and the ability to put images on a story that anyone following the user can see for 24 hours. Unlike on Instagram or Facebook, you cannot go to a user's page and view past images. For this reason, Snapchat users might not feel a need to create the "perfect" image as with other social networking sites. In fact, Choi and Sung (2018) found that Snapchat users are more likely to show "their true self," rather than "their ideal self" that they would share on Instagram. Although it is still possible to alter your image in Snapchat using filters, the process is not as intensive as is possible in other sites. This does not mean that users don't use filters and other enhancing strategies on Snapchat to carefully craft their appearances. Choi and Sung (2018) argue that "the unique architecture and affordances of Snapchat grant depth of communication and a sense of real-time talk-like conversation with acquaintances in small networks, aimed at experiencing greater intimacy" (p. 2295).

Snapchat and Instagram, being image-based, are the most prevalent social media sites for users to post selfies. Hand (2017) argues that "an aspect of selfie aesthetics is the extent to which images such as selfies are routinely altered . . . the ability to crop, to remove blemishes, lighten and darken the skin, and so on, positions the selfie at the conjunction of immediacy and alterability" (p. 225). The ability a person has to alter their own image to their liking is a large part of selfie culture. Hand further argues that the act of taking a selfie is often performative in nature because "the whole body also has to reshape itself to make the selfie happen." In a selfie, the person's arm is often in the picture, drawing attention to the camera and the act of taking the picture.

The availability of filters to modify the original image to a user's liking gives the user more control over their looks. Bij de Vaate et al. (2018) found the following trends: selfie-takers are predominantly female and spend more than two hours online daily, selfies were selected for their overall appearance and social aspects, editing of selfies is primarily done with filters, and selfie-takers will take two to five selfies before posting one online (p. 1402). At first glance this may appear to give users more control over their image. Yet, women often experience intense scrutiny and cyberbullying as a result of airbrushing and modifying an image. For example, after Ali Oetjen, the *Bachelorette* star, posted pictures of herself that were photoshopped, she was viciously attacked online for enhancing her appearance (Karasin & Court, 2019). This demonstrates that while standards of beauty are high on social media and attracting a large audience is no easy job, Instafamous users are not given the liberty to fully use the available tools.

In sum, successful self-presentation is linked to perceptions of popularity, social desirability, and increases in social capital where likes, comments, and views are attributed to success, status, and favourability (Shumaker et al., 2017; Andersson et al., 2015; Marwick, 2015; Madden et al., 2013).

2. Rethinking Friendship on Social Media

Traditionally, **friendship** reflected an informal association without distinct boundaries. Unlike work and family ties, friendships are voluntary and determined, negotiated, and established by the two parties involved and can change over time (Fischer, 1982). There is no single meaning of friendship as it is culturally determined and based on social norms. Nonetheless, there is an understanding that friendship relations are strong, based on trust, and provide emotional, economic, and social support (Granovetter, 1973).[1]

The reason friendship acquires a different meaning on social media becomes evident when we focus on the features of the technology itself: social media introduce novel constraints and possibilities, creating fundamentally different norms around friendship formation and maintenance (Baym, 2010).

To provide a more systematic framework of the influence of technology on friendship, boyd (2006) identified four features of social media that affect friendship formation:

1. **Persistence**: Data posted on profiles and walls of social networking sites remain indefinitely archived and can be retrieved in the future.
2. **Searchability**: This is a key feature of digital data because it facilitates finding information about others.
3. **Replicability**: This feature refers to capabilities provided online to reproduce content (text, pictures, and videos) and insert it in other contexts. Users can post content effortlessly from one medium to another or from one conversation into another.
4. **Invisible audience**: Determining the identity of a recipient or reader of a post is not easy, so it is difficult to tailor messages toward specific audiences.

Consider Instagram, for example: people can see who follows whom; this puts pressure on peers to have a similar number of followers, to have similar kinds of followers (status, gender, diversity), or to have specific celebrities in the network as well. This transparency, which was lacking before social media, can create tension, change social norms around what friendship means, and create expectations around friendship formation.

Yet social media has not only transformed how we maintain friendships; it has also led to specific technology-based behaviours that transform how friend networks function. For example, social processes have been transformed online leading toward greater engagement in **social comparison** and **feedback-seeking** (Nesi & Prinstein, 2015). For adolescents and young adults both social comparison and feedback-seeking are integral parts of identity construction processes. They evaluate the self, using information in their environment and in particular relying on the opinions of their peers (Harter et al., 1996; Nesi & Prinstein, 2015). Social media can exacerbate our inclination toward engaging in social comparison and feedback-seeking, which can lead to depressive symptoms, low self-esteem, and feelings of inadequacy (Nesi & Prinstein, 2015). For example, in a study on Facebook, Chou and Edge (2012) found when young people continuously see posts from others looking happy, celebrating achievements, and being generally positive, they conclude that their peers' lives are better than their own. Often there is little realization that the image presented is part of users' performativity; they showcase their best selves and not necessarily their real selves. This is not a random act, as Hogan (2010) points out: this is a process of data curation, where users act like curators of exhibits or museums, carefully selecting pictures, information, and artifacts that are all strategically positioned to craft a unique self. For Goffman (1959) this distinction was central as it emphasized agency. Goffman referred to the presentation of self in private space as a person's **backstage** and the public expression of self as the **frontstage**. This is important for understanding users' decisions as to what to post. For users social media is their frontstage and it is there that they accordingly present their most desirable elements of the self. It also creates enormous pressures on users to grow their followers and gain popularity. For example, Canadian YouTube celebrity Elle Mills uploaded a video where she described how being a YouTube sensation was not easy (see also Chapter 6; Mills, 2018). It was a lonely experience for her and the more followers and likes she garnered, the greater the anxiety to maintain the hard-earned fame (Alexander, 2018). This demonstrates that *social* media can also make us feel lonely and depressed, even when the main goal is to promote sociability (Primack et al., 2017).

3. Romance Online

Understanding digital media also includes understanding how it has changed romantic relationships. Meeting a romantic partner by swiping through potential candidates is a novel experience: left for moving to the next candidate and swiping right for good matches. While it is more comforting and perhaps less intimidating than meeting a potential partner in-person, it adds new challenges. Similarly, ending a romantic relationship via text may sound simple, but it comes with many repercussions for what romance means and for how people cope with breakups. People use digital media, first of all, to screen potential romantic partners by searching Google and visiting their profiles on Instagram or Facebook. In addition to providing verifying information on potential romantic partners, digital media can also move the relationship forward more quickly, as snaps on Snapchat, text messages, and likes on Instagram can fill the communication gap that might otherwise occur in between in-person meetings (McGinn, 2011).

The use of online dating sites is now a fairly widespread social practice. Smith (2016) reports that 15 per cent of American adults have used online dating sites or mobile dating apps, such as PlentyOfFish (POF), Tinder, Match.com, OKCupid, and eHarmony. Recent years has also seen an increase in LGBTQ-specific dating sites, such as Grindr, Jack'D, and Her (Johnson, et al., 2017). Gay men have previously been the largest user group of geosocial-networking sites and only recent studies have found heterosexual couples gaining interest in these types of dating sites (Anzani et al., 2018). Gay-specific dating sites provide alternative safe spaces for gay men to meet. Gay men feel they can be more open about their sexual identity on gay-specific dating sites and also express their desires (Wu & Ward, 2018). Dating sites help LGBTQ people meet others with the same sexual orientation (Chan, 2018), but more importantly, it also made the community more visible by providing a "window into what it was like to engage in an everyday activity—meeting people or dating—as an LGBTQ-identified person"

(Fox & Ralston, 2016, p. 639). Some consider online dating as less serious and more prone to deception, but the Pew Research Center (2016) shows that online dating is also about finding a romantic partner, as in 29 per cent of cases online dating led to a serious long-term relationship or even marriage.

Romantic relationships also originate from active participation in online communities or video games. Huynh, Lim, and Skoric (2013) looked at massively multiplayer online games (MMOs or MMOGs), and noted that such games "have blurred the play/life boundary, transforming themselves from a site of pure play to a site for romantic relationship formation and maintenance" (pp. 251–52). They found that in-game romances did not remain virtual; they often translated into offline relationships. To those playing the MMOs, romantic interactions were part of their constructed reality (Huynh et al., 2013). This shows that dedicated dating sites are not the only online venues for meeting romantic partners; rather, there are many different avenues for the creation and expression of romantic relationships.

Not only does the Internet play a role in the formation of new romantic relations, it has also become an important part of maintaining long-term relationships. For instance, couples who are in a long-term relationship will often post their relationship status on Facebook: a study by Young and Quan-Haase (2009) found that 60 per cent of males and 65 per cent of females posted their current status. The relationship status on Facebook functions as a social signal, legitimizing the seriousness of the relationship and assuring the partner that things are progressing well (Mod, 2010). In a study by Mod (2010), those individuals who had updated their Facebook relationship status were more likely to experience happiness and satisfaction in their relationship rather than jealousy based on their partner's online behaviours. For married couples, posting frequent dyadic profile pictures and statuses strengthened the relationship and increased satisfaction (Saslow, Muise, Impett, & Dubin, 2013). A Pew (Lenhart & Duggan, 2014) report showed that the Internet has had a "major impact" on about 10 per cent of romantic relationships, with 74 per cent of individuals reporting that the influence was largely positive, because of the possibilities of obtaining advice and social support.

Even though many reports about the role the Internet plays in romantic relations are positive, most problematic behaviour is associated with breakups. The phenomenon known as **breakup 2.0** is complex because it involves the initiator and non-initiator of the breakup, the social network that is serving as an audience of the breakup, and the digital footprints available on social media sites. In her book *Breakup 2.0*, Gershon (2010) investigated how young people perceive digital media in the context of breakups and found that they are confused about the role that mediated communication should play. Gershon discovered that people believe that the medium chosen to communicate the breakup is pivotal. Some media are evaluated as more serious than others and hence are more suited for ending a relationship. For most, face-to-face communication was the medium of choice for breaking up with someone, and they considered using other media to be highly inappropriate.

In a follow-up study, Lukacs and Quan-Haase (2015) also found that Facebook had increased the amount of distress for parties involved in breakups due to salient digital reminders of their relationship, including pictures together, posts and messages, status updates, and other digital memorabilia. What also complicates the breakup is that social media creates another layer of interpreted communication with the ex-partner. Any information posted by the ex can be interpreted in multiple ways, some of which can be hurtful. In Lukacs and Quan-Haase's (2015) study, respondents reported that accessibility to the ex's behaviours often promotes **cyberstalking** or interpersonal electronic surveillance (IES). IES is defined as the use of information and communication technologies to gain awareness of and monitor another user's online and/or offline behaviours (Tokunaga, 2011). Breakup complications resulting from digital media continue to evolve. **Ghosting**, the complete absence of all communication as a means to terminate a romantic relationship, is a new breakup strategy and extremely hurtful (LeFebvre et al., 2019). When a person is ghosted they are more likely to feel powerless and unable to understand why the relationship ended, making the coping process much more difficult and prolonged.

The distress resulting from a breakup has prompted scholars to examine what kinds of coping strategies linked to social media people engage in and how effective these are. Box 10.1 showcases a study of the digital coping strategies employed following the dissolution of a romantic relationship that is complicated by Facebook use.

Box 10.1 Romantic Dissolution and Facebook Life: Coping Strategies for Breakups

Following a breakup, individuals experience many negative feelings. To mitigate the negative feelings, individuals engage in coping behaviours employed to alleviate distress, jealousy, anger, depression, and anxiety, as well as to help move on from the breakup (Lukacs & Quan-Haase, 2015). The types of Facebook coping strategies employed are closely linked to the nature of the breakup and the uniqueness of the past romantic relation (Quan-Haase, Nevin, & Lukacs, 2018). Table 10.1 shows the different types of coping strategies that individuals engaged in and specific actions associated with them. The study found that coping involves erasing and avoiding breakup reminders and digital traces, as they perceive them as hurtful. They regulate their use of Facebook and limit Facebook communication with the ex. An important coping strategy was expressing their emotions via Facebook content, often aimed at

Table 10.1 Facebook Coping Strategies Following a Romantic Breakup

Coping Strategy & Subtopic	Specific Actions
Erasing and Avoiding Digital Traces	
a. Relationship status	Change or delete the relationship status from one's profile
b. Photographs	Change profile picture from one with ex-partner Untag photos with ex-partner Delete old photographs with ex-partner
c. Messages and posts/updates	Delete old messages related to ex-partner Unsubscribe to posts by the ex-partner in the news feed to avoid new digital traces
Regulating Facebook Communication	
a. Delete Facebook connections	Delete the ex-partner as a Facebook Friend Delete mutual Friends with the ex-partner
b. Limit or eliminate Facebook use	Hiatus from Facebook Considered deleting Facebook Delete Facebook Find distraction
Emotional Expression	
a. Expressive writing	Post about the breakup Provoke jealousy through posts and pictures
b. Antagonism toward ex-partner	Disparage ex-partner through posts, photographs, and messages
Support Seeking	
a. Friendship and kin networks	Increase Facebook use to combat loneliness Seek advice, reassurance, or messages of love from Facebook Friends
Information Seeking	
a. Interpersonal electronic surveillance	Log in to ex-partner's account using their password View ex-partner's profile Learn about ex-partner via mutual Friends to see news feed, status updates, and pictures
Information Avoidance	
a. Self-restraint	Actively avoid viewing ex-partner's profile Actively avoid viewing ex-partner's Friends' posts
Preventative Measures	
a. Security concerns	Adjust privacy settings on Facebook Change Facebook password
b. Future communication	Block ex from Facebook

Source: Quan-Haase, A., Nevin, A. D., & Lukacs, V. (2018). Romantic dissolution and Facebook life: A typology of coping strategies for breakups. *Studies in Media and Communications*, *17*, 73–98.

continued

the ex-partner. They also use Facebook to seek support and new information about the ex, including about potential new romantic interests. Others preferred to avoid information about the ex and either deleted the ex and their friends or chose to unsubscribe to updates. Coping strategies included preventative measures such as changing passwords, blocking the ex, and adjusting privacy settings.

The Facebook-mediated termination of romantic relationships highlights the complex information behaviours users move through in a highly documented environment where social relationships are publicly recorded and unrecorded. The different coping strategies show users both making use of the abundance of information available to them and avoiding or censoring information in the information-rich environment of Facebook. By exercising autonomy using the different functionalities of the Facebook platform, users are able to change their social environment to support their current emotional states.

Digital media have made the process of breaking up more difficult and often prolonged. As a relationship unfolds, it leaves a digital trace (Hogan & Quan-Haase, 2010), which can trigger memories of the romance even after its dissolution. Van Dijck (2007) points toward the existing relationship between material culture, technology, and memory, arguing that objects mediate memory and represent a person's identity at a specific moment in time. Like shoeboxes filled with personal items, social media become repositories of our past relationships. These digital traces can make it difficult to move on and leave previous relationships behind. Box 10.1 discusses a range of coping strategies that can help deal with the distress, anger, and jealousy following a breakup. Many of these strategies are directly linked to digital media, but others also include taking a break from media use and refocusing one's attention away from technology to other interests such as sports, hobbies, and friends.

4. Virtual Mourning

The passing of a loved one is never easy. When someone dies, family and community come together to celebrate the lost life and provide each other with emotional support and comfort. With the widespread use of digital media among all age groups, we are observing a change in how mourning occurs, how people express their condolences, and a rewriting of social norms around funeral etiquette (Hogan & Quan-Haase, 2010).

Thanatology, the study of death and its diverse cultural and normative practices, is not familiar to most people. In this context, digital media become **thanatechnology**; that is, technological mechanisms such as posts, selfies, and emoticons that are used to obtain information or support learning about thanatology topics (Sofka, 1997). Thanatechnologies play an important role in society as they help people cope with loss, providing an expanded support network that overcomes limits of time and space and allows a transnational community to come together to mourn.

With millions of individuals creating profiles on social media sites and spending time on virtual communities, a unique Net culture has inevitably evolved to deal with loss. **Virtual mourning** is becoming a common phenomenon. As long as a deceased user's profile continues to be updated, the illusion persists that content and user are one entity. Hogan and Quan-Haase (2010) point out that "when the submitter dies, and the profile lives on, we can see this distinction all too clearly. Death has become the ultimate arbiter of this difference between the data that persists and the individual that does not" (p. 311).

Carroll and Landry (2010) discuss the persistent online presence of deceased individuals and how their profiles are transformed into **memorial profiles** and places of grieving. Carroll and Landry (2010) list four activities that take place on social networking sites after loss:

1. *Creation of a narrative*: The first activity is the creation of a narrative of the dead person's life. People tell stories about the deceased to cope with the loss. This engagement with the person's life history is a collaborative process, in which family and friends often reflect upon and negotiate the person's various and divergent portrayals.
2. *Posting of notes*: The second activity is the posting of short, simple notes on a person's wall to publicly express feelings of loss and solidarity, which allows the community to share their feelings with others and join in the act of memorializing and coping with grief—for example, "RIP" or "I miss you." Following is another example from Carroll and Landry:

   > i miss you adam, i wish you could come back but since you can't, i wanted to say that i love you very much, we all miss you, ♥courtney (posted 9 April 2007, http://profile.myspace.com/index.dfm?useaction=user.viewprofile&friendID=175255389)

3. *Praising*: A third activity is to praise the deceased and highlight their virtues, merits, and accomplishments.
4. *Connecting with the deceased*: A fourth includes addressing the deceased directly by asking them for guidance, comfort, and understanding. This shows how powerful profiles are in continuing to represent the deceased and in providing some form of comfort for those left behind. The engagement in these four activities brings the community closer together, and the profile of the deceased provides a central space for family and friends to congregate, share their memories, and express their feelings of loss.

Virtual mourning has also come under scrutiny. Much media attention followed the "selfies at funerals" Tumblr blog created by Fast Company editor Jason Feifer (Feifer, 2013), which collected selfies taken at funerals and shared via

Three-way selfie at Nelson Mandela's memorial service in South Africa: David Cameron, Helle Thorning-Schmidt, and Barack Obama

Instagram or Twitter. The Tumblr blog raised awareness around competing social norms, the norms created by mobile culture to share with our digital audience our experiences, and the norms to be sensitive to the mourning occurring during a funeral. Further uproar surged online when then US President Barack Obama took a selfie with the then Prime Ministers of Denmark and the UK at the memorial service for Nelson Mandela in late 2013. This suggests that there continue to be incongruous levels of acceptance when it comes to the impacts of new media on funereal rituals (Gibbs, Carter, Nansen, & Kohn, 2014). Box 10.2 discusses a study examining what types of funeral selfies people post and what motivations they could have.

Box 10.2 shows that virtual mourning is often merely an extension of Western conceptualizations of death, grief, and commemoration. Building on the idea of

Box 10.2 #Funeral: Key Themes in Instagram Selfies

With so many Instagram posts tagged with #funeral and the media attention the hashtag has received, Gibbs et al. (2015) examined 1,330 images to identify key themes. Table 10.2 shows the three key themes that emerged during the analysis of the images: (1) people, (2) materials, and (3) culture. Of the images with people as primary subjects, individual selfies were the most predominant; many of the selfies were taken in places outside of the funeral for the purposes of self-promotion, possibly reflecting "long-standing traditions in Western cultures requiring funeral-goers to 'dress up' in formal attire and look good for the ceremony" (Gibbs et al., 2015,

p. 260). Other selfies with sorrowful subjects and group photos with extended family also demonstrate the importance of funerals as a social event, the interaction features of the platform enabling commenters to express solidarity and solemnity in response to the poster's emotive captions. Similarly, contextualizing photos such as pictures of funeral objects and settings convey the user's emotional experience to a wider social network by communicating the person's presence to an audience outside of the temporally and spatially bound funeral event. In conclusion, the study shows that pictures of funeral objects were consistent with mainstream Western funeral visualization and pictures depicting the deceased were rare, in accordance with cultural norms around the sequestration of death (Leaver & Highfield, 2018; Gibbs et al., 2015). This shows that while new social practices are emerging around funerals and selfie taking, these practices mostly remain bounded and conform to existing norms and expectations surrounding funerals.

Table 10.2 Types of Instagram Posts Tagged with #funeral (Ranked by frequency of occurrence, based on 1,330 images include in the study)

People and Mourning	Event and Materiality	Cultural Production
Selfies, individual photos (303)	Funeral event or service (88)	Memes (154)
Groups, families, togetherness (111)	Flowers (61)	Popular culture references (110)
Selfies, multiple people (71)	Funeral business and work (32)	Montage (67)
Old photos (20)	Funeral service cards and text (24)	Animal deaths (32)
Deceased bodies (3)	Music and performance (24)	Inanimate object deaths (6)
	Gravestones, urns (21)	Artwork (5)

Source: Adapted from Gibbs, M., Meese, J., Arnold, M., Nansen, B., & Carter, M. (2015). #Funeral and Instagram: Death, social media, and platform vernacular. *Information, Communication & Society, 18*(3), 255–268.

Instagram users sharing their participation in a funeral, Orbis Robotics has introduced a telepresence robot named **CARL** that uses Skype to allow real-time remote participation in a funeral service. Websites such as funeralOne and HeavenAddress borrow from Facebook's design to create interactive memorial profiles for the deceased (Nansen et al., 2017). While social media and technology are slowly changing cultural understandings of funeral decorum in both social and commercial spheres, funerals continue to follow traditional norms and expectations.

Cyberbullying

Understanding the Nature of Cyberbullying

Adolescents confront new struggles growing up in a digitally mediated world. This becomes apparent when we look at the phenomenon of **cyberbullying**. Statistics Canada (2016) reports one in five young Canadians have been victims of cyberbullying, with those aged 15 to 29 most likely to be victimized. Cyberbullying is commonly defined as intentional and repeated actions with the aim of harming another Internet user (Tokunaga, 2010). Often cyberbullying is viewed as an extension of traditional forms of bullying that take place in the schoolyard and include physical or verbal abuse. It also includes digital forms of harassment in the workplace and any type of harassment online. For example, cyberbullying against women in gaming environments has received much media attention under the hashtag #Gamergate (Massanari, 2017). Some writers, though, see cyberbullying as more difficult to escape, more damaging for victims, and more pervasive. Parents and caregivers (for example, teachers) are hypersensitive to potentially harmful behaviours, wanting to protect children from physical and psychological harm. Yet, findings based on interviews with teens show a different picture.

In a study of American teenagers, boyd (2014) found teens frequently referred to cyberbullying-like behaviours as **drama**. Teens did not use the term *bullying*, nor did they perceive these behaviours as problematic. The teens saw drama as "performative, interpersonal conflict that takes place in front of an active, engaged audience, often on social media" (Marwick & boyd, 2014, p. 1187). Teens included a wide range of behaviours under drama from insignificant joking around to serious, jealousy-driven aggression. Teens were not naive; they were aware of cyberbullying but reserved the term for instances where drama escalates and gets out of control. boyd (2014) found that drama does not assume there is a victim and a perpetrator as is the case in cyberbullying. The key difference then between drama and cyberbullying is that there is no power differential among those involved. Highlighted in the discussion of drama are parallels to the characteristics of cyberbullying, which causes a grey area for many young people in how they classify and define their own behaviours, reinforcing the argument that cyberbullying depends on context of the behaviour and who is doing the defining. This grey area makes it much more difficult to define cyberbullying and leads to asking if young people themselves can identify instances of cyberbullying. Or perhaps, they are in a better position in comparison to parents and caregivers to distinguish between cyberbullying and drama, as they have an insider perspective on power differentials.

What is helpful in defining cyberbullying for both youth themselves and parents/caregivers are the four key elements the Cyberbullying Research Center has identified that make up cyberbullying (Patchin & Hinduja, 2018):

1. *Willful*: behaviours were deliberate and not accidental.
2. *Repeated*: pattern of behaviour occurred over time rather than it being an isolated incident.
3. *Harmful*: the target perceives harm was inflicted.
4. *Electronic devices are involved*: a type of digital technology (mobile phones, app, email) was involved.

For a behaviour to be classified as cyberbullying, all four elements must be present. So, a one-off interaction, even if harmful, would not fall under cyberbullying. What differentiates cyberbullying from traditional forms of bullying is that it is no longer about size, aggression, strength, or status (Tepperman et al., 2013; Hinduja & Patchin, 2009). Rather, those doing the cyberbullying take advantage of the lack of barriers in online spaces as abusers are physically removed from their victims (Bryant, 2011). Due to the always-on nature of the Internet and the lack of physical distance, cyberbullying brings new levels of intensity to bullying behaviours and extends the scope of harm (Davis et al., 2015). There is no opportunity to escape the bullying.

Cyberbullying is often discussed as if it is a single type of behaviour. But that is not the case. Cyberbullying, while occurring on any type of digital media, is most often reported on social media. As Figure 10.4 shows we can distinguish nine types of cyberbullying: exclusion, cyberstalking, gossip, outing/trickery, harassment, impersonation/fraping, cyber threats, trolling, and flaming (Smith et al., 2013; Patchin & Hinduja, 2006). This is not an exhaustive list because as technology develops, so do the cyberbullying behaviours (Smith et al., 2013).

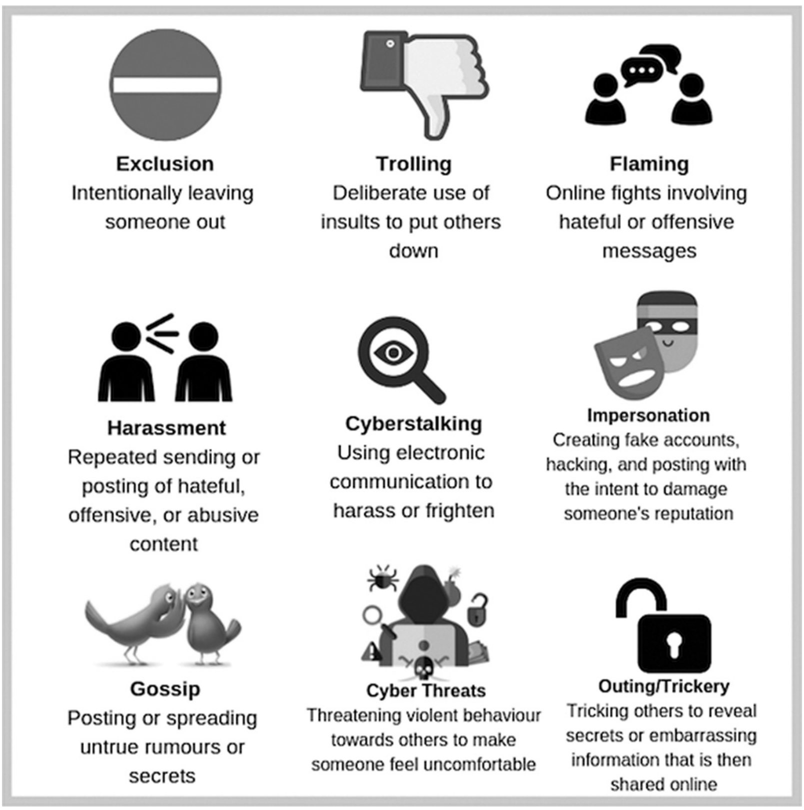


Figure 10.4 Types of cyberbullying

Social Roles in Cyberbullying: Perpetrators, Victims, and Bystanders

When looking at cyberbullying, we can identify three social roles (see Figure 10.5): cyberbullies, cyber victims, and cyber bystanders. Each has a distinctive role to play in cyberbullying and is characterized by a different set of behaviours. A mistake often made in cases of cyberbullying is to assign a single social role to individuals. We tend to want to think of one person as a mean perpetrator and the other as a poor victim. Yet, much research looking into cyberbullying has demonstrated that these social roles are often interchangeable and that also a person who is a bully in one scenario may be a victim in another. This observation is particularly important for parents and caregivers as well as for the police when trying to address cyberbullying cases. It is important to hear all sides and to understand how the bullying played out. This does not mean that there are no cases where a clear perpetrator can be identified, as we will discuss below in the case of Canadian teen Amanda Todd. In fact, the perpetrator was a male adult living across the Atlantic Ocean, who bullied her incessantly under an anonymous identity.

Cyberbullies: Cyberbullies are the perpetrators of cyberbullying targeted at inflicting harm on others. In doing so, they take advantage of their position of power over a chosen victim—they want the victim to fear or be intimidated by them. Cyberbullies often use gossip and information, true or not, as their weapon (boyd, 2014). Cyberbullies produce creative harms—videos, images, and other non-text-based content—to target their victims and make the cyberbullying more

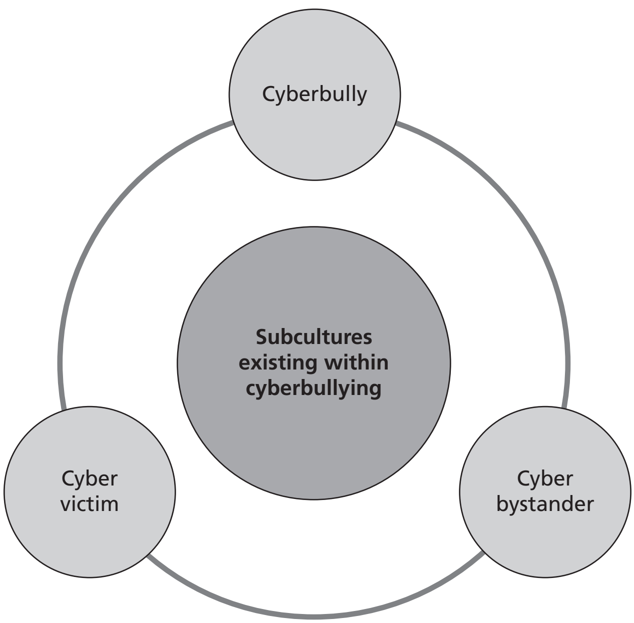


Figure 10.5 Three social roles in cyberbullying

impactful. Cyberbullies are able to expand the reach of bullying because digital media is not restricted to a specific time of day or physical location (Wingate et al., 2013); digital traces can follow a person everywhere they go. As cyberbullies hide behind aliases and the anonymity of the Internet, they exude confidence (Wingate et al., 2013) and can inflict harm at a distance (Hinduja & Patchin, 2010; Davis et al., 2015). Not knowing who the bully is can create additional stress for cyber victims.

Cyber victims: Cyber victims are the targets of cyberbullies and experience emotional, psychological, physical, mental, and virtual harm. With the always-on nature of digital media, youth can't easily escape the bullying (Davis et al., 2015). Not only that, spaces that would have been safe before, like a teen's bedroom, now can be reached at all times (Hinduja & Patchin, 2010). While turning off digital media could provide a respite from the bullying, victims can't easily disconnect because they are part of a larger hyperconnected culture and often they are also obsessed with what is being said about them. This leads to constant checking of accounts and updates on social media. Often cyber victims are fearful of confronting the cyberbully directly and worry a confrontation will only escalate the harmful behaviours.

Cyber bystanders: Cyber bystanders are all individuals who witness the cyberbullying incident by, for example, seeing a harmful text, photo, or meme. Quirk and Campbell (2015) examined a range of instances of cyberbullying and identified four types of bystanders:

Outsiders: take no action even though they are aware of the situation.
Reinforcers: positively encourage the cyberbully.
*Assistant*s: did not start the cyberbullying but join in the harmful behaviour.
Defenders: actively intervene and attempt to stop or disrupt the cyberbullying.

Often, bystanders are unsure how to react to the cyberbullying. If they don't know the bully or the victim, they are most likely to take no action and remain outsiders (Shultz et al., 2014). The "I won't do something because someone else will" attitude is common on digital media because although it is very public and visible it is easy for bystanders to ignore, block, or scroll past instances of cyberbullying.

Consequences of Cyberbullying

Cyberbullying has many consequences for both the victims and the perpetrators. For victims, there is a feeling of loss of control. Long-term cyber victims can also develop anxiety and depression. There is also an increased risk of self-harming behaviour, heightened levels of distress, drug and alcohol abuse, and feelings of shame (Beyazit et al., 2017; Peker, 2015; Holt et al., 2016). Often young people are also under increased risk of suicide, which is referred to as **cyber bullicide**. Box 10.3 discusses the case of Amanda Todd to demonstrate how irreversible the effects of bullying can be for victims and their families. For perpetrators there are also consequences, often legal. Depending on the situation, cyberbullying can be dealt with

Box 10.3 Cyberbullying: The Case of Amanda Todd

A case of cyberbullying demonstrating the irreversible consequences of malicious cyber attacks is that of Amanda Todd, a 15-year-old from British Columbia, Canada. On 10 October 2012, Amanda Todd was found dead. Her resolution to take her own life was directly linked to her distressing experiences online. When suicide results from attacks on a person on the Internet, it is termed cyber bullicide. Some insight can be gained into her struggles from a YouTube video she posted prior to her death. The photo below shows how in the video, using flashcards, she tells a story of being blackmailed and bullied online, of desperation, fear, and a sense of helplessness (Wolak, Mitchell, & Finkelhor, 2007). This feeling of having nowhere to hide is directly linked to the fact that digital technologies are pervasive in young people's lives (boyd, 2014). We need to better understand what motivates perpetrators to engage in cyberbullying, how to support victims, and what kinds of impacts these struggles have on personal development and youth socialization.

Amanda Todd Legacy—www.amandatoddlegacy.org

A frame from Amanda Todd's YouTube post.

under civil law or criminal law (PREVNet, 2019). The laws around cyberbullying vary by province, territory, and country. Cyberbullies often are not aware that they are breaking the law, thinking that their comments are funny or meant as a joke. Yet, digital artifacts such as comments, images, or memes can serve as evidence in court as part of a trial.

Amanda Todd's story has led to drastic policy and legal changes in Canada (Deschamps & McNutt, 2016). To address cyberbullying, a memorandum was added onto Ontario's Education Act that stated that schools have an obligation to engage in prevention of and intervention in (cyber)bullying (Ministry of Education, 2012). As part of this legislation, it is recognized that a communal effort is needed to address cyberbullying by including schools, parents, and external agencies (i.e., social workers, psychologists [Ministry of Education, 2012]). As many prevention efforts highlight, young people cannot effectively resolve problems of cyberbullying on their own; they need support from key social groups and figures, including parents. In a study of how parents of victims of cyberbullying cope and support their children, Canadian criminologist Ryan Broll (2014) found that this was very difficult for parents. Often, they struggled to find a balance between their children's desire for freedom and independence when online and their simultaneous need for protection and parent intervention. What complicated matters was that parents often were overwhelmed by the technology itself; this prevented them from supporting their kids' engagement in crafting an online identity and connecting to a digital audience. Canadian parents reported that they are worried and try to engage with their teens (Hong & Craig, 2019). Figure 10.6 shows that 53 per cent of parents talk to their child about what they do online often or always. Many fewer parents reported that they monitor or check up on their child's online activities.

For Broll (2014), it is important to help parents connect to teachers, the police force, social workers, and other partners. There are many challenges in helping victims of cyberbullying, ranging from identifying instances of cyberbullying (versus drama) to navigating existing legal frameworks, which vary by jurisdiction and also continuously change. Broll (2014) suggests a **network of security partners** approach to cyberbullying, where parents, teachers, the police force, and social workers come together to inform, advise, and collaborate with one another in

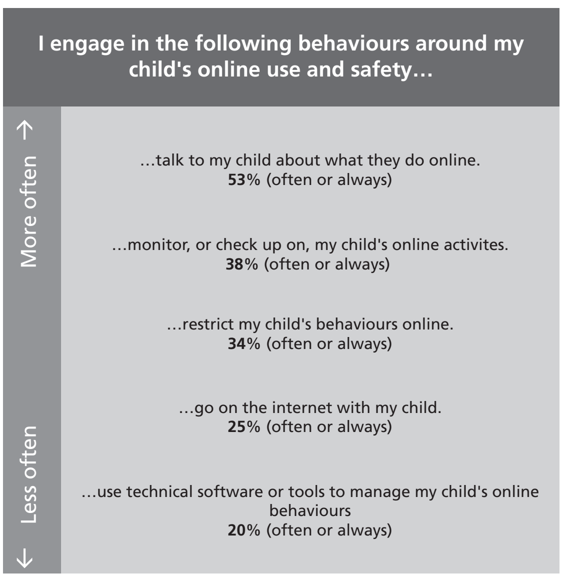


Figure 10.6 Parents engage with their child

Source: Hong, I. & Craig, W. (2018). *Survey of Canadian parents on technology and electronic bullying*. Report for Telus WISE. Kingston, Ontario. Retrieved from https://wise.telus.com/en/wp-content/uploads/2019/02/Survey-of-Canadian-Parents-on-Technology-and-Electronic-Bullying.pdf ensuring a person's safety online. As social media companies themselves have come under closer scrutiny for providing the platform for cyberbullying to occur without taking much responsibility, some companies have started their own initiatives. For example, Facebook launched the Bullying Prevention Hub, where teens and their parents/guardians can find more information about cyberbullying and what can be done if cyberbullying occurs. These resources are also available to adults who have suffered from cyberbullying. Yet, many argue that these guidelines are not enough, and that companies need to take more steps to safeguard users of social media.

Conclusions

This chapter provides an overview of how technology mediates social relationships. The central contribution of the Toronto School of Communication demonstrated the importance of studying media in relation to society and the kinds of biases—space and time—that result from media. With the introduction of the telephone, new opportunities emerged for mediating social relationships and questioning existing social boundaries. The telephone greatly facilitated the transmission of information over long distances and across social spheres. The home, which was previously considered a sheltered and secluded social space, suddenly became open and easily accessible.

With the introduction of digital media came another shift in how people communicate and maintain social relationships at work, home, and school. The move toward the large-scale adoption of digital media and mobile technology helps users to stay connected 24/7 from any location. As part of this trend, new social phenomena emerge online around topics such as crafting of the virtual self, online friendship, romance, and death. It is important to also realize that those segments of society who do not have access to digital technologies are disadvantaged in many ways; thus digital connectivity has become an essential resource of the twenty-first century. The chapter ends with a closer look at cyberbullying. We learn that cyberbullying can be best studied by differentiating between three social roles: cyberbully, cyber victim, and cyber bystander. While some dismiss cyberbullying as simply representing teen drama, it has irreversible effects, as the case of Amanda Todd demonstrates. As youth online socialization becomes normalized and an integral part of teen social life, developing effective interventions becomes a pressing policy problem.

Questions for Critical Thought

1. How did the introduction of the telephone change the boundaries of the home in American society? Discuss the social effects of the telephone on gender roles.
2. Discuss differences in advanced economies and emerging economies in terms of smartphone adoption. What differences are evident when we explore age as a factor in smartphone adoption?

3. Describe the key coping strategies following a breakup complicated by Facebook.
4. What is your opinion on taking funeral selfies? Do you think these new norms around social media will become widely accepted as smartphones are more widely available?
5. What are the key distinctions between drama and cyberbullying? Why do you think that teens are more likely to employ the term *drama* while parents and caregivers employ *cyberbullying*?

Suggested Readings

Arora, P. (2019). *The next billion users: Digital life beyond the West*. Cambridge, MA: Harvard University Press.

This book outlines the discrepancies in use of digital media around the world, highlighting the fact that the poorest and most populous regions have the largest number of users. This creates enormous opportunity for economic, social, and cultural development.

Hand, M. (2017). Visuality in social media: Researching images, circulations and practices. In L. Sloan & A. Quan-Haase (Eds.), *Handbook of social media research methods* (pp. 215–231). London, UK: Sage.

This article investigates the three key elements of visuality in social media: images, circulation, and practices, linking it to different ways of studying how young people today use visuality as a means to express elements of the self.

Martínez, I., Murgui, S., Garcia, O. F., & Garcia, F. (2019). Parenting in the digital era: Protective and risk parenting styles for traditional bullying and cyberbullying victimization. *Computers in Human Behavior, 90*, 84–92.

This paper analyzes how parenting styles can act as risk or protective factors for bullying and cyberbullying victimization in Spain.

Quan-Haase, A., Nevin, A. D., & Lukacs, V. (2018). Romantic dissolution and Facebook life: A typology of coping strategies for breakups. *Studies in Media and Communications*, *17*, 73–98.

This paper examines through interviews the kinds of strategies young people employ to cope with the aftermath of a romantic breakup complicated by Facebook.

Online Resources

Is Social Media Hurting Your Mental Health? | Bailey Parnell | TEDxRyersonU
https://www.youtube.com/watch?v=Czg_9C7gw0o
Bailey Parnell from Ryerson University discusses how social media use can become an obsession leading to a range of negative mental health consequences.

Pew Internet and American Life Project
www.pewinternet.org
The Pew is an American non-profit organization that conducts empirical research on how Americans use the Internet and the impact it has on their lives. The website is comprehensive, including reports, press releases, and statistics. Of particular relevance is their data on the connectedness of millennials.

PREVNet
https://www.prevnet.ca/bullying/cyber-bullying
This comprehensive website showcases research into cyberbullying and is geared toward providing emotional support to children, youth, and young adults who are targets of cyberbullying, as well as caregivers, such as parents and teachers.

Statistic Canada: Women and Men Who Experienced Cyberstalking in Canada
https://www150.statcan.gc.ca/n1/pub/75-006-x/2018001/article/54973-eng.htm
This resource provides statistical data on Canadian's rates of victimization by women and men with a focus on cyberstalking.

Interactive Activities

Activity 1: Interacting with HitchBOT on the Go

See the YouTube video on HitchBOT and consider the following questions:
https://www.youtube.com/watch?v=4pWNQ3yUTJo

1. Would you have picked up HitchBOT if you had encountered the bot at the side of the road? Explain your decision.
2. HitchBOT likes to chat with humans. Do you think a long drive would be more pleasant if you had a robot as a companion to interact with or do you think this is not real conversation? Explain.
3. HitchBOT reached its destination in Victoria. What does that say about how our society interacts with bots?

Activity 2: Selfie Cultures around the World

Selfie Exploratory: London, New York, Sao Paulo, Berlin, Moscow, Bangkok.

Visit the web site http://selfiecity.net/ and go to the selfie exploratory.

Through the selection of various features explore how different cities in the world vary by selfie aesthetics.

Next, choose "open eyes," "closed mouth," and "no glasses" and compare women's and men's selfies. Did you notice any differences?

11 The Surveillance Society

Learning Objectives

- to define surveillance as a multifaceted term with great relevance to the information society;
- to examine Foucault's analysis of power relations in society and provide an overview of the Panopticon and its means of control;
- to discuss how personal information circulates in social media environments and how this circulation changes our understanding of private and public space; and
- to present models of counter-surveillance and sousveillance as a means of both personal and grassroots resistance against surveillance practices.

Introduction

This chapter defines *surveillance* by contrasting different perspectives on the term. On the one hand, transparency and the availability of information are often considered beneficial to society, insofar as transparency diminishes misunderstandings, prevents deviant or criminal behaviour, and increases productivity. On the other hand, the term often also has a negative connotation, implying the eradication of **privacy**, the diminishing of individual rights, and unnecessary obsession with data. As data continues to accumulate at an unprecedented pace, new questions around the collection, use, sharing, and storage of big data arise (Chen & Quan-Haase, 2018). This chapter discusses these perspectives, with examples, and ends with a discussion of innovative counter-surveillance and sousveillance methods that aim to both increase awareness and expose the pervasiveness and impacts of these surveillance and data recording practices in our society as well as facilitate personal and grassroots resistance.

Defining and Understanding Surveillance

The term **surveillance** is originally a French word meaning "watching over." Observing the lives of other people and their behaviours, appearances, and social relationships is a naturally occurring social phenomenon. Innocuous and unobtrusive observing often occurs at coffee shops, for example, when one sits at a table and leisurely watches passersby. Similarly, since the inception of social media tools, peers spend hours scanning through friends' photos, wall posts, and status updates. For the most part, this behaviour is welcomed; in fact, our society is obsessed with likes and other signals of acknowledgement, but it can also be perceived as odd if no interaction takes place. The term **creeping** has been introduced to describe this pervasive behaviour, which is sometimes compared to stalking. In this context, the term *surveillance* takes on a rather negative connotation. But a radically new form of surveillance has emerged, resulting from the pervasiveness and ubiquity of computing. **Surveillance capitalism**, according to Zuboff (2019), "unilaterally claims human experience as free raw material for translation into behavioural data. Although some of these data are applied to service improvement, the rest are declared as a proprietary behavioural surplus, fed into advanced manufacturing processes known as 'machine intelligence', and fabricated into prediction products that anticipate what you will do now, soon, and later." What is worrisome is that users of the services often know little about what data is collected, where it is stored, and what it is used for. Not only does data serve capital flows, but governments are equally eager to generate and access data from average citizens.

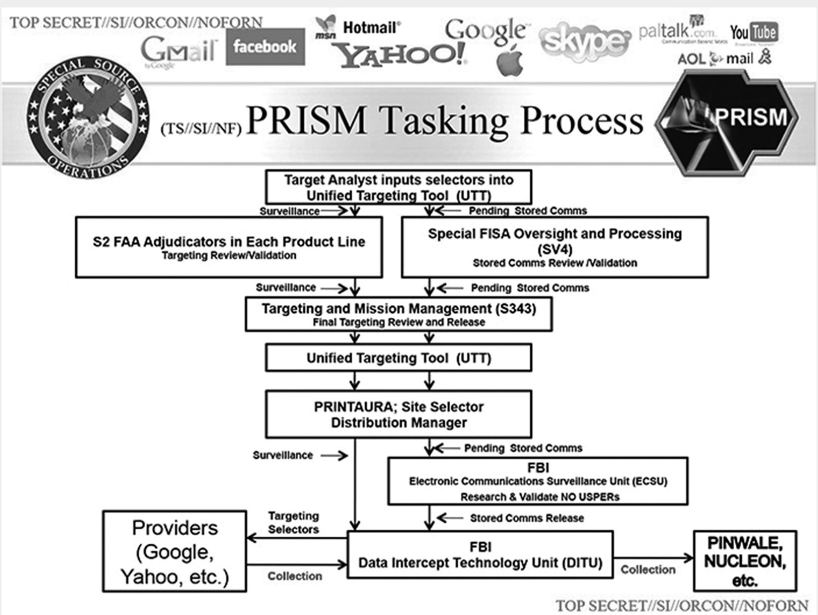
Countries around the world have institutions whose mandate is to gather intelligence to support national and international security. For example, in Canada it is the **Canadian Security Intelligence Service (CSIS)** and in the United States it is the **National Security Agency (NSA)**. Both institutions have come under close scrutiny as a result of their data acquisition and exploitation practices (Boutilier, 2019). Criticism started with Edward Snowden's June 2013 release of thousands of classified files documenting the institutions' surveillance practices of average citizens. The files demonstrated the existence of an intelligence alliance between Australia, Canada, New Zealand, the United Kingdom, and the United States called **Five Eyes (FVEY)**. FVEY operates by pressuring private telecommunications companies to provide the government surveillance powers of citizens by unscrambling encrypted communications and monitoring calls in real time (Deibert, 2013). In a 2014 interview, Snowden noted that FVEY was a supranational intelligence gathering organization operating outside of national regulatory frameworks. Since Snowden's revelation, our understanding of surveillance has changed drastically. Box 11.1 shows the societal impact that this case has had on current debates about privacy rights, data management, and data mining, and the unprecedented capabilities for spying afforded by networked technologies.

David Lyon (2018), a Canadian privacy scholar, introduced the term **liquid surveillance** to describe how data flows between corporations and governments and the distrust that exists among average citizens about how institutions safeguard their data. In liquid surveillance it is unclear who is doing the surveillance—is it the intelligence agency or the company sharing the user data (i.e., Google, Verizon, Instagram)? The Snowden case demonstrates how user data flows seamlessly from companies to the NSA. The Snowden case also demonstrates why surveillance is

Box 11.1 Edward Snowden Leaks US Spy Program

To the embarrassment of the Central Intelligence Agency (CIA), Edward Snowden, a former contractor for the NSA, leaked highly confidential information on the surveillance practices employed by governments around the world. Even though it was widely known that secret intelligence organizations engage in a wide range of operations to gather information on potential threats to security, foreign states, and suspicious activities of their own citizens, the Snowden files provided direct evidence of these behaviours. But more importantly, the files revealed the scope of these practices; that is, surveillance practices were targeting not only Internet activity but also cellphone data. More shocking, data was being collected from ordinary citizens. Snowden's report revealed the existence of a secret court order instructing telecommunications company Verizon to share all of its cellphone data with the NSA on an "ongoing daily basis" (BBC, 2014).

A central question resulting from this controversy has been: What is the purpose of recording and storing *all* digital communications, cellphone data, and Internet activities? The Snowden case demonstrates that obtaining users' data is easy and cheap, and as a result it is advantageous for spy agencies to simply gather the massive amounts of data that flow through their networks. Secondly, because it is difficult to predict where threats come from, gathering all data is a convenient means for determining, through keyword searches and data mining techniques, where these may originate. This indicates an approach to surveillance that is filled with paranoia, operates outside legal frameworks, and sees a need to monitor all digital transactions for potential danger.



Top-secret slides from the NSA surveillance program PRISM were leaked and show in a flow chart the data collection process, from the initial input of an agency analyst, to data analysis under machine-learning tools.

increasingly becoming a contested and highly polarized issue in society affecting citizens and leaders around the world.

Three Perspectives That Influence Our Understanding of Surveillance

The terms associated with surveillance show how scholars have approached the topic from different directions. Lyon and Zureik (1996), for example, have identified three main perspectives that influence our understanding of what surveillance is: (1) capitalism, (2) rationalization, and (3) power.

1. Capitalism

The first big shift in surveillance occurred during the time of industrialization when new forms of capitalist production in England accompanied the desire to increase productivity, which resulted in new ways of controlling workers and their labour (Lyon & Zureik, 1996). For Karl Marx (1867/1996), "the work of directing, superintending and adjusting becomes one of the functions of capital, from the moment that the labour under the control of capital, becomes cooperative" (p. 217). Surveillance here takes on two roles: one as an internal component of production and another as a means of **discipline** (Foucault, 1975/1995). The role of directing and supervising, originally occupied by controllers, was later substituted with machinery. As a result, the assembly line became an efficient means of control that did not require any human intervention. Similarly, the introduction of clock-in cards and the design of offices as open cubicles were all part of seamlessly embedding monitoring practices into the workplace. An open cubicle will exert control over work behaviour—including times of arrival and departure, work habits, regulations of breaks, and appropriate use of work time. Technology as a tool of discipline is also making its way into other, non-work-related domains of life.

The study of surveillance as part of a capitalist system provides two advantages (Lyon & Zureik, 1996). First, it allows for an analysis based on **political economic theory**, where economic factors motivate monitoring practices, techniques, and tools. As discussed earlier, Zuboff's concept of surveillance capitalism demonstrates the close link between economic gains and surveillance. Second, it "makes possible a critical stance in which systematic inequalities are exposed and a critique is made of major organizations and ideologies that perpetuate the system" (Lyon & Zureik, 1996, p. 6). Workers who are part of this capitalist system have no flexibility and their individuality is erased through mechanisms of control and power.

Criticism of the perspective stresses its narrow focus and two main weaknesses (Lyon & Zureik, 1996). First, the idea that all surveillance is motivated by economic factors is limiting, considering that people engage in surveillance for social reasons as well. For instance, after a breakup, individuals often are obsessed with the online behaviours of their former partners (see Chapter 10; Quan-Haase, Nevin, & Lukacs, 2014). Box 11.2 considers the role of surveillance and control in the context

Box 11.2 Teens, Mobility, and Parenting

Modern parenting can be daunting. With most teens having a mobile phone in North America (Anderson & Jiang, 2018), parents are constantly rethinking and renegotiating their parenting strategies. Teens can be more independent as a result of the technology—they can be away from home while still able to report back—yet it can also open the door to keeping track of their teenager's whereabouts, which about 16 per cent of North American parents do (Anderson, 2016). Not all parents track their teenager's whereabouts, often citing their privacy and autonomy. But about half of parents have looked through their teen's call records or messages. Figure 11.1 provides an overview of the kinds of behaviours parents frequently engage in to monitor their teen's digital life. Interestingly, a majority of parents check websites and mobile phone activity rather than relying on technical measures such as parental controls. Parents are closely involved digitally, with about half knowing their teen's email password and a third also knowing their teen's social media passwords.

A number of new tools have made it easier for parents to keep track of their teenager's behaviours. For example, the app Life 360 allows entire families to stay connected through a map that visualizes everyone's whereabouts. By contrast, MySpy, one of the most used tracking apps, not only tracks location, but also allows parents to snoop through their teen's texts and social media exchanges. While tracking teenagers can calm down anxious parents, it also raises ethical questions about the privacy rights of teens. This makes it important to not install software without the knowledge of the teen, but rather to negotiate the use of these monitoring tools in the context of evolving parent–teen relations.

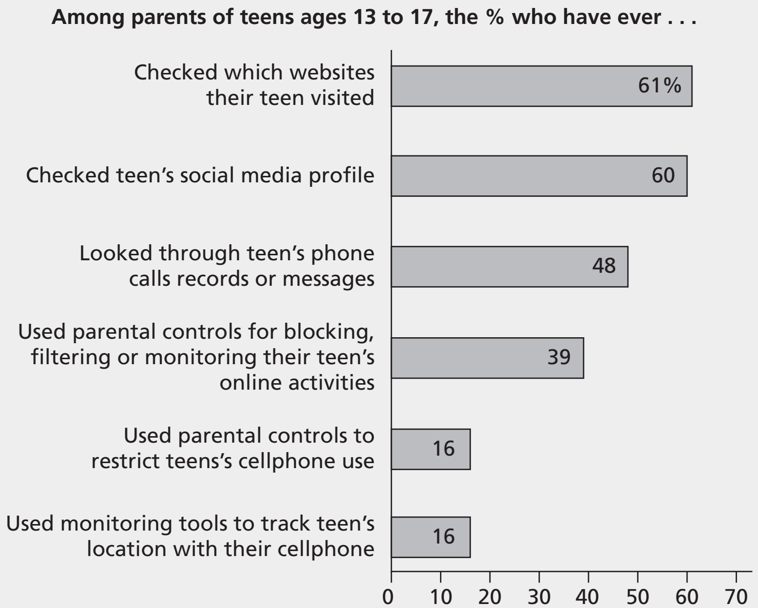


Figure 11.1 Smartphones as mobility and control of teenagers' digital behaviours.
Source: Pew Research Center: http://www.pewresearch.org/fact-tank/2016/01/07/parents-teens-digital-monitoring/

of parenting, whereby parents may use technology to protect their children from harm and keep an eye on their whereabouts.

Box 11.2 shows that not all uses of technology are linked to capitalism; many parents want to track their teens via apps and control their digital traces to protect them from harm. Despite this, the number of apps available to track kids and their social interactions show that there is a profit to be made from teen tracking.

The second weakness of the capitalist perspective is that it reflects a simplified view of social processes by suggesting that surveillance is in and of itself negative. For example, teens enjoy using Snapchat streaks to stay connected with their peers. This is not necessarily a negative form of surveillance; rather, it is welcomed by users. In general, then, the capitalist view of surveillance provides a good understanding of the economic meaning of surveillance, but does not fully explain surveillance as it occurs in other social contexts, such as parenting and peer socialization.

2. Rationalization

The second big shift in surveillance is associated with changes in how society operates. Weber's (1920/2003) concepts of **rationalization** and **bureaucratization** are closely linked with the concepts and practices of surveillance. Rationalization describes a fundamental shift in the functioning of society: instead of behaviour relying on kinship ties, tradition, and informal affiliations, it now relies on rules based on **rational choice**. According to Weber (also see Kim, 2008), three factors play a key role in this shift: (1) knowledge, (2) growing impersonality, and (3) enhanced control.

1. *Knowledge*: Knowledge is seen as the basis for rational choice. Rational choice requires an understanding of cause and effect as well as a weighing of various outcomes. Weber referred to this process as **intellectualization** because decisions are based on modern scientific and technological knowledge, instead of superstitious or mystical beliefs.
2. *Growing impersonality*: The objectification of individuals occurs as part of rationalization, reflecting the Puritan's austere work and life ethic. Individuals, with their unique stories, are incorporated into a rational and impersonal system in which there is no consideration of personal concerns or matters.
3. *Enhanced control*: Most important for our current discussion, Weber saw rationalization as increasing control in social and work life. This increased control is a result of the Puritan ethic of self-discipline and self-control, which Weber referred to as **innerworldly asceticism**. Through institutionalization, rationalization leads to greater bureaucratic administration, legal formalism, and industrial capitalism.

Weber (1920/2003) introduced the notion of the **iron cage** to explain how nation-states, institutions, and modern organizations exercise power and control over their citizens, members, and workers, respectively. The iron cage is a social system based on efficiency, rational decision-making, and bureaucratic rules; there is little room for individual needs and life histories. For Weber, there are two sides of the iron cage. On the one hand, rationalization increases an individual's freedom because its transparency clarifies how individuals might achieve their goals. This comes from the notion that "more information is always better than less information," as it creates transparency and allows for supervision. On the other hand, however, the iron cage seriously hampers human agency by limiting individuals' possibilities and actions in a completely institutionalized system of rules (Kim, 2008). While the iron cage represents a certain order that is needed for society to function, it also represents constraints in our ways of living. In a completely open society where data flows freely, we become restricted in our behaviours, attitudes, and opinions as everything about us is known to everyone, making it difficult to deviate from societal norms and imposed standards. That is, we all become prisoners of the iron cage.

Critics of Weber's perspective on surveillance argue that it over-focuses on technologies of rationalization, such as the assembly line, as the driving force of control. For example, computers at work allow for further and more invasive forms of surveillance by documenting workers' activities, potentially recording every keystroke. Yet, as Lyon and Zureik (1996) point out, the Weberian perspective provides an analysis of the social system itself and not of the means, whether technological, social, or institutional, by which rationalization and bureaucratization are put in place.

3. Power

The third approach associated with surveillance is based on Foucault's (1975/1995) work on disciplinary practices. For Foucault, power is an inherent part of all social relationships and social systems. As a result, social control becomes a central feature of modern societies.

Foucault's Analysis of Power Relations in Society

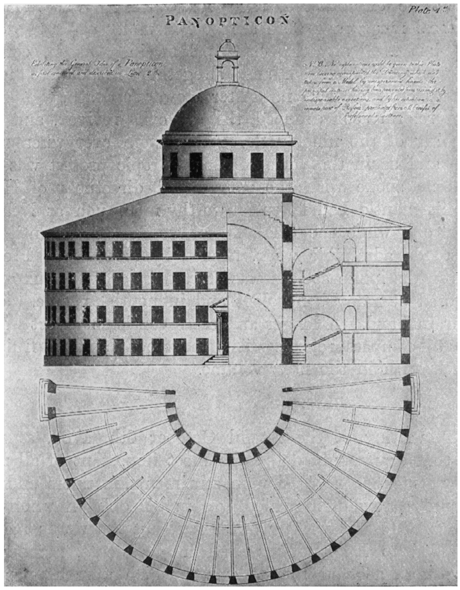
Foucault's analysis of the historical development of power relations in society includes perhaps the most compelling and influential theoretical work on surveillance. Foucault outlined how control can be achieved through **hierarchical observation**, the exertion of power and control simply through surveillance. Observation occurs in a "network of gazes" that are laid out following a hierarchical structure, with data being harvested from lower to higher levels, often with no consent or knowledge. For Foucault (1975/1995), implementing hierarchical observation requires a construction of space in which buildings facilitate "articulated" and "detailed" control. Control is articulated because the physical outline of a space embodies the hierarchical nature of the observation. Moreover, control is detailed because the observer has a full view of the actions of those being observed. Basically, power relations are laid out in the design or shape of the architecture.

The use of intricate systems of surveillance as a form of punishment started as early as 1780. Yet to understand the social meaning of surveillance and the role technologies play in distributing and enforcing power, it is essential to examine the concept of the **Panopticon**. Foucault (1995) uses Jeremy Bentham's Panopticon as an example to show how, through the design of buildings, power can be embedded in surveillance mechanisms. The illustration on page 243 shows Bentham's design of a prison; a circular building with a tower located in the centre. The tower is surrounded by disconnected cells, each of which houses a single imprisoned individual. The arrangement allows the supervisor, from a central point in the tower, to observe prisoners at all times without being noticed. The inside of the cells are visible to the person in the tower, but the persons in the cells cannot see inside the tower or even discern if anyone is in the tower at any given time. For Foucault, Bentham's model follows two principles: the **visibility of power** and the **unverifiability of power**. It is the combination of power being visible and unverifiable that is so effective in establishing discipline.

The Panopticon places the individual in a position where "[h]e is seen, but he does not see; he is the object of information, never a subject in communication" (Foucault, 1975/1995, p. 200). This uncertainty creates a new form of control in which the supervisor is no longer needed, as their presence or absence cannot be determined; rather, the inmate exercises control over their own behaviour as a result of the uncertainty of potentially being watched. Foucault (1975/1995) describes this process of control as the **automatization of power**, showing

> [how] the surveillance is permanent in its effect, even if it is discontinuous in its action; that the perfection of power should tend to render its actual exercise unnecessary; that this architectural apparatus should be a machine for creating and sustaining a power relation independent of the person who exercises it; in short, that the inmates should be caught up in a power situation of which they are themselves the bearers. (p. 201)

In these kinds of environments, individuals need to engage in complete self-censorship and regulation. This form of discipline is based on what Foucault (1975/1995) describes as "automatic and disindividualized power relations," where no one single observant is watching and no one person is responsible for the power imbalances. Rather, it is the architecture, location, and embedded power relations that create the sense of absolute control and constant surveillance. To some extent, this is similar to the metaphor of **Big Brother** introduced by George Orwell to explain absolute state control in his dystopian novel *Nineteen-Eighty-Four*. Yet today we see new forms of surveillance that are different from the state controlled first discussed by Orwell. For example, the reality-TV show ***Big Brother*** exemplifies a new form of surveillance that does not share many elements with traditional forms of surveillance as discussed by Orwell. Nonetheless, the show's setup does resemble the architecture of the Panopticon. In *Big Brother*, cameras and microphones are located



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Jeremy Bentham's Panopticon (after the original drawing of 1791).

in every room, even bathrooms, and behind one-way mirrors, providing a view into housemates' daily activities from different angles. Housemates are aware of the cameras but cannot see them. Like residents of the Panopticon, they know they are being monitored, but they cannot predict when. Moreover, because the gathered footage is heavily edited and cut, the housemates do not know which of their activities will be made public; as a result, they have the sense of always potentially being on display.

While institutions and buildings themselves were often set up to support surveillance, until fairly recently technology played only a minor role in enforcement. However, advances in digital technologies have given rise to fundamentally different modes of data collection, storage, and retrieval.

Technology's Role in the New Surveillance

The information revolution and its related technologies have made our lives more open to the public than ever before. Digital tools can easily collect, store, and retrieve personal information. Gary T. Marx (2007) identifies three distinct approaches to describing the changes in surveillance as a result of the information revolution and its associated technologies: (1) functional, (2) revolutionary, and (3) cultural.

1. *Functional view*: Societies, in order to operate effectively, require some element of security and safety. To achieve these goals, personal information needs to be collected and stored. From the functional view, the transformations in surveillance are only of degree, not of kind.

2. *Revolutionary view*: The revolutionary view argues that technologies have led to a radical transformation in the nature of surveillance, jeopardizing basic privacy rights. This view of new surveillance is deterministic and ignores any kind of individual agency.
3. *Cultural view*: This view also argues that information technology is radically changing society. But instead of advocating for a deterministic view, the cultural view argues that social and cultural factors moderate how information technology impacts surveillance. This view sees counter-surveillance, in combination with new privacy laws, norms, and values, as leading toward a balance between disclosure and protection of personal data.

Although we can debate whether or not these technological changes should be labelled "fundamental" and "revolutionary" or "continuous" and "expected," there is no doubt that technological developments have created radically different surveillance practices. In addition, changes have occurred in our basic understanding of what surveillance is. For example, millions of users have taken part in the #AgeChallenge to see what they would look like as they age by supplying an image of themselves to FaceApp (Conner, 2019). Through the use of AI, the app renders an image of what a person might look like when they are older. The app is fun and provides an unexpected image to a user about future appearances that can be easily shared. Yet, there are privacy concerns with the use of FaceApp, as the app gains a licence over the images forever (Phelan, 2019).

As Marx (2007) indicates, traditional definitions of surveillance may be restricted in their applicability to the new modes of surveillance that have emerged as a result of the information revolution. Traditional definitions tend to emphasize close observation of a "suspected person." By contrast, new surveillance is not limited to single individuals or suspects, and physical distance does not restrict one's ability to observe. In this sense, the definition needs to be broadened to accurately capture the nature of modern surveillance practices. Marx (2007) suggests that the **new surveillance** can be defined as "the use of technical means to extract or create personal data" (p. 85). To differentiate between traditional forms of surveillance and the modern types of surveillance, Marx contrasts the two along key dimensions (Table 11.1).

While traditional forms of surveillance would often include informants or spies and wiretapping telephone lines, new types of surveillance include hidden cameras in banks or stores, keystroke monitoring by employers, and audio scanners that pick up cellular phone frequencies. According to Marx's chart (Table 11.1), even something as seemingly routine as uploading a funny post on Instagram has elements of new surveillance. This is because peers as well as third parties (e.g., marketing companies) connected to Instagram can easily track, observe, and record the post. In fact, even messages that users have started typing but never post are tracked by companies (Woollaston, 2013). For instance, Table 11.1 shows that in traditional surveillance, data reside with the collector, whereas new surveillance sees data shared among companies, third parties, and institutions. The data

Table 11.1 Dimensions of New and Old Surveillance

Dimension	A: Traditional Surveillance	B: The New Surveillance
Senses	Unaided senses	Extends senses
Visibility (of the actual collection, who does it, where, on whose behalf)	Visible	Less visible or invisible
Consent	Lower proportion involuntary	Higher proportion
Cost (per unit of data)	Expensive	Inexpensive
Location of data collectors/ analyzers	On scene	Remote
Data collector	Human, animal	Machine (wholly or partly automated)
Data resides	With the collector, stays local	With third parties, often migrates
Timing	Single point or intermittent	Continuous (omnipresent)
Time period	Present	Past, present, future
Data availability	Frequent time lags	Real-time availability
Comprehensiveness	Single measure	Multiple measures
Form	Single media (likely or narrative or numerical)	Multiple media (including video and/or audio)
Data merging	Discrete non-combinable data (whether because of different format or location)	Easy to combine visual, auditory, text, numerical data
Data communication	More difficult to send, receive	Easier to send, receive

Source: Adapted from Marx, G. T. (2007). What's new about the "new surveillance"? Classifying for change and continuity. In S.P. Hier & J. Greenberg (Eds), *The surveillance studies reader*. Maidenhead: Open University Press, pp. 83–94. Table 6.1, p. 87. Used by permission of Gary T. Marx.

collector in traditional surveillance was a person or even an animal; in the new surveillance it is a machine, often collecting information remotely.

There is some controversy regarding the extent to which the use of personal data on social network sites represents a form of surveillance. We can use the three perspectives outlined on pages 238 to 243 to examine this issue. First, from a functional viewpoint, we could argue that this form of surveillance is harmless because third-party companies are primarily interested in aggregate data and will use this information to develop and market better products, which will benefit consumers (Young & Quan-Haase, 2013). These third-party companies are not interested in individual behaviours, opinions, or attitudes, but rather in trends and patterns revealed in anonymous answers by masses of people.

Second, from a revolutionary viewpoint, we can take a more critical stance, arguing that most Facebook users, for example, involuntarily grant third-party access to their personal information by not being fully aware of their ability to change their privacy settings, by deciding not to change them, or by not fully understanding them. Recall the Cambridge Analytica scandal mentioned in Chapter 1: in that case, the unlawful use of personal data for unprecedented targeted political advertisement demonstrated users' need to constantly balance their decisions to disclose personal information, their desire to connect with their family, friends, and co-workers, and the need to protect themselves against privacy threats. In this light, we can see how Facebook can be considered an example of new surveillance and of how pervasive surveillance truly is in our information society.

Finally, from a cultural standpoint, we can argue that new laws and cultural practices are developing to protect users from privacy threats. For instance, in Canada the Privacy Commissioner demanded that Facebook change its privacy settings and make its options more transparent to allow users to make informed choices (Privacy Commissioner of Canada, 2009). Facebook was also forced to shorten and simplify its privacy rules as a result. The increased transparency should give users a better understanding of how their settings affect the kind of personal data that third-party companies and other users are able to access. The demand for privacy from Internet giants was heard around the world when the European Union's General Data Protection Regulation (GDPR) was implemented in 2018. The GDPR includes the European Court of Justice's 2014 ruling of **the right to be forgotten**, which allows citizens to request personal information to be removed from a search engine's result page (Yang, Quan-Haase, & Rannenberg, 2017). In this case, European users are being granted the authority to reclaim their online data and this in another example of laws that attempt to preserve user privacy in the face of corporate overreach.

However, it is not always clear to what extent the personal information garnered through surveillance is being used. As noted by Stedmon (2011), "as surveillance technologies become ubiquitous, the potential to monitor locations from distant control centres (possibly even from control centres abroad) means that gaps in spatial knowledge and lack of local knowledge could impact on many aspects of successful surveillance and public safety" (p. 533).

Is Privacy Dead?

When Facebook co-founder and CEO Mark Zuckerberg stated in 2010 that "privacy is dead," he meant that social network sites had changed people's sense of privacy. For him, people wanted to share more information more widely and technology had fundamentally changed social norms around the very meaning of privacy. But is it actually the case that users are happy for the world to know their business?

Privacy Concerns in Users' Digital Life

Privacy concerns refer to people's unease surrounding the misuse of their information, resulting in the need to safeguard their information or personal data from the hands of others (Dienlin & Trepte, 2015), thereby protecting one's privacy. Users express a wide range of concerns regarding their privacy when online (Tsai et al., 2016); even users who evaluate their digital skill level as high report concerns, despite being better equipped to prevent privacy threats than users with low skills

(Spake, Zachary Finney, & Joseph, 2011). Privacy concerns include the misuse of personal information posted online (Barnes, 2006); lack of trust for banking online (Alhabash et al., 2015); concerns about identity theft, fraud, or bullying online (Bartsch & Dienlin, 2016); and concerns related to smart home medical/monitoring technologies (Townsend, Knoefel, & Goubran, 2011; Garg et al., 2014).

An important distinction, however, is between **immediate** and **future privacy concerns**. Immediate concerns are those that result shortly after disclosing personal information on social network sites, including identity theft and harassment from sexual predators. Future concerns are those that occur long after the information has been disclosed. A study of undergraduate students' privacy showed that they thought the likelihood was higher that a future romantic partner would look at their profile than a future employer, the government, or a corporation (Tufekci, 2007). This suggests that students are most concerned about immediate privacy breaches coming from their personal social network than from an institution or organization.

Another distinction is often made between **social privacy** and **institutional privacy** (Raynes-Goldie, 2010). Social privacy refers to the concern that known others—such as friends, acquaintances, and family members—will discover personal information. By contrast, institutional privacy refers to the threat of one's information being mined and used by governments or corporations. Institutional privacy concerns have become increasingly salient in recent years (see Box 11.1), and debates about online privacy have been supplemented by **hacktivist groups** like **Anonymous** and websites like **WikiLeaks**, whose slogan is "We open governments." Hacktivist groups range from single individuals to loosely linked networks of people who gather around a target or idea to tightly organized groups (Singer & Friedman, 2014). Anonymous, for example, is a decentralized group that does not follow directives but instead operates on ideas (Singer & Friedman, 2014). Dismissing the relevance of Anonymous to how the Internet operates would be a great mistake, something that security expert Aaron Barr learned the hard way. In 2011, he announced that his security firm, HG Gary Federal, had infiltrated the group; shortly afterward, Anonymous hacked his website, making a mockery of HG Gary Federal and calling into question its ability to provide secure networks. They also took control of his Twitter account and posted his social security number and home address. This case shows how hacktivists can influence individuals' lives, commerce, and politics.

How can we explain users' willingness to disclose personal information despite their privacy concerns? One perspective argues that online users are not fully aware of their vulnerability to privacy threats because they follow the "nothing to hide, nothing to fear" rule (Lyon, 2018). According to Viseu, Clement, and Aspinall (2004), most users do not think privacy violation will affect them directly. Privacy becomes a concern only when it has been lost or breached. That is, until they have a negative experience, users do not feel compelled to change their behaviours.

A second reason many people voluntarily disclose information online is to craft an online presence as discussed in Chapter 10. Studies on information revelation have consistently shown that users of social network sites reveal considerable amounts of personal information on their profiles, through the profile itself, status updates, pictures, and connections. This trend toward more disclosure of personal information has been defined in the literature as **information revelation** (Gross & Acquisti, 2005). The need to belong and be an active participant in one's online community has led many young people to disclose personal information on social network sites. On Facebook, users often disclose their first and last names, date of birth, sexual orientation, and relationship status (Young & Quan-Haase, 2009). By contrast, few respondents disclose their physical address, their cellphone number, or their IM screen name, thereby limiting the likelihood of individuals contacting or locating them outside of Facebook. The sharing of location information has changed, though, with the introduction of **locative media apps**, which use the locational functionality of a smart device's (smartphones, tablets, smart watches) GPS, Wi-Fi, and Bluetooth hardware to send and receive information specific to a user's location in real-time. Locative media apps present new challenges to the privacy of smart device users. Examples of locative media apps include wayfinding apps like Google Maps and public transit apps, information apps like Yelp and Foursquare, dating apps like Tinder and Grindr, and gaming apps like Pokémon Go (Pieber & Quan-Haase, 2019). Over time, producers of locative media apps can acquire detailed pictures of users' daily travel routines and places they regularly visit, including their homes and places of work and leisure (Frith, 2015).

Taken together, the findings on users' behaviours on social network sites are puzzling. On the one hand, users report high levels of concern about the potential, immediate, or future misuse of their personal data. On the other hand, people continue to disclose large amounts of personal information, including pictures, information on friends, their whereabouts, etc. This contradictory behaviour has been termed the **privacy paradox** (Barnes, 2006).

Another paradox that emerges on social media is the nature of surveillance itself. Surveillance on social media is not about one person doing the observing and another person being observed, as in traditional surveillance; instead, surveillance on social media is about everyone being both object and subject at the same time. Tufekci (2007) has referred to this as **peer monitoring** because in most cases it is not strangers or spies who are watching and observing our behaviours; in social media, it is our family, friends, and acquaintances who are keeping a close eye on our every move.

Resistance to Privacy Threats and Surveillance Practices

In an effort to counter the pervasiveness and invasiveness of surveillance in our society, models of **counter-surveillance** have been proposed. Counter-surveillance is both a theoretical perspective and an action-oriented approach. Individuals who advocate for counter-surveillance will often engage in practices that put the status quo into question and make surveillance practices visible, particularly those practised by the state, private security, public police, and commercial enterprises. In this section, we discuss two forms of counter-surveillance: (1) sousveillance and (2) privacy protection strategies.

Sousveillance

Mann, Nolan, and Wellman (2003) have described **sousveillance** as a form of counter-surveillance that empowers those subjected to institutional, state, or corporate surveillance practices. In this approach, individuals or members of grassroots organizations use mobile technologies or wearable computers to record their experiences of being watched. **Grassroots movements** are those that are locally organized rather than spearheaded by larger organizations with global reach. A subset of sousveillance practices are referred to as **inverse surveillance** and consist of recording, monitoring, analyzing, and questioning surveillance technologies and their proponents, and also recording how surveillance takes place by authority figures, such as police officers, guards, and border patrol agents. Around the globe, many groups have formed to participate in the sousveillance social movement. For instance, those engaged in inverse surveillance tactics in New York City noted as much as a 40 per cent increase in the numbers of video security cameras after the September 11 events (Mann et al., 2003). The pervasiveness of surveillance can also be observed in many other cities, such as Chicago; London, England; and Toronto.

Sousveillance entails **reflectionism**, a perspective that proposes using technology as a mirror to question and confront the ubiquity of surveillance practices in our modern society. The aim of reflectionism is to engage people in critical debate about how surveillance is occurring, thereby creating greater transparency. Reflectionism, according to Mann et al. (2003), uses a method known as **inquiry-in-performance**; that is, knowledge is gained through interacting with technologies in real-life contexts, with the following two aims:

1. uncovering the Panopticon and undercutting its primacy and privilege; and
2. relocating the relationship of the surveillance society within a more traditional notion of observability (p. 333).

The process of reflectionism is closely linked with *detournement*, a concept introduced by Rogers (1994) to describe the tactic of using those very same tools that are employed to control us as a means to provoke the social controllers and make them aware of the imbalance of power. Reflectionism "extends the concept of detournement by using the tools against the organization, holding a mirror up to the establishment, and creating a symmetrical self-bureaucratization of the wearer" (Mann et al., 2003, p. 333). Anti-surveillance groups use various aspects of reflectionism to make the public aware of both the ubiquity of surveillance tools and their infringement on private and public life. Huey, Walby, and Doyle (2006) report that counter-surveillance practices against police forces, known as **Cop Watch** groups, have emerged. The main goals of Cop Watch groups are to promote awareness of police brutality against marginalized populations, monitor police activity, and report police misconduct and unnecessary brutality.

Brucato (2016) describes how counter-surveillance practices against police forces, are becoming normalized as evidenced by growing numbers of amateur recordings uploaded to sites such as YouTube. As overseers of advanced surveillance systems, law enforcement use surveillance to render themselves invisible while exposing the activities of subordinate individuals. Cop Watching aims to promote awareness of police brutality against marginalized populations, monitor police activity, and report police misconduct and unnecessary brutality. Advocates of Cop Watching see this particular form of sousveillance as a necessary intervention strategy that raises awareness around current surveillance practices and the activities of public and private police. Critics argue that sousveillance does not conclusively deter police from using undue force and that video evidence alone does not guarantee that viewers will be able to transcend pre-existing social divisions and indifference to mass surveillance (Brucato, 2016).

Box 11.3 "Dark Sousveillance" and Social Media

Despite the widespread nature of surveillance in a society where personal data is collected and stored by institutional, corporate, or government actors, the experience of surveillance is not homogeneous across populations. Browne (2015) chronicles the racialized surveillance of black communities throughout American history, something that extends into contemporary debates around state abuses such as stop-and-frisk policies and the pervasive presence of police and surveillance technologies in majority black neighbourhoods. In 2014, the NYPD enacted a new strategy in Brownsville, an east Brooklyn housing project. The tactic was aptly named "Omnipresence" for its use of flood lights and near-ubiquitous posting of police sentries on street corners, subjecting Brownsville's residents to constant scrutiny and fear of police confrontation. "[Handshakes would result in] an automatic search because they say we were doing hand-to-hand transactions," a local construction worker explained as to why young men had begun greeting one another by bumping fists or elbows (Goldstein, 2014). Browne (2015) coined the term **dark sousveillance** in reference to acts of counter-surveillance and anti-surveillance that appropriate surveillance apparatuses to challenge state-sanctioned forms of anti-black surveillance that frame subjects' blackness as inherently suspect.

In recent years, bystander recordings of police brutality, such as the fatal choking of Eric Garner, have attracted public attention on social network sites where such recordings are widely disseminated (Bock, 2016). The integration of sousveillance and social media have resulted in the creation of a new civic context wherein participants can challenge law enforcement's role as sole arbitrators of surveillance data (Bock, 2016, p. 29). Black Lives Matter (BLM), for example, was founded by Alicia Garza, Patrisse Cullors, and Opal Tometi after the acquittal of George Zimmerman, a white police officer, in the death of 17-year-old Trayvon Martin. What began as a Twitter hashtag grew into a transnational movement in 2014 following the police shooting of Jermaine Carby in Brampton, ON and Michael Brown in Ferguson, MO (Battersby, 2016). Witness photographs of Michael Brown's body were retweeted widely, as was Ramsey Orta's cellphone video of officers choking Eric Garner earlier that year (Canella, 2018). Dark sousveillance in the form of Cop Watching is promoted by users of the #blacklivesmatter hashtag while the products of such endeavours are similarly shared on social network sites where organizing occurs. In Canada, the Toronto-based organization Network for the Elimination of Police Violence published its free CopWatch mobile app in 2014 with the intention of aiding civilians with the recording and sharing of police interactions (Hess, 2015). As mentioned in Chapter 8, social media can be a powerful tool for the mobilization of social movements and can aid in raising awareness about police violence and mobilize groups to protest these acts. This demonstrates that digital media, webcams, and social media can all serve as a means to challenge power relations among social groups in society.

However, these public acts of sousveillance are also paradoxically subject to the same police surveillance they seek to challenge, from the NYPD's unvetted filming of BLM protesters (Joseph, 2017) to the Department of Homeland Security monitoring the social media activity of BLM activists (Leopold, 2015). Canella (2018) argues that although video activism is crucial for raising awareness, the power imbalance inherent in these forms of surveillance, where the state will always be "technologically more sophisticated than activists' counter-surveillance tactics," means that "law enforcement will remain one step ahead of video activists in the contemporary surveillance arms race" (p. 394).

Users in Action: The Use of Privacy Protection Strategies

The second form of counter-surveillance, digital privacy protection strategies, occurs at a micro-level, with people protecting themselves against potential threats to their privacy (Adhikari & Panda, 2018). As we mentioned earlier, the privacy paradox theory states that people tend to disclose large amounts of personal information online even though they express concerns about potential privacy risks. Evidence, however, suggests that people are not as naïve and oblivious to threats as suggested in the privacy paradox theory. Yet not all social groups are equally prepared to protect their privacy and some social groups feel particularly vulnerable online.

A Canadian study of undergraduate students shows, for example, that they engage in a wide range of strategies to mitigate threats and are constantly managing their personal information online (Young & Quan-Haase, 2013). Table 11.2 shows that the most frequently used privacy protection strategy (strategy 1) was to exchange private Facebook messages to restrict others' access to content perceived as confidential. This was followed by strategy 2: changing the default privacy settings on Facebook to restrict who can see what profile elements. Another frequently used strategy (strategy 3) was to refuse to include personal information in order to

Table 11.2 Privacy Protection Strategies Used by Facebook Users

Individual Items and Scale	Study Findings: Mean	Study Findings: Standard Deviation	Provide your own rating here and compare
1: I have sent private email messages within Facebook instead of posting messages to a friend's wall to restrict others from reading the message.	4.72	0.68	
2: I have changed the default privacy settings activated by Facebook.	4.33	1.25	
3: I have excluded personal information on Facebook to restrict people I don't know from gaining information about me.	4.08	1.17	
4: I have untagged myself from images and/or videos posted by my contacts.	3.85	1.55	
5: I have deleted messages posted to my Facebook wall to restrict others from viewing/reading the message.	3.64	1.55	
6: Certain contacts on my Facebook site have access only to my limited profile.	3.47	1.70	
7: I have blocked former contacts from contacting me and accessing my Facebook profile.	2.91	1.71	
8: I have provided fake or inaccurate information on Facebook to restrict people I don't know from gaining information about me.	1.66	1.03	

Note: Items were evaluated on a 5-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree."
Source: Young, A.L. & Quan-Haase, A. (2013). Privacy protection strategies on Facebook: The Internet privacy paradox revisited. *Information, Communication & Society, 16*(4), 479–500. Copyright © 2013 Routledge

prevent unknown others from gaining access to it. Interestingly, few participants have provided fake or inaccurate information on Facebook (strategy 8). Students do not falsify information because their friends would question the validity of the information and wonder about its meaning (see Chapter 10's discussion on the presentation of the online self).

Unlike undergraduate students, older adults are often portrayed as either helpless, with low confidence when it comes to using social media (Lehtinen, Näsänen, & Sarvas, 2009), or as victims of cyber scams (Henriques, 2017). In a study of older adults in East York, Toronto (Quan-Haase & Elueze, 2018), older adults were not complacent about their privacy when on social media. Rather, they actively countered potential privacy threats by employing a range of protection strategies:

1. limiting personal information shared;
2. ignoring social media requests;
3. restricting access to information shared; and
4. using pseudonyms.

For example, Juliana, who was 67 years old and lived in Toronto, limited the personal information she disclosed on her Facebook profile: "On Facebook, I had my name, I had my date of birth, and I had Toronto. Three things. I don't put anything on the Internet that's personal."

Juliana implied that putting additional information was tantamount to giving out too much personal information about herself on social media. This study demonstrates that users across all age groups are protecting themselves through active engagement with system features and reduced information sharing against privacy threats. Of course, looking at the life course also demonstrates that what is considered too much information varies considerable by age and social context. Yet, what it also demonstrated is that users are neither naive nor without agency. We learn that:

- Users adapt their disclosure to different types of apps and social media, for example, posting more private and personal information on sites like Snapchat where they know the content is ephemeral and hard to track, share, and save.
- Users' privacy protection strategies vary by their digital skill level, with users who are more skilled sharing more information than those who are less skilled.
- Senior users navigate digital media carefully, as they are often the targets of scams. For senior users, digital media is unfamiliar and thus they prefer to be cautious with their data.
- Media stories about data breaches frame how users view their own needs for protecting information.

A new concept is providing average Internet users with more say over their personal data and its use. The concept of the **digital citizen** proposes that users of the Internet can shape data practices by advocating for their rights (Lyon, 2018). Part of this fight for data rights includes changes in existing legal frameworks. One example that shows how legal frameworks can make data practices more visible is the case *Europe vs. Facebook*. Max Schemer, an Austrian lawyer and activist, fought for a user's right to know what types of data are being collected about them by tech companies and who has access to that data. Users were granted by the European Court of Justice the right to obtain access at any given time from companies about the data they hold on a single user. The case included a website, also known as Europe versus Facebook (see http://europe-v-facebook.org/EN/Get_your_Data_/get_your_data_.html), which states that "[b]y sending an access request you get an idea about the use of your personal data by Facebook. It also shows Facebook that users care about their data and privacy" (Figure 11.1). Moreover, the legal case ended **safe harbour**, a practice where data from European citizens was transferred across the Atlantic to North America.

The fight for users' rights to control their data continues. Max Schemer filed a new lawsuit in 2019 against tech giants such as Amazon, Apple, Netflix, and Spotify among others. The lawsuit states that these companies are violating a central law of "right to access," which grants users the right to obtain a copy of all raw data that was collected on them as well as how the data was collected, with what purpose, and who the additional third parties are with whom it was shared. The law also allows users to find out where their data is stored and for how long (Lomas, 2019). These cases demonstrate that tech giants place commercial interests first and largely disregard any rights users may have. It is only through advocating for digital citizenship and citizens' rights that users are starting to make illegal practices visible and regaining their data rights.

Conclusions

This chapter covered the complex topic of surveillance and compared traditional types with new modes. Modern societies provide citizens with many rights and opportunities. At the same time, these social systems are based on conventions of rationality, standardization, norms, and discipline that impose many restrictions on an individual's freedom. Technology both facilitates surveillance and imposes control mechanisms. Constant surveillance exposes vulnerabilities in individuals and may lead to a dystopic "Big Brother" world, in which public and private life is closely monitored. Yet we must recognize the pitfalls of technological determinism because surveillance technology alone does not determine how society defines and respects privacy.

Finally, current trends lean toward *more* disclosure of personal information on the Internet. In part, this is a result of the proliferation and widespread use of social media, which further blurs the boundary between private and public space. However, people are not completely oblivious to the risks associated with making so many aspects of their private lives public. Indeed, many users of social media employ a series of strategies to protect themselves against privacy threats, including strategies of counter-surveillance such as sousveillance and inverse surveillance. These strategies empower users and suggest that social norms, policies, and values shape how technologies affect privacy, creating a balance between disclosure and protection of personal data.

Questions for Critical Thought

1. Discuss the three factors—knowledge, growing impersonality, and enhanced control—that have played a role in the shift toward a Weberian society of rationalization and bureaucracy.
2. Define David Lyon's concept of liquid surveillance and explain how it describes the relation between corporations and governments.
3. Discuss the pros and cons of parents using mobile technology to track their children's whereabouts.

4. Describe the phenomenon of the privacy paradox using Instagram as an example. How can we best explain users' paradoxical behaviour on these social media sites?
5. What are the key privacy concerns of older adults when online and what privacy protection strategies do they employ to mitigate risks?

Suggested Readings

Damour, L. (2018). Should you track your teen's location? *The New York Times*. https://www.nytimes.com/2018/08/29/well/family/should-you-track-your-teens-location.html

This article discusses the pros and cons around parents using mobile technologies to track their children's whereabouts and the ways it changes parent–child relations in the twenty-first century.

Elueze, I., & Quan-Haase, A. (2018). Privacy attitudes and concerns in the digital lives of older adults: Westin's privacy attitude typology revisited. *American Behavioral Scientist*, *62*(10), 1372–1391.

This empirically-based article studies the privacy concerns and protection strategies that seniors employ to guard their personal information while at the same time participating in social media.

Lyon, D. (2018). *The culture of surveillance: Watching as a way of life*. John Wiley & Sons.

This text describes the new culture of surveillance made possible by digital technologies and the social, economic, and political implications for society.

Marx, G. T. (2016). *Windows into the soul: Surveillance and society in an age of high technology*. Chicago: University of Chicago Press.

This book is about technologies of surveillance and their function in society as means of control as well as the social and ethical consequences.

Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. New York: Public Affairs.

This timely book exposes the ways by which tech companies offer free services and thereby gain access to massive and detailed amounts of information on users and their daily lives.

Online Resources

Derek Banta: What If Your Data Could Be Protected Online?
https://www.ted.com/talks/derek_banta_what_if_our_data_could_be_protected_online
Banta explains the social relevance of protecting personal data and the technological innovations that can help in this endeavour.

Edward Snowden: Here's How We Take Back the Internet
https://www.youtube.com/watch?v=yVwAodrjZMY
In this TED Talk, Edward Snowden Talks about the leak of top-secret files and the consequences for how we think about surveillance in modern society.

Facebook Algorithms and Personal Data
http://www.pewinternet.org/2019/01/16/facebook-algorithms-and-personal-data/
This is a report by the Pew Research Center on what data Facebook keeps on users and how the data is used to target users with customized advertisements.

Office of the Privacy Commissioner of Canada
https://www.priv.gc.ca/en/
The website provides advice and information for citizens about how to protect their personal information and outlines the laws that governments and corporations need to follow. The site includes helpful tips on how to prevent identity theft.

Interactive Activities

Activity 1: Critically Engaging with Data Ownership and Surveillance

We discussed in the chapter how the European Court of Justice ruled that tech companies had to make user data available to users if they requested it.

Step 1: Visit Facebook's Help centre at facebook.com/help and type the query: "How do I download a copy of my information on Facebook?" in order to get the most up-to-date step-by-step instructions on how to request your data.

Step 2: Take a look at the types of data collected on you. Are you surprised by any of the data that was collected?

Critical follow-up questions:

1. Would you change your posting habits as a result of the findings from your data review?
2. Do you think that it is a good idea to allow users to request their data for review?

Activity 2: Have I Been Pwned?

Despite all the efforts that companies and governments place into safeguarding personal information, many instances of data breaches have been reported. To verify if a company that you have an account with has been hacked, you can check online.

Visit the website: https://haveibeenpwned.com/

Enter your email to check if your information has been posted online.

- How many times have you been pwned?
- Does the report indicate there have been any pastes? (sharing of the private data on the Internet for anyone to see)

If you have been pwned, change your password immediately to prevent cybercriminals from potentially hacking your account. Make sure you change passwords frequently, even if there is no suggestion of an actual breach.

Consider educating yourself on cybersecurity risks and adopting new strategies such as those proposed by the Canadian Centre for Cyber Security (https://www.getcybersafe.gc.ca/cnt/rsks/index-en.aspx) to protect your data from cybercriminals.

12 Ethical Dimensions of Technology

Learning Objectives

- to summarize and evaluate the three central themes of the book;
- to examine the ethical and moral dimensions of our technological society, including the idea of the neutrality of technology;
- to think critically about the metaphors of technology as destiny and technology as progress;
- to stress the materiality of technological production, use, and disuse and its effect on countries in the Global South; and
- to examine the social and health consequences of overload and addiction resulting from overreliance on mobile devices, apps, and online games.

Introduction

In the previous chapters we discussed the many ways in which technology and society intersect. The primary goal of this final chapter is to summarize and reflect upon the three key themes that run through the book. The first theme stresses that the study of technology needs to be approached from a socio-technical viewpoint. The second theme posits that technology and innovation are closely interwoven with economics and that this has consequences for our understanding of social inequality locally and globally. The final theme emphasizes that social change goes hand in hand with technological developments. These three themes inform how we approach and understand the study of technological change and its complex interlink to trends unfolding in society.

The second goal of this concluding chapter is to discuss some of the ethical dimensions that humans encounter as they engage with technology. **Ethics** can be understood as the study of moral behaviours and examines the nature of good and evil, right and wrong. Some of the ethical themes this chapter looks at are the neutrality of technology, technology as human destiny, and technology as progress. We will also cover the domain of ethics of AI which deals with questions both about the ethical behaviours of AI. Moreover, most discussions of technology are theoretical in nature and disregard the materiality of technology; these discussions are unconcerned about the labour and natural resources such as energy that go into the production and use of such devices as cellphones, tablets, and game consoles. Yet, energy production and consumption are not equally distributed, neither across nations nor within them. We also take a critical stance toward the cycle of mass production by looking at electronic waste; the aim of this critical engagement is to make visible the materiality of technology and its implications for society. As not all electronic waste is the same, it becomes critical to examine the levels of hazardous and toxic waste. Through this discussion, the chapter emphasizes the unexpected consequences of technology with which society needs to come to terms. The chapter ends with an investigation of overload; that is, the sense of not being able to manage the many demands and expectations put forth by our multiple and diverse spheres of life. While technology is often celebrated as the harbinger of flexibility and mobility, its ubiquity has also led to increased levels of stress, which have consequences for physical and mental health.

The Book's Three Central Themes

The book covers a wide range of technologies, their uses, and social implications. Nonetheless, we can identify three themes as most central in our analysis of society and technology.

1. The Socio-technical Approach

Why is a socio-technical approach to the study of technology useful? What insights do we gain? Early conceptualizations tended to focus on technology as material substance, disregarding the social nature of technological invention, implementation, and use (Feist et al., 2010). As society relies more heavily on technology, it is inevitable that we need a better understanding of the link between the social and technological dimensions as they come together during technological design and implementation.

As discussed in Chapters 1 to 5, science and technology studies (STS), as a field, has taken a socio-technical approach in which the social and technological are closely interwoven and mutually influence each other, a relationship that has been referred to as a mutual shaping process (Bijker, 2009; Bijker et al., 1999). In such an approach, technological, political, economic, cultural, and social factors are integrated to explain how one technology diffuses in society over others. An example of this was discussed in Chapter 8, where we looked at women's widespread adoption of household technologies in the 1950s and 1960s. Household technologies became popular not only because of their utility in the home, but also because changes were taking place in terms of raised expectations of household cleanliness (i.e., germ theory and household science), increased incomes in middle-class families, lower prices for consumer goods, and the notion that mass-produced goods served as status symbols (Wajcman, 2013). These factors together prompted the diffusion of household technologies in North America and Europe, a trend that continues today with the popularity of **smart appliances**. Refrigerators no longer regulate only temperature; they are now intelligent and able to keep and detect a digital shopping list. Many refrigerators are part of a network of appliances in the home, in what is called the **Internet of Things (IoT)**, and integrate seamlessly with Amazon's Alexa, discussed already in Chapter 5.

Despite the strengths of a socio-technical approach for understanding how technology and society intersect, some limitations remain. First, the socio-technical approach does not explicitly delineate a select set of variables that need to be examined when looking at the design and implementation phase. The approach is rather vague in determining what factors are most central in a socio-technical analysis. Second, the approach does not state what mechanisms underlie the relationship between technology and society. It is unclear as yet exactly how these two forces come together and mutually shape each other. For example, does a technology like Amazon's Alexa diffuse because users are excited to interact with an intelligent agent or because of its massive advertisement campaign? Third, little detail is provided as to how a socio-technical approach should uncover the mechanisms underlying the mutual shaping process. While a wide range of methods have been proposed for the study of the socio-technical there is still uncertainty as to the best way to approach such an investigation. Generally, a qualitative approach that includes interviews is more recommended than a survey approach that garners more general responses. These shortcomings suggest that much more work is needed to fill in the existing gaps in the socio-technical approach.

2. Technological Inequality

A central question investigated in this book is how technology and inequality are linked. Karl Marx (1867/1970) was the first scholar to highlight how industrialization and capitalism were closely connected with social transformations. As discussed in Chapter 1 and more extensively in Chapter 7, several developments—the Industrial Revolution, Taylorism, and Fordism—have all contributed to changes in labour processes, such as deskilling, mass production, and the moving assembly line. As outlined in Chapter 4, Schumpeter (2004) later developed the Marxist theory by arguing that innovation was the driver of economic development because it created new markets and sources of revenue.

Based on Schumpeter's analysis, we can conclude that technological inequality occurs at three levels. First, the gap between those involved in innovation and those involved in the work force continues to grow. The personal wealth of Bill Gates, Jeff Bezos, and Mark Zuckerberg is a prime example of this widening economic gap. Second, the difference in society between the haves and have-nots often plays out in terms of technological savviness. As discussed in detail in Chapter 6, those who lack digital skills and know-how are finding it increasingly difficult to join the workforce

Box 12.1 Net Neutrality

Inequality also plays a role in how information is transmitted via **Internet service providers (ISPs)**, who profit from providing an essential service to consumers. As discussed in Chapter 6, access to online tools and information is essential for developing digital literacies, gaining employment skills, executing tasks that improve one's quality of life, participating in civic discussions, and tapping into channels of revenue. The large influence that ISPs have over the delivery of information and content makes consumers vulnerable to the negative consequences of broadband discrimination—in other words, the ISP's decisions about what content gets delivered to whom at what speeds. A 2017 study of AT&T networks in Cleveland showed that AT&T had neglected to upgrade transmission infrastructure in low-income neighbourhoods so that many residents living below the poverty line were saddled with slow connection speeds and uneven, often slow Internet access (Callahan, 2017). While slow and uneven digital connectivity is invisible to the eye, it has real repercussions on people's lives. As urban centres are often stratified geographically by economic class, the unequal maintenance of network infrastructure can be seen as an act of discrimination against low-income communities, a practice known as **digital redlining**. Without regulations, ISPs are also able to discriminate against the type of content that is delivered over the Internet. For instance, a broadband provider might decide to curb video streaming services that compete with its cable television packages, which would negatively impact consumer choice and, more importantly, users with disabilities who prefer accessible multimedia formats. **Net neutrality** is the belief that ISPs should provide all users with equal access to all online content, applications, and platforms without intervention. Without regulations that uphold the principles of net neutrality, our freedom to choose what we view, read, play, and do on the Internet would be massively eroded by profit-motivated broadband discrimination, and the needs of low-income users would likely be overlooked. If net neutrality were lost, a select group of customers would get preferential treatment, as data would then travel at different, predetermined speeds on the net. ISPs have been eager to work with large companies such as Netflix to create fast lanes and monetize services that grant preferential access to the companies' data. According to Cheng, Bandyopadhyay, and Guo (2011), "the status quo of prohibiting broadband service providers from charging websites for preferential access to their customers—the bedrock principle of net neutrality (NN)—is under fierce debate" (p. 60).

In Canada, the **Canadian Radio-television and Telecommunications Commission (CRTC)**, the regulatory body in charge of the Internet, has taken a strong position supporting net neutrality because they "believe that it is important that all Canadians have access to choice, innovation and free exchange of ideas" (2018). Due to its size, Canada already struggles to provide equal access to broadband. In remote areas, telecommunications companies are reluctant to invest as returns are limited. The CRTC, however, has declared broadband access a basic fundamental service and is providing funding to ensure that Canadians in remote areas have access and that the access is high-speed and includes affordable, unlimited data access. By contrast, the United States reversed its past Internet policy and ended net neutrality in 2018, and now economic interests dictate data flows. Enforcing net neutrality is crucial for reducing inequality of opportunity due to limited or preferential web access.

(McMullin, 2011), which creates further divides along educational levels, socio-economic status, and age, with older generations often not able to find new employment as a result of their low levels of digital know-how. We also covered in Chapter 6 the opportunities given to those engaged on social media platforms, as discussed in the example of YouTube stars who have annual revenues in the millions. Third, a global divide exists between those nations that invent, test, and distribute new technologies and those that continue to fall behind. This divide is complex though. As discussed in Chapter 7, the production of most technologies today takes place in the Global South, yet the many contributions to the digital society made by those nations is not acknowledged. Workers in these nations are paid low wages and do not get to enjoy the benefits of the current technological boom. In fact, as will be discussed later in this chapter, countries located in the Global South are disproportionately recipients of electronic waste and this imbalance most severely impacts vulnerable people in these societies, such as children, the poor, and the elderly.

A central conclusion of this book is that science and technology are key parts of the economy and that investing in R&D leads to social and economic advantages for nations. In Chapter 4, we discussed that some nations make much greater economic commitments to R&D despite the uncertainties that come with innovation. The system of innovative capitalism of which R&D is a part creates vulnerabilities and exploitation that are difficult for nations and communities to manage in an increasingly interconnected, global economy. Technological inequality and creating capabilities to harness and utilize data are perhaps the some of the most important challenges of the twenty-first century. How do we distribute wealth and power to generate more global equality? What role will technologies—such as the Internet, smartphones, AI, and robotics—play in the struggle for democracy, education, quality of life, and health? How can entire nations keep up with the data revolution? As technology continues to evolve and widely diffuse throughout society, it will become more essential to address these questions.

3. Social Change

While there is no single definition of **social change**, it is often described as a major change of structured social action or social structure taking place in a society, community, or social group (Weinstein, 2010). Researchers have identified a number of dimensions of social change, including space (micro-, meso-, macro-levels), time (short-, medium-, long-term), speed (slow, incremental, evolutionary versus fast, fundamental, revolutionary), direction (forward or backward), content (socio-cultural, psychological, sociological, organizational, anthropological, economic, and so forth), and impact (peaceful versus violent) (Servaes, 1999).

In the context of technologically induced social change, analysts often assume that these changes are negative, short-term, revolutionary, and peaceful. For instance, as discussed in Chapter 7, the introduction of machinery in the weaving industry resulted in job losses and was the start of a trend toward deskilling that continues to affect workers in an information-based economy. Nonetheless, the term *social change* does not preclude positive change in the context of development or **information and communication technology for development (**ICT4D), as discussed in Chapter 6.

Social change does not always occur in predictable ways, and does not have the same implications for all members in society. As Servaes (2017) notes, "[t]he new traditions of discourse are characterized by a turn toward local communities as targets for research and debate, on the one hand, and the search for an understanding of the complex relationships between globalization and localization, on the other hand" (p. 1). As a result, the link between technology and social change can only be examined in the context of specific social groups and requires a long-term outlook. In Chapter 6, we discussed how seniors and younger generations benefit differently from the use of digital media and the types of barriers they encounter (Quan-Haase et al., 2018). This kind of analysis requires an in-depth understanding of multiple factors that affect these groups, including economic, social, cultural, and historical. And even within bounded social groups, social change can occur differently for distinct social actors.

Ethical Dimensions of Our Technological Society

1. Neutrality of Technology

A central concern in the debate about how technology intersects with society is the **neutrality of technology argument**. The proponents of this argument believe that technology is impartial because it lacks a set of moral values and direction. Within this model, technology is not an agent with moral choices but a passive object used to meet human needs and goals. This debate links directly to the definition provided in Chapter 1, where technology is equal to material substance. Consequently, technology itself is inherently neither good nor bad. However, what humans can exploit or accomplish with a given technology can fall into either category.

The value-neutral perspective suggests that because it is humans, and not technological artifacts, that possess a system of ethical, moral, and social values, technologies are placed into a moral equation only as a result of human use. Yet under what circumstances can technology accurately be considered neutral? Swedish philosopher Sundström (1998) has described three arguments through which technology could be deemed value neutral:

1. *Multiple uses of tools*: The first argument is based on the notion that if a technology has multiple and ambiguous uses, value is assigned to that artifact only by humans through the possible uses of the device. Hence, the application or purpose of an artifact is not limited to a singular function; rather, a number of purposes may exist for a single artifact.
2. *Uncontextualized tool*: The second argument relies on the notion that value is assigned to an object only when a value-laden being, such as a human, assigns

a certain set of values to the device through applied practice. Therefore, if a tool or technique is not used in practice by human beings, it will contain no value properties, because of "the neutrality *before* action and the neutrality of *inaction*" (p. 42).

3. *Tool as science*: The final argument is that because technology is the product of science, which is inherently neutral, technology should also be perceived as being value neutral.

As technology becomes further entrenched in modern life, the notion of technological neutrality comes increasingly under critical scrutiny. Much of the philosophical and scholarly debate over the neutrality of technology has centred on ideas of origin and design. Critics such as Feenberg (1991) have proposed that technology cannot be referred to as neutral because it is imbued with the values present in the particular culture or civilization from which it originated. An example that shows both the complexity of the argument as well as how new technological developments are changing how we understand morality in technology is MIT's "Moral Machine" described in Box 12.2 below.

Box 12.2 The Moral Machine

What kinds of decisions should machines make? Researchers from MIT created a **moral dilemma** to investigate how research can informs the potential moral decisions that machines may have to make when on the road. A moral dilemma presents a situation that puts a person in a situation with impossible choices. The moral machine created by MIT scholars puts you in the position of a driverless car. As the car is driving on the street, its brakes fail and it is presented with two choices: if it veers right, it will run over a large group of elderly people but if it veers left it will run into a woman pushing a stroller. What decision should the driverless car make? By varying the scenarios in terms of the options: running over five children, running over a doctor, running over a homeless person, etc., researchers can understand what groups of people individuals choose to live or die. The researchers ran the experiment for 18 months in 233 countries and received a total of 40 million responses. The study showed that some moral preferences were shared globally; for example, most participants favoured saving the largest number of lives, prioritized the young, and valued humans over animals. In particular, people were most empathetic toward saving babies in strollers, children, and pregnant women. They also found culture mattered, as there were substantial differences across regions. In Latin America as well as France and its former and current overseas territories there was a strong preference toward sparing women, the young, and the athletically fit. Country by country findings can be explored on the Moral Machine website. The Moral Machine has also been criticized for simplifying moral decisions to group memberships that reflect the social world inaccurately. For example, an elderly person could also be a doctor, creating new ethical complexities to ethical decisions. This suggests that there is a long way to go before machines can be coded using experimental settings such as moral dilemmas.

Box 12.2 shows how machines are not neutral but are often confronted with making moral decisions that are difficult and more complex than humans making those same decisions. Human decisions can be justified, as humans cannot compute all possible outcomes in a split second; rather, their decisions are accidental and thus less prone to judgment. The other important consideration is that machine decisions are more difficult to justify, as they are written in code before being placed in the position to make a judgment. This makes the decision not only explicit, but also open to ethical scrutiny. For Green, “[t]o argue that any technology is neutral is to ignore the social and cultural circumstances in which the technology was developed, and the policy and regulatory regimes under which that technology is deployed” (2002, p. 5). The social context in which a technology is developed does not have to match the context in which the technology is later utilized. Rather, technology is a reflection of the values, goals, and norms of the society that uses it. One approach that takes this view seriously is **value-sensitive design (VSD)**, which integrates values and ethics into the design phase (Friedman, Kahn, & Borning, 2002). VSD focuses on the ethical values of individuals who are directly as well as indirectly impacted by a technology and builds on the idea that technology is not neutral because it embodies the power struggles between social groups and the societal goals that these groups pursue.

2. Technology as Human Destiny

The metaphor of destiny in relation to technology is a powerful mode of approaching humanity’s relationship to the world. During the Victorian era, the concept of destiny in relation to technology was heavily linked to the idea of progress. Inspired by Judeo-Christian historicism and Westernized interpretations of civilization, the Victorian belief in linear progress was thought to be evidenced through technology. Following the carnage of the First World War, faith in linear progress quickly evaporated. Factors such as the destructive consequences of the atomic age at Hiroshima and Nagasaki and the general increasing entrenchment of technology into the fabric of society greatly shaped the intellectual response to and surrounding discourse about humanity’s technological destiny.

Jonas (2003) argued that if in the era of Napoleon, destiny was achieved through politics, “we may well say today, ‘Technology is destiny’” (p. 14). Jonas divides technology into two distinct and separate spheres: **traditional technologies** and **modern technologies**. Traditional technologies have stationary and passive characteristics representing “a possession [and] a set of implements and skills,” while modern technologies are an active “process [and] a dynamic thrust” (Jonas, 2003, p. 14). This is similar to Heidegger’s (2010) comparison of traditional and modern technologies as seen through a hydroelectric plant on the River Rhine, which, unlike the windmills of yesteryear, transforms, controls, and manipulates natural matter in highly artificial ways. To confront the restless impulses of modern technology, Jonas argues for ethical responsibility due to “the central place it now occupies in human purpose” (1984, p. 9).

The relationship among technology, progress, and destiny also caught the interest of Canadian communication scholar George P. Grant. A fervent Canadian nationalist and philosopher, Grant's (1986) technological outlook was greatly shaped by the willingness of then-Prime Minister Lester B. Pearson and the Liberal Party to acquiesce to American requests to accept nuclear-capable warheads. Grant's broad definition of *technology* encompasses instruments and knowledge through which technology is an ontology, or mode of being connected to the nature of existence. He argues in favour of regarding technology as our "civilisational destiny" (p. 22), resulting in a view of destiny as an imposed mode of being, in which technology engulfs every aspect of society. Grant's use of the metaphor of destiny suggests that human destiny is closely linked to technological change and, to some extent, it also suggests that technology is an inevitable and central part of humanity.

For Grant (2002), "faith in progress through technology" is such an ingrained and permanent component of North American life that "[t]he loss of this faith for the North American is equivalent to the loss of himself [herself] and the knowledge of how to live" (p. 400). He also believed that technological destiny directly shapes how we represent and make sense of the world around us and ourselves. Grant (1986) is critical of the close interweaving of human subsistence and technology because as human reliance on technology increases, so consequently does the need to find technological solutions to correct and handle technological problems. As technology becomes woven into the very fabric of human existence—material, cultural, economic, and social—humans will find it increasingly difficult to detach themselves from technology and comprehend its dangers. Grant's key contribution then is to question our heavy dependence on and blind belief in technology, as for him the more our destiny is one with technology, the more difficult it is for us to step back and take a critical standpoint.

Destiny is also a central part of Heidegger's inquiry. For Heidegger (1953/2010), human destiny is not fully determined, but rather is closely linked to human agency and choice. Modern technology endangers this freedom by concealing the full reality of its true nature. Deluded into believing they are masters of technology, humans may be unaware of technology's perilous externalities and misinterpret or ignore its dangers and risks. When humans fail to be concerned about technology and do not question its hidden intentions, Heidegger (1953/2010) says, they may simply become objects of technology. This perspective represents a reversal to the framing of technology as mere human tools: technology is not an object that humans employ; instead, humans are themselves objects, part of a technological system.

Heidegger's (2010) solution to this problem is not to reject technology outright but to detach ourselves from it and extensively question its purpose and role in society—what he refers to as the essence of technology. This critical lens directly reflects his call toward viewing technology as an activity, rather than a series of artifacts designed for human means (Verbeek, 2005). Through this proposal, Heidegger supports the argument that "modern technology is not destiny imposed upon humanity, but [is] rather a manifestation of the effort by humanity to gain a measure of control over the forces of nature" (Zimmerman, 1990, p. 251).

Criticisms of Heidegger's outlook have come principally from scholars, such as Feenberg (1999), who have rejected the fatalism of Heidegger's approach. Critics point toward two problems with Heidegger's view. First, technology is neither always nor only negative for humanity. Technology can improve the human condition in all realms. Second, the view of faith in technology is simplistic and denies human agency. Critiquing Heidegger, Feenberg (1999) argues that his viewpoint produces conclusions in which "technology rigidifies into destiny . . . and the prospects for reform are narrowed to adjustments on the boundaries of the technical sphere" (p. 14). As a result, he says, Heidegger's approach allows minimal space for the development of alternative technological practices, which perhaps take into account the moral and ethical dimensions of technological use. Additional criticisms of Heidegger's philosophy of technology have been connected to his abstract language and his nostalgia for a *pastoral era* (Verbeek, 2005). Heidegger's (2010) distinction between traditional and modern technologies is useful for understanding his nostalgia. He advocates in favour of traditional technologies, which in his view do not interfere with nature. He rejects the use, and related social, political, moral, and ethical consequences, of modern technologies because he sees them as disturbing the natural equilibrium existent in nature.

The progressive betterment of humanity through technology has an appealing utopian sentiment, yet, as philosophers such as Grant and Heidegger have argued, perhaps such an ideal is also potentially fraught with naivety. If technology is a core function of humanity's destiny, to what extent is humankind able to extract itself from the force of technology? Additionally, to what degree should humans initiate a collective inquiry into the potential dangers, risks, and consequences (expected and unexpected) of a technology before its implementation?

Technological development does not always move forward; sometimes, a technology is abandoned for alternative and safer choices. In effect, human agency and societal attitudes can shape how a specific technology is used and whether or not it is discontinued.

3. Technology as Progress

Guiding our understanding of technology is the assumption that it leads to progress. This idea emerged in the seventeenth and eighteenth centuries, particularly in Europe and North America, where technology was enabling radical economic, workplace, social, and cultural change. Technology assured "liberation and enrichment on the basis of the conquest of nature which was to be accomplished through the new natural sciences" (Borgmann, 1984, p. 216). Advances in the natural sciences allowed new technologies to be developed, and these created possibilities for how people could travel, work, and spend their leisure time. An example is the creation of the railroad industry, which connected remote locations, thereby allowing for travel and hence the rapid transfer of ideas, goods, and people.

This notion of technology as progress is still deeply rooted in Western culture and continues to impact how we perceive, use, and evaluate technology. People view technology as a social and economic force and "[t]he dominance of particular technologies is often used to mark the 'progress' of modern western societies" (Hill, 1989, p. 33). These technologies become such markers of the times that we actually describe society in terms of the dominant technologies—for example, the industrial era, the atomic age, and the information society. In this view, then, technological inventions represent an improvement on previously existing technologies (Street, 1992), and progress can be achieved only if we continue to develop new technologies: without innovation, society stagnates.

Baudrillard (2005) describes technologies as objects whose value is developed through our perception of their functional or symbolic worth. In his reflections on how technology and progress are linked, he contends that "technological society thrives on a tenacious myth, the myth of uninterrupted technical progress accompanied by a continuing moral 'backwardness' of man relative thereto" (p. 133). His notion of **moral backwardness** is essential for understanding the position of individuals, vis-à-vis technology, as inferior entities who do not question the nature of their social system. Moreover, for him technological advancement does not represent progress but is characterized by a **model of regressiveness**. In his view, technological progress and failure are put at the forefront of debates, serving as a distraction from more critical engagement with technology. Hence, technology is regressive because of this myopic view that fails to question the present production system with its inequalities, power relations, and injustices.

Baudrillard's (2005) theory uses the term **gizmo** to describe technologies that do not have a clear purpose in society. He describes how a gizmo is "always an indeterminate term with, in addition, the pejorative connotation of 'the thing without a name' . . . [I]t suggests a vague and limitless functionality" (p. 123). Gizmos "serve to reinforce the belief that for every need there is a possible mechanical answer" and that "every practical (and even psychological) problem may be foreseen, forestalled, [and] resolved in advance by means of a technical object that is rational and adapted—perfectly adapted" (p. 125). Indeed, from a Westernized viewpoint, we tend to relate "the measure of civilization" to the abundance and complexity of available technologies (Street, 1992).

Additionally, the perspective of technology as progress stresses that technology is an enabler, giving people the means to fulfill their needs and wants, and it supports the idea of **technological utopianism**, in which society uses technology to create and maintain an idealized societal form (Segal, 1985). Supporters of technological utopianism have "made technological progress equivalent to progress itself rather than merely a means to progress, and they [have] modeled their utopia after the machines and structures that made such technological progress probable" (pp. 74–75).

The view of technology as progress is rather myopic, as we discussed in Chapter 3, because it does not take into account the social consequences of technology. Simply put, progress is not a one-dimensional concept; technology and its use are embedded in the reality of people's everyday lives. Moreover, the metaphor of technology as progress leads us to a set of key ethical, moral, political, and social questions:

1. Is technological change always necessary?
2. Does technological advancement improve humanity?
3. Are there unaccounted-for consequences of technology that are not always apparent?
4. Does the technology as progress paradigm reflect capitalist notions of society?

These questions require careful consideration. They point toward how technology and society intersect. From this perspective, it is only through technological progress that society can solve its fundamental economic, social, health, and ethical problems. Technology, then, is no longer an option; rather, it is human destiny because it is the only means through which humans can build a better world (Francis, 2009). As a result, people take technology for granted and no longer engage in questioning technology (Feenberg, 1999). Nevertheless, some oppose this viewpoint because, for them, technological change "threatens established ways of life" and therefore they see such change as a regressive force (Street, 1992, pp. 20–21). We must continue to explore these questions as technology becomes ever more pervasive and ubiquitous in society.

Energy Production and Consumption

At the heart of debates around technology is the understanding of energy, and its economic and political power. Modern societies rely on energy to support everyday activities as well as commerce, making the production of energy a central concern. Yet, energy production is filled with moral and ethical dilemmas. Do we produce energy cheaply even if this increases CO_2 levels and further accelerates climate change? Or do we move toward green energy at the expense of thousands of jobs? There are no easy or right answers to any of these questions. Rather, societies through public debate and policy set a direction, often with great uncertainty. In this section, we look at two broad themes linked to the energy debate: (1) energy generation and inequality, and (2) Indigenous communities and their relation to energy production and consumption.

Energy Generation and Inequality

Energy-exporting country is a term used to describe countries, such as Canada, that produce more electrical energy than they consume and therefore export their surplus to **energy-importing countries**—countries that produce less energy than

Figure 12.1 Large variations in energy consumption around the globe
Source: BBC

they consume, such as Italy. Figure 12.1 shows in different patterns electricity consumption in kilowatt-hours (kWh) per capita for countries around the globe. Figure 12.1 allows us to draw two conclusions. First, there exists large variability in the consumption of electricity across nations. Second, African countries consume, on average, relatively little electricity even today, although energy consumption in Africa has grown rapidly in the past decade and significant energy resources are produced in the region (and exported).

We may think that individuals living in energy-exporting countries enjoy unlimited access to energy. Yet, this is not the case because even within countries there exist discrepancies in access to energy. Even though Canada is an energy-exporting country, that does not mean that **energy poverty** does not exist. Energy poverty arises "when basic energy needs such as heating, lighting and running appliances become a substantial expense and burden" for a household (Green et al., 2016). Approximately 8 per cent of Canadian households spend at least 10 per cent of their income on home energy. This places enormous financial pressures on low-income families, as a large proportion of their income goes to paying energy bills. Energy poverty has been a particular issue in Ontario, as "retail electricity prices more than doubled from 2001 to 2016 (almost three times as much as in the rest of Canada) and increased 7% a year between 2010 and 2016" (Sepulveda, 2018). This put enormous pressure on low-income households, as they often paid about

8 per cent of their income to electricity up from about 5 per cent in 2001 (Sepulveda, 2018). Low-income households in the rest of Canada pay less, in 2016 they paid about $1,100 per year, a lower percentage of their income.

Even though Canada is one of the leading producers of energy in the world, there are still inequalities within the country that lead to unfair access and cost of energy, which affect in particular low-income households and communities in northern Canada. A 2017 market snapshot from the National Energy Board showed that, at over 30 cents per kWh, households in the Northwest Territories and Nunavut pay more than double the Canadian average for electricity due to the "[limited] viability of lower-cost energy infrastructure like natural gas pipelines and hydroelectric facilities" in sparsely populated areas (2017, para. 1). Energy inequalities often stem from inequitable policy, because regulation of the electricity sector occurs at the provincial level—including policies on pricing.

Indigenous Rights

In order to improve the costs of creation and transportation of electricity, several energy development projects have been suggested and implemented in Canada and the United States. However, many of these projects would have negative environmental and cultural impacts on Indigenous communities and thus have incited adamant objections from Indigenous activists and allies across both countries. One example is the **Keystone XL pipeline** project, which would transport crude oil from northeastern Alberta, Canada, to refineries in Illinois, Oklahoma, and the Gulf Coast in the United States, a route that would traverse Indigenous territories including the Fort Belknap Indian Reservation in Montana, home of A'ani and Nakoda peoples, and the Rosebud Indian Reservation in South Dakota, home of the Sicangu Oyate peoples. Indigenous communities are not alone in their resistance. Many environmentalist groups are also opposed to such projects due to potential for oil spills and increased carbon emissions. However, the most significant opposition comes from Indigenous groups who have been fighting for the right to their own land, which would be affected by these projects. The Supreme Court of Canada in 2004 ruled that governments have a "common law duty to consult, and, where appropriate, accommodate when Crown conduct may adversely impact established or potential Aboriginal and Treaty rights" (AANDC, 2009, p. 1).

Despite the opposition from Indigenous groups and environmentalists, many Canadians are pro-pipeline and similar energy development projects, often citing economic gains and job opportunities as reasons to pursue development. Bains (2013) argues that Indigenous communities could economically benefit from oil and gas development due to increased employment opportunities and revenue, which has led some Indigenous communities to support such developments. More recently, some Indigenous communities have also considered a plan in which they would become owners of the Trans Mountain pipeline with the aim of taking the project into their own hands (Bakx, 2019). Figure 12.2 shows

	Number of First Nations affected*	Percentage of First Nations**
British Columbia	56	28
Alberta	20	44
Saskatchewan	16	23
Manitoba	3	4.8

* As identified by developers in project plans submitted to the Major Project Management Office.

** Affected communities as a percentage of all First Nations communities in a given province.

Figure 12.2 First Nations Communities Affected by Proposed Energy Developments in Western Canada

Source: https://www.fraserinstitute.org/sites/default/files/opportunities-for-first-nation-prosperity-through-oil-and-gas-development.pdf; p. 2

the number of First Nations affected by various energy development projects in Canada. Northern Gateway operating in BC has affected as many as 36 First Nations. While Bains highlights the economic advantages of these energy projects, he does not outline the many negative impacts, often irreversible. In fact, Bains (2013) dismisses any negative effects, writing "despite the potential for economic prosperity, there are many First Nations communities that are opposed to resource development. Many of these First Nations have utilized the courts to delay and halt resource development" (p. 10).

Bains is not the only one who dismisses Indigenous opposition when discussing these projects. Ceccoli (2018) and Gravelle and Lachapelle (2015) do not even mention Indigenous opinion when discussing the opposition to the energy developments in the United States. Further, in an article published by the *Globe and Mail*, Wood and Rossiter (2018) point to Joe Oliver's published letter endorsing the Northern Gateway pipeline but cautioning that "there are environmental and other radical groups that would seek to block this opportunity." Wood and Rossiter argue that an effect of this was "to frame the pro and con sides of the debate as one over the environment … More importantly, it suggested the opposition to the Northern Gateway pipeline was from environmentalists, period. This obscured the opposition of Aboriginal peoples." Gravelle and Lachapelle (2015) found that "in the case of Keystone XL, local framing of economic benefits appears to have outweighed counter-frames regarding risks" (p. 106). When presented with environmental concerns, people were often swayed towards the positive effects of the Keystone XL pipeline rather than the negative. Although Gravelle and Lachapelle do not mention Indigenous opinions explicitly, some of the Indigenous arguments against the pipeline would fit into "local framing" that they argue would be a more effective argument against the pipeline. Therefore, dismissing these Indigenous perspectives underrepresents the negative implications of energy development projects such as the Keystone XL pipeline.

Further, respecting Indigenous rights does not mean that we cannot advance energy development in Canada. Fontaine (2017) explains that "while some [Indigenous groups] vow to stop [the pipeline project], others want to ensure development doesn't trample Indigenous rights" (para. 3). Some Indigenous nations are worried about the negative effects of the project, such as the potential to "pollute the rivers" and the "impact on the air." There is good reason for the resistance, as many past projects demonstrate a poor track record, promising taking precautions against oil spills yet taking little initiative when a disaster occurs. For example, an oil spill of about 43 barrels of crude oil near St. Louis, Missouri, probably originated from TransCanada Corp's Keystone pipeline (Nickel & Kumar, 2019). How to handle and mitigate the long-term negative effects of oil spills are still unclear, putting not only the natural environment at risk, but also potentially causing many health consequences to nearby communities. In Murphy (2016) writes about Joe Dion, a Cree man from Frog Lake, Alberta, who is "pro-pipeline;" however, "Mr. Dion says projects have to be built in a way that is respectful of affected communities and with the environment in mind, and he understands the US tribe's concerns the project would threaten their water source." It is becoming increasingly important to develop energy projects that can reach communities that are currently living without electricity. However, the implementation of these energy projects needs to respect the individuals living on the land and put regulations in place that guarantee vulnerable populations and their environments are not at risk.

Electronic Waste

The ethical debates around technology need to go beyond issues of adoption and use. As discussed earlier in this chapter, it is central to gain knowledge of how the social and technological intersect. But it is also important to consider the ethical implications of what happens to our gadgets when they are broken, obsolete, or simply no longer fashionable. Most users do not think about their gadgets/electronics after they have discarded them, but many materials that compose electronics are either toxic or nondegradable. This waste is often exported to other countries, such as China, that are poorly equipped to deal with toxic materials. This creates enormous ethical challenges that are not sufficiently taken into account by the countries where the waste originates.

Electronic waste, also called e-waste or waste of electric and electronic equipment (WEEE), refers to scrapped electric or electronic devices. It comprises a wide range of discarded household and commercial technologies, including computers, cellphones, televisions, and batteries. Trends such as globalization, development, population growth, and declining retail prices have caused a steady rise in the amount of electronic waste produced annually. As electric and electronic devices are manufactured more cheaply and sold at lower costs, they become more disposable, and people opt to purchase new devices instead of having old ones repaired or upgraded. Moreover, rapid technological advances encourage consumers to replace outmoded or obsolete technologies frequently.

At least 20 million tons of household electronic waste is produced globally every year (Zoeteman, Krikke, & Venselaar, 2010), and recent estimates of total WEEE production worldwide suggest that the figure is closer to 40 million to 50 million tons (Khan, Lodhi, Akhtar, & Khokar, 2014). While much of this is reused, refurbished, or recycled, much is also dumped in landfills or incinerated. Of special concern are the millions of tons of electronic waste exported from developed countries to China, India, and other developing nations (Terazono & Yoshida, 2013; Zoeteman et al., 2010). It is often children and vulnerable populations who work to take electronics apart, sort them, and redistribute them for recycling. This work is not only labour intensive but is conducted under poor conditions, often in open dump sites, without proper protective gear (e.g., masks or gloves). Many of these countries do not have the resources available or policies in place to properly handle large amounts of electronic and toxic waste; consequently, hazardous substances contained in the discarded technologies are left to contaminate terrestrial and marine ecosystems. Canadian photographer Edward Burtynsky's (2006) documentary *Manufactured Landscapes* shows this waste, using photos to show the changes that result from industrial work and manufacturing waste in China. The photography and the movie are a social analysis of how landscapes shape people's lives and how our heavy reliance on electronics has left a permanent mark on both the landscape of China and its people.

Electric and electronic devices contain many materials that are potentially harmful to humans and other organisms, including brominated flame retardants; heavy metals such as lead, cadmium, and mercury; and radioactive substances such as the isotope of americium used in some smoke detectors (Goosey, 2009). These cause little harm when properly recycled or discarded but can otherwise pose serious environmental and health risks. Decisions concerning the disposal of electronic waste thus have an important ethical component. Though WEEE remains a serious problem, potential solutions have been raised and in many cases implemented. For example, restrictions on the kinds of materials that may be used in electronics manufacturing limit the number of toxic substances in technologies that will eventually be thrown away (Goosey, 2009). High-level recovery systems ensure that more devices are reused and refurbished (Zoeteman et al., 2010). International co-operation in developing agreements and policies to facilitate ethical and sustainable disposal of WEEE will also necessarily play a role in mitigating the dangers of electronic waste (Khan et al., 2014).

An innovative way of increasing awareness of the issues surrounding electronic waste is the WEEE forum. Its website, http://www.weee-forum.org/, invites individuals to participate in a range of activities, including an International E-Waste Day. Another key initiative is StEP, which has multiple projects in the

Ghanaians working in a large electronic waste dump in Agbogbloshie, a suburb of Accra, Ghana.

Source: "Agbogbloshie" by Marlenenapoli—Own work. Licensed under CC0 via Wikimedia Commons—http://commons.wikimedia.org/wiki/File:Agbogbloshie.JPG#/media/File:Agbogbloshie.JPG

works, including an interactive world map that shows statistics like e-waste generation and disposal.

Initiatives like these are a stepping stone toward greater awareness and the development of initiatives to ethically address the problem of electronic waste.

A Society of Overload

Have we reached a society of overload? What does a society of overload look like? And how can we address problems resulting from overreliance on technology? These are not easy questions to answer. For example, what to some may seem excessive reliance on technology may simply seem to others like normal, everyday use. A study of Canadian students in Grades 7–12 found that they spend three hours or more per day in front of an electronic screen in their free time (Boak et al., 2018). At the age of two, the children were clocking up around 17 hours of **screen time** per week. A study of young children in the UK found that five-year-olds spent about one hour per day in front of screens (Madigan et al., 2019). This demonstrates how varied technology use can be. There are also variations in how this usage is interpreted. The social norms that a society develops around technology use are critical in how members of the society evaluate how others make use of the technology and what meaning members give it. For instance, going on a date and constantly checking updates on a cellphone may be perceived as rude, while engaging in the same behaviour when going out for dinner with friends may be seen as normal and even expected. That is, social norms specific to a local or social group arise that dictate what is perceived as acceptable and what is deemed improper, and these vary considerably from one social context to another.

One central theme of this book has been that technology alone does not lead to social change; rather, change involves a coming together of multiple factors. When we look at how and why our technologies lead to feelings of being overwhelmed, a complex picture emerges. We obtain some insights into what makes life more demanding from Brigid Schulte's book *Overwhelmed* (2014), discussed in Chapter 7, in which she describes her busy life, constantly rushing from one thing to another. She is constantly juggling different demands, trying to give her best, and integrating technology to be available to her family and to meet work demands, which, as a reporter for the *Washington Post*, are high. Schulte's hectic lifestyle is common among North American working adults and perhaps more heightened in working parents as there are many factors, among which technology is a central one, that together create this sense of overload.

One important factor is the widespread use of mobile technologies that tether us to our work, family, and friends 24/7. We have, as a society, now reached unprecedented levels of connectivity not only with more people through interactions with weak and strong ties, but also with more diverse networks consisting of faraway contacts, virtual communities, and contacts and social groups (e.g., "fandoms") on various social media platforms. Hence, people increasingly need to juggle different spheres of life—work, family, social circles, and activities—while playing a different set of social roles in each. Sociological theory has described these changes as part of social practices common in postmodernity; according to Harvey (2000) and Thrift (1996), what has taken place is a **time–space compression** resulting from heavy reliance on technology that allows for interactions and the flow of information to occur at a faster pace and without constraints of distance. The smartphone is an excellent example of a technology that facilitates both time and space compression, as we can, through various apps, connect with our contacts instantly anywhere in the world. The time–space compression concept describes how our societal practices, social norms, and expectations change the qualities of and interactions between time and space. As a result of these changes we see greater integration of different parts of the world, extending the effects of globalization.

Technology alone, however, is not responsible for overload. Women have moved since the 1960s into the work force and this trend, coupled with others such as increased productivity demands, congested cities, and greater reliance on always-on communication technology, has created enormous time pressures, changed social roles in the home, and put more demands on families. Couples now share household responsibilities, and as such there is, somewhat ironically, less time for either the home or work. Schulte's feeling of being overwhelmed and exhausted is clearly shared by many parents. But it is also a reflection of a more fundamental shift in society: modern citizens struggle to find time for themselves and as a result often feel rushed, unsatisfied, and perhaps even unproductive despite their never-ending busyness (Nowotny, 1994).

Another trend resulting from our fast-paced information society is what is referred to as **information overload**. Information overload describes the inability to effectively make decisions because of too much information. In some cases, more information is not necessarily better; rather, it incapacitates a person and impedes rational decision-making. In a digital society, where we are constantly both accessing and sharing information, we can quickly feel overwhelmed with the sheer amount of information available. We discussed in Chapter 1 fake news and misinformation, both consequences of vast amounts of information flooding the Internet without sufficient time to properly fact-check the information and consider its informational value.

Central to these changes is what scholars are referring to as the commodification of free time. In this view, exploitation took place under Fordism at the workplace, but workers were given complete autonomy in determining their leisure time. That is, leisure time was a discrete unit that was unpaid and therefore free of labour. Through the availability of information and communication gadgets, however, this clear division of the workplace and leisure time has collapsed. Worse still, time for leisure in our current networked, technology-driven information society appears to be shrinking rather than expanding: time is split among household demands (e.g., child care, house cleaning, shopping, cooking) and work-related tasks. If there is an emergency at work or a pressing deadline, multitasking can be a good way to fulfill demands in multiple spheres. An example of this occurs when a parent is at home taking care of their children and receives a text message from work indicating that their input is required on an important project. Rather than having to quickly arrange child care and go into the office, they turn on their computer or make a phone call and complete the work-related task from home. In this case, technology is advantageous for both the workplace (the team gets the information they need to complete the project) and the parent (who doesn't have to sacrifice time with their children). But it also adds to the stress level of working parents by blurring the boundary between work and home. Gardiner (2014) describes this shift from an industrial society to one in which the boundaries between work and home have become porous:

> In the contemporary setting, however, capital instigates a far-reaching process of "deterritorialization", wherein formerly discrete activities and social spheres are integrated into the demands and rhythms of production itself. Capitalism now produces not only the conditions of the workplace, but the general social relations in which workers live and raise their families. Hence, the contemporary worker is involved in production not only as a labouring body but as a much broader "social subject", which far exceeds the hours they spend in the workplace itself. (pp. 34–35)

Life occurs at a much more rapid pace as information travels instantaneously through social media on a global scale, and daily rhythms are faster with people able to coordinate with multiple networks in real time (Agger, 2004; Giddens, 2013). The concept of **deterritorialization** describes how in a networked society we observe collisions of social spheres and social roles.

A central question that needs further investigation, then, is whether or not technologies are helping us manage time more efficiently (i.e., our schedules and assignments), or if they are only exacerbating our feelings of busyness and our stress levels. While being always on and available may be good for business productivity, it can take a toll on family relations and potentially lead to stress.

One interesting finding is that people tend to underestimate how much time they spend on various activities. It is particularly difficult to determine how much time we spend online, for example, searching for information, reading the news, or checking our social media accounts. This has particularly affected young people who spent many hours in front of a screen, referred to as screen time. Based on a review article, screen time was associated with negative **mental health outcomes** such as depression, loneliness, aggression/hostility, ADHD, suicidality, and anxiety (Dickson et al., 2018). The worrisome negative outcomes of screen time have led to the development of new policies to help guide parents, caregivers, and doctors in establishing appropriate technology routines for children and youth (Davies, Atherton, Calderwood, & McBride, 2019).

Determining how much time one spends on social media sites is a first step toward more effective time management. Spending time away from technology doing other activities such as hiking or reading is another solution. Ironically, some of the latest and most popular gadgets available on the market are geared toward managing and reducing technology-induced stress. Box 12.3 discusses two of these.

Box 12.3 The Latest De-stressor Technologies

As the pace of life continues to accelerate and the number of apps available incrementally increases, people's stress levels also continue to rise. Stress may seem like a passing state of mind, not to be taken too seriously, but the World Health Organization (WHO) reports that it costs the US economy alone $300 billion USD a year. In Britain, about 10.4 million days a year are lost due to stress-related absences by employees. Stress can also be linked to problems like depression, anxiety disorders, and insomnia. The most recent gadget to help individuals regulate their stress is called Calm, a meditation, sleep, and relaxation app. The app creates audio content that is meant to strengthen mental fitness and tackle stress, anxiety, insomnia, and mood changes. It contains bedtime stories for adults, sleep music, meditation lessons, and nature sounds. Calm launched in 2012, and was chosen as Apple's iPhone app of the year in 2017. A similar app, Headspace, is a guided meditation app that

continued

was launched in 2010. The app is set up in a series of mediation sessions; users complete one session a day for ten days. There are six series: foundation, sport, health, relationships, performance, and Headspace Pro. There is also a subsection dedicated to younger users, geared to toddlers and preteens. Apps target a large market of individuals who are struggling with managing daily stressors and who see technology as part of the solution.

Box 12.3 describes different gadgets geared toward reducing stress induced by heavy reliance on technology. As we have discussed, this dependence comes at a price, namely increased stress, which has consequences for both physical and mental health.

Often, the label "addiction" is used to describe both the urge to constantly check devices and excessive video gaming in. New technologies, such as Calm, and Headspace, have been developed to help individuals reduce their stress levels and cope with their addiction to cellphones and apps.

Conclusions

In contemporary society, technologies and technological systems are embedded in the functions of our daily lives. Our interactions with these devices have become almost second nature—to the point that we think nothing of the interplay between ourselves and devices as seemingly mundane as toasters, coffee makers, televisions, and computers. Since the beginning of the Industrial Revolution, people have viewed technical advancements as a mark of progress at both a technical and a social level. These devices have increasingly become more complex in their design and functionality.

Some consider technologies to be neutral—passive tools and techniques humans use to fulfill specific goals or needs. Others have strongly argued that the view of technologies as neutral entities is unrealistic and does not take into account the social, political, and cultural values and intentions of the creators of particular technologies.

For theorists such as Martin Heidegger, a key to understanding the problems of technology in the past was to be found in our ability to remove ourselves from technological objects and systems; to stand back and question technology's role in society. But is this even possible in modern society? Certainly, most people do not question the role and purpose of a technology unless that technology personally affects them in a profound manner. For example, the raw emotion brought on by a school shooting or a nuclear disaster is often a powerful catalyst that spurs an examination of the technologies involved.

There are a myriad of ethical questions that result from our reliance on technology. These range in nature from the ethical use of tools within specific social groups to the ethical and material implications of our technological waste. Technology also expends large amounts of energy resources, the production of which has significant environmental impacts, from the direct devastation of oil spills to the long-term effects of climate change. Despite the social and environmental consequences of electricity consumption, society's heavy reliance on a myriad of tools exacerbates the unequal living conditions of the energy poor. As technology becomes further entrenched in the modus operandi of our twenty-first-century existence, humans must examine the short- and long-term effects of our relationship to technology. We do not call for a rejection or an abandonment of technology, but rather for a measured evaluation of technology in order to maintain a healthy social, economic, and political relationship between ourselves and technology. As technologies continue to evolve, they present new and unknown challenges that require careful consideration and scholarly investigation.

Questions for Critical Thought

1. Discuss the key arguments in favour of and against the neutrality of technology.
2. What are the problems underlying the metaphor of technology as progress?
3. Is it possible to critically examine technology if it is an intrinsic part of humanity's destiny? Provide three arguments to support your viewpoint.

Suggested Readings

Crary, J. (2013). *24/7: Late capitalism and the ends of sleep*. London, England: Verso.
This critique of late capitalist societies points out that social and natural rhythms have become subsumed under the machine-like structure of a society in which people are expected to be available all day, every day.

Leben, D. (2019). *Ethics for robots: How to design a moral algorithm*. New York: Routledge.
The author argues for establishing means for evaluating robots in terms of how effectively they accomplish the problem of co-operation among self-interested organisms.

Rutkowski, A. F., & Saunders, C. (2019). *Emotional and cognitive overload: The dark side of information technology.* New York: Routledge.
In this book, the authors argue that information technology use has a dark side that results from overload in information and addiction.

Shaw, K. (2019). Trolley dilemmas shouldn't influence self-driving policies. *Robotics Business Review*. Retrieved from https://www.roboticsbusinessreview.com/unmanned/trolley-dilemmas-should-not-formulate-self-driving-policies/.
This article interviews authors of a paper that criticize the approach used in MIT's Moral Machine, arguing that it is too contrived and does not represent a real model of decision-making around safety.

Online Resources

12 Free Apps to Help You Beat Stress
https://thiswayup.org.au/12-free-apps-to-help-you-beat-stress/
Provides a brief overview of apps available on the market for free that help with stress and technology overload. The apps range from those that provide guidance in meditation and relaxation techniques to apps that help you control your technology overreliance.

Centre for Ethics and Technology
www.ethicsandtechnology.eu/
Based in the Netherlands, the 3TU Centre for Ethics and Technology is a research-oriented collaboration by three Dutch universities dedicated to the study of ethics in science and technology. The site contains a publication database, areas of research, and a list of key members.

UNESCO's Ethics of Science and Technology Programme
http://en.unesco.org/themes/ethics-science-and-technology
Created with the establishment of the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), this site documents UNESCO's attempt to create a dialogue for understanding science and technology within an ethical framework.

What Moral Decisions Should Driverless Cars Make?
https://www.ted.com/talks/iyad_rahwan_what_moral_decisions_should_driverless_cars_make?language=en
In this TEDx Talk Iyad Rahwan from MIT discusses the many moral dimensions that arise from driverless cars being on the roads and how his team collected data globally on people's opinions around what ethical decisions machines should make in varying social contexts.

Interactive Activities

Activity 1: The Moral Machine: Impossible to Make Decisions for Driverless Cars

MIT's Media Lab has developed a Moral Machine to gain insights into people's opinions around the ethics of machines. The website provides an overview of how individuals think machines should make decisions when faced with moral dilemmas. The Media Lab asked people around the globe to participate in their moral dilemma experiment to map opinions around the globe. The game has been discussed in all the major newspapers and Professor Iyad Rahwan describes the moral dilemmas programmers confront when coding driverless cars in his TEDx Talk entitled "What Moral Decisions Should Driverless Cars Make?" To help program driverless cars, participate in the Moral Machine dilemma at http://moralmachine.mit.edu/ and answer the following questions.

1. Did you find it difficult to make moral choices on behalf of driverless cars?
2. Why do you think it is so difficult to program driverless cars even when fatal accidents happen on roads every day? What is different when humans are driving in contrast to machines.
3. Finally, do you think it is a good idea to design moral dilemmas like MIT's Moral Machine to help program machines?

Activity 2: Digital Relaxation Techniques: Are They Effective?

Download the app Calm on your mobile phone. The app has a free trial that allows you to test how it works. Try to use Calm for these following three activities:

- Use it for doing one meditation session a day.
- Use it for relaxation before going to sleep.
- Use it when you start feeling stressed, as a destressor.

After using the free trial, consider the following questions:

1. Does Calm work to achieve greater relaxation?
2. How would you rate the app on a 1–10 scale in terms of its efficacy in achieving greater relaxation? What could be improved?
3. Did you find that you wanted to use Calm regularly, but your life turned so busy that you were not able to engage in the relaxation time even though you intended to?
4. Overall, is it a good idea to use technology as a way to destress or do you think that yoga or going for a run are better ways of destressing?

Glossary

access to the Internet When an individual has a means to connect to the Internet, either through a computer or another digital tool. Several different means of accessing the Internet exist, including Ethernet, dial-up, and wireless (WiFi).

actant A non-human actor who engages in relationships with human and non-human actors.

actor A person or entity bearing the capacity to (inter)act independently within society. The term *agent* is analogous.

actor network theory (**ANT**) A sociological theory popularized in the 1980s by scholars Latour, Callon, and Law, which examines relationships between actors and envisions the world as a series of continuous and related webs.

adhocracy Where individuals or teams are assembled as they are needed to solve narrowly defined, short-term problems instead of having permanently assigned roles and functions based on organizational charts.

adoption (or **technological adoption**) The decision to use an innovation in order to facilitate the achievement of specific goals.

agrarian societies Social groups whose livelihood is primarily sustained through agricultural means.

Agricultural Revolution (or **Agrarian Revolution**) The shift from a Paleolithic diet to a period based on cultivated foods.

algorithm A problem-solving method used in mathematics and computer science expressed in the form of a series of instructions.

alienation A term used to describe the feelings among workers who, due to the standardization of their craft, begin to experience disconnection with and apathy toward their work duties.

alone together When two people, typically a romantic couple, are with each other with no other party present.

angel investors Individuals who provide capital investment for initiating technology businesses and in exchange become shareholders of the company or receive some form of repayment over time.

Anonymous A network of individuals who come together for a purpose or goal. They often share similar ideas and use the Internet to make their views known.

applied research Research conducted with the aim of acquiring new knowledge, with the intention to address or solve practical problems.

armed drones Aircraft that have no human pilot, they are unmanned combat aerial vehicles (UCAV) and usually armed.

artifact An archaeological term describing any object used, constructed, or modified by a human.

artificial intelligence (**AI**) A branch of computer science dedicated to designing machines capable of resembling or outperforming human intelligence.

augmentation The ability to supplement the physical human body by connecting it to digital components with computational capabilities.

automation The use of technology to complete a process or procedure with little human intervention.

automatization of power Foucault's term to describe how surveillance can be used to enforce self-control.

autonomous The capability of a technology to independently act within a selected environment. Within this view, technology is guided by its own internal logic, which directs and shapes social interactions and systems of thought.

autonomous Marxism Also known as autonomism, this branch of Marxist theory emphasizes workers' ability to self-organize with the aim of creating changes in the workplace and throughout society at large.

autonomous technology theories Philosophical or sociological approaches based on the belief that humans have little choice in deciding how a technology will evolve and diffuse in society. Technological determinism is an example of an autonomous technology theory.

autonomous vehicles An automated vehicle that can guide itself without the need for a human steering at the wheel.

awareness knowledge Attained through awareness of the existence of a particular technology or innovation.

backstage The elements of an individual's identity that are not revealed to the public but, rather, remain private.

basic research Scientific inquiry aimed at the development of knowledge about the world.

Big Brother A fictional character in George Orwell's novel *Nineteen Eighty-Four*. Big Brother, the dictator of the totalitarian state of Oceania, has come to represent control and surveillance for the purpose of maintaining power.

Big Brother A reality-TV show that has been broadcast in about 70 countries. Participants live in a house with minimal technology, and one of the housemates gets booted off the show every week.

black box of design A term used to describe how the unfolding of technological invention and development is difficult to observe.

blogs Originally referred to as Web logs, a blog is a type of website or a portion of a website that typically contains personal or informal views, media, and commentaries, which are displayed in reverse-chronological order.

body erasure The neglect of considerations related to the body in the design and use of technology.

bonding social capital Connections to those individuals in our networks that we feel close with, facilitating the exchange of resources.

bourgeois public sphere A term coined by Habermas for the public spaces of debate that existed historically in the late eighteenth and early nineteenth centuries in European coffee houses and other public spaces.

breakup 2.0 The dissolution of a romantic relationship and the role played by Web 2.0 technologies, such as Facebook, Twitter, and Flickr, during and after the dissolution.

bridging social capital Connections to individuals that we are not close to, but that we know and can rely on for the exchange of resources.

broker A person who buys and sells items or services for another party.

bureaucratization A social system that allows organizations—both public and private—to achieve their goals through the implementation of rules, norms, and values.

Cambridge Analytica A British political consulting firm that accessed information about 85 million Facebook users in order to target political advertisement.

Canada Media Fund (CMF) A not-for-profit corporation that fosters, promotes, develops, and finances the production of Canadian media content.

Canadian Advanced Network and Research for Industry and Education (CANARIE) An ultra-high-speed network connecting Canada's researchers, educators, and innovators nationally as well as to global data, technology, and colleagues.

Canadian Radio-television and Telecommunications Commission (CRTC) Canada's regulatory body, which oversees all telecommunications including radio, television, and new media.

Canadian Security Intelligence Service (CSIS) A national intelligence service responsible for collecting, analyzing, reporting and disseminating intelligence on threats to Canada's national security.

capitalism An economic system where the means of production are privately owned.

care structures Digital spaces that provide social support and help transgender individuals adapt to hostility and challenges in everyday life.

CARL A telepresence robot introduced by Orbis Robotics that uses Skype to allow real-time remote participation in a funeral service.

chatterbots Computer programs designed to simulate a conversation with human participants through textual or aural means. See also *intelligent agents*.

China's Great Firewall The technological and social mechanisms used by the Chinese government to control the flow of information via digital networks in mainland China.

C-Leg A prosthetic knee-joint system, using hydraulic components, that can adjust itself to the changing speed and walking conditions of its user.

clickbait Often sensationalized content online, the goal of which is to get people to click a link to a webpage.

clicktivism A type of activism that involves minimal effort, such as sharing something on social media.

closure Occurs when a social group has finalized experimenting with a new tool, as no new meanings or uses are ascribed to this artifact.

code A system comprising symbols and rules for representing information or instructions in a way that a computer can read and use.

collective conscious the social norms, social roles, and expectations that bound people together in societies characterized by organic solidarity.

community A social unit sharing a commonality, such as social norms, values, customs, identity, or location.

Community Access Program (CAP) A Canadian government initiative, administered through Industry Canada, aimed at providing Internet access and skills for rural Canadians.

community-liberated view Where community life is not lost but has changed with people socializing outside their local neighbourhoods and their immediate family ties.

community-lost view Sees industrialization as responsible for a decline in the prosperity of community.

"community question" Addresses issues around how community has changed over time.

community-saved view Where friendship and family ties continue to exist and form close-knit clusters similar to those found in the pre-industrial era.

compatibility The extent to which an innovation fits with a social group's existing norms, values, and attitudes.

complexity A characteristic in the model of adoption that describes the level of proficiency people need in order to understand how a particular technology works.

confirmation stage The period in which potential adopters continue to seek out information about an innovation in order to ascertain whether or not they have made the right decision.

context collapse The lack of context that exists on social media, for example, tweeting a friend on Twitter is the same as addressing everyone with access to Twitter.

cool media A term used by McLuhan to describe forms of media that require greater effort on the part of the viewer to understand the content and determine meaning.

Cop Watch Social groups primarily in the United States and Canada that see their mission as observing and documenting the activities of the public police to prevent misconduct and unnecessary force.

core team A cohesive group of programmers who work closely together to develop a software product.

counterpublics Discursive spaces aimed at the transgender community which provide feelings of belonging and affiliation.

counter-surveillance An umbrella term used to denote any form of resistance against surveillance, and includes ways of evading surveillance by the state, increasing awareness of state surveillance, and acts against the mainstream forms of surveillance.

creative class Individuals that possess a high degree of education, skills, and creativity.

creative destruction A term Schumpeter uses to summarize the social, economic, and cultural transformations that occur as a result of innovations.

creative processes The term Schumpeter uses to describe the design, development, and implementation of new technologies.

creeping The act of looking at others' profiles, wall posts, and pictures on social network sites, such as Facebook.

critical problems In the context of system theory, these are complex problems that require socio-technical solutions.

crowdfunding The practice of raising money from a large number of individuals for a proposed idea, project, or other pursuit, most commonly through websites dedicated to supporting crowdfunding initiatives.

crowdwork (microtask) The employment of people by websites to complete low-level repetitive tasks (such as data entry or transcribing), where individuals are paid by each piece of work they complete.

cultural capital These are resources and status attained through our education, knowledge of culture, and understandings around social norms. A person's cultural capital defines their belonging to specific social groups (including class) and allows them to make claims around identity.

cyberbullying Acts of bullying as they occur in cyberspace.

cyber bystanders Witnesses to cyberbullying incidents.

cyberstalking Following obsessively the activities of a person on the Internet via, for example, social media.

cybertariats Presented by Huws as individuals who are employed in basic data-entry jobs for minimum wage.

cyber victim A person that is the victim of a cyber-crime, a crime committed online, such as cyberbullying or harassment.

cyborg A being or entity containing both artificial and biological components that are seamlessly connected.

cyclical fluctuations Schumpeter's term to describe changes in the economy resulting from innovations appearing simultaneously in clusters, instead of being spread over a longer period of time.

decision stage A period featuring the activities that lead toward the adoption or rejection of an innovation.

deconstruction of work tasks Breaking a work task into its simplest components and laying out the most efficient method for doing each task.

dehumanization A concept frequently featured in the work of Ellul that refers to the manner in which technology has engulfed every level of society and human existence at the latter's expense.

democratic divide Describes the differences in political engagement of those who have access to the Internet and those who do not.

deskilling The elimination, reduction, or downgrading of skilled labour because of the introduction of technologies within the workplace.

deterritorialization A situation that arises when social spheres blend, and activities that were separated before by time and space become more closely integrated.

developed country (or **nation**) A term used to describe a nation with a high level of social, technical, industrial, material, and economic development. A list of developed countries can be found in the *International Monetary Fund's World Economic Outlook Report*, April 2010.

developing country (or **nation**) Nations with a low level of material well-being and lacking a high level of social, technical, industrial, material, and economic development. The term is not to be confused with *Third World countries*, which historically has a very different meaning.

diffusion of innovations The study of the adoption and spread of technological innovations in society, or segments of society, over time.

digital citizen A person using information technology in order to participate in social and political activities.

digital divide Describes discrepancies between social groups in access to, use of, and empowerment by networked computers and other digital tools, such as cellphones, PDAs, and MP3s. The term also can encompass differences in skill level and knowledge about digital artifacts.

digital immigrants The generation that did not grow up with the Internet and only started using digital technologies in their adult years.

digital natives A term used to describe people born during or after the development of digital technologies who have correspondingly grown up with a knowledge and familiarity of digital technologies.

digital public sphere Public spaces formed online to help citizens organize and mobilize.

digital redlining Creating new inequalities and perpetuating old ones between racial, cultural, and class groups through the use of digital technologies, digital content, and the Internet.

digital revolutionaries Protest leaders who use the Internet as a tool to organize protests and inform and mobilize citizens.

discipline A central concept in Foucault's analysis of power. He describes discipline as the technique used against individuals to exercise power as well as the actual instruments used to enforce it.

discontinuance The rejection of a technology or innovation after initial adoption and previous use.

disruptive technologies These are technologies that are responsible for transformative social change.

domain of common concern The idea that in the public sphere discussions should centre around topics that are of interest and relevance to a wide range of individuals.

domestic science movement The study of the relationship between individuals, families, communities, and the environment in which they live.

drama An interpersonal conflict which can be performative in nature, taking place in front of an audience, either in-person or online (such as on social media).

drone swarms A colony of armed drones that act in a coordinated fashion.

dystopian perspective The belief that technology has a destructive or negative influence on society. This can include the re-organization or changing of social or labour practices through the imposition of technology.

dystopian perspective of the Internet Predicts negative social consequences as a result of Internet use, in particular the weakening of social relations and communities.

ease of invention Describes the extent to which an innovation can be easily discovered based on existing knowledge. Some inventions are difficult to discover because they require not only complex knowledge in an area but also the combination of knowledge from distinct areas.

economic opportunity divide Reflects beliefs and attitudes that individuals have about the advantages provided by access, such as finding a job, obtaining health information, and being able to take an online course.

e-Lancers A freelance worker that works for different employers at various times rather than being permanently employed by one person/company and who provides their services over the Internet.

electronic waste (WEEE) The electronic components that need to be disposed of after a device has been thrown out.

energy-exporting country Countries that produce more energy than they need, and therefore export their excess energy to other countries.

energy-importing country Countries that produce less energy than they need, and therefore import energy from other countries to sustain their country's energy use.

energy poverty The lack of access to modern energy services.

Enlightenment An intellectual movement that started in Europe in the late seventeenth and eighteenth centuries and embraced individual thinking over tradition and custom. It questioned in particular religious beliefs and promoted the advancement of knowledge through the scientific method.

ethics Moral principles that govern what is considered "good" or "bad" behaviour.

evolutionary model of technological development An idea proposed by George

Basalla, which suggests that new technologies arise from earlier sources, rather than from mere ingenuity.

experimental development Systematic research based on existing knowledge that aims to develop new or improve existing materials, products, or processes.

exploitation The unbalanced relation between labour and profits, where the proletariat's work is taken advantage of as they obtain only a fraction of the gains made from the sale of the products they manufacture.

fake news A type of news that contains false information but presents itself as if the information is correct.

Federal Communications Commission (FCC) An agency of the US government in charge of regulating interstate communications by radio, television, wire, satellite, and cable.

feedback-seeking The behaviour of seeking feedback, either informal or formal, from employers, co-workers, or teachers.

First Mile Project The development, use, and engagement with broadband systems by First Nations to deliver a wide range of services to their communities.

Five Eyes (FVEY) An intelligence alliance comprising Canada, the United States, Australia, New Zealand, and the United Kingdom.

Fordism Refers to a system welding the principles of scientific management to standardize work processes.

Fortnite Developed in 2017 by Epic Games, Fortnite is an online survival video game where 100 players fight against each other until there is only one player left.

French Revolution The social and political upheavals that took place in France in the late eighteenth century, demarking the loss of power of the monarchy and church.

friendship Voluntary and informal relationships established between two or more parties who have interacted socially with one another. Whereas traditional friendships occur between friends who have shared localized experiences together, contemporary friendships may develop across a virtual sphere between individuals who interact via the Internet.

future privacy concerns Privacy concerns that occur long after the disclosure of personal information online.

gatekeepers Individuals who bring information about a new innovation or technology into a social group.

Gemeinschaft Generally translated as "community" and refers to a cohesive social entity that is united by pre-existing social bonds.

gender The complex characteristics that correlate to masculinity or femininity; gender could be referring to biological sex, gender roles, or gender identity.

gender identity An individual's personal experience of their gender which might not correlate to their given sex, and could exist along a spectrum of identities in-between or outside of male or female.

gender resegregation A situation that occurs when women are assigned to jobs that are perceived as more feminine, while jobs performed by women are labelled as "women's work."

gendered socialization The ways in which characteristics that are considered feminine or masculine are taught to girls and boys respectively.

germ theory The theory that diseases are caused by the invasion of the body by microorganisms, which are too small to be seen without a microscope.

Gesellschaft Translated as "society" or "association" and describes the coexistence of individuals who are self-serving units and come together because of an overarching goal.

ghosting A method of ending a relationship, usually non-serious, with someone by suddenly ending all communication without explanation.

giant magnetoresistance (GMR) An effect that occurs in magnetic materials ranging from nanoparticles over multilayered thin films to permanent magnets, which is used to read and write information in hard drives.

gig work Any paid activity or tasks that is outsourced using an online platform to a "surplus population" of qualified workers.

gizmo Baudrillard's term to characterize a technology that lacks a meaningful purpose within society.

global cities Cities with significant influence or impact in global affairs deriving from acting as a central locale for economic markets, innovation, production, or diplomacy.

global digital divide Differences in access to the Internet and other digital tools among nations and regions.

globalization The move toward the interconnectedness of human affairs—economic, cultural, social, and political—transcending national boundaries, governments, and laws.

Global North Used to refer to economically advantaged, politically stable, population stable countries that benefit from globalization.

Global South Used to refer to economically disadvantaged countries (or developing countries), or spaces and people negatively impacted by contemporary capitalist globalization.

global village A term popularized by McLuhan to describe the possibility that electronic forms of media and communication have compressed spatial distances by enabling people to remain connected to activities and individuals throughout the world.

goal A term used by Heidegger to represent the desired end product to which an act is originally directed.

graphical user interface (GUI) A computer program that allows the user to interact with a computer using visual elements such as symbols, menus, or icons.

grassroots movements The use of collective action from a specific community to effect change for a political or economic movement.

green revolution An unprecedented growth occurring in the 1960s in the production of food resulting from R&D and technology transfer, primarily affecting developed nations.

gross domestic expenditure on R&D (GERD) A measure the OECD uses that takes into consideration the total expenditure (current and capital) on R&D accrued by a nation over a one-year period, including expenses by companies, research institutes, universities, and government laboratories.

hack-a-thon An event where computer programmers and others interested in software, graphics, and interface design get together for collaboration on a software project.

hacktivist groups Networks of activists on the Internet that engage in protest, activism, and civil disobedience (sometimes criminal) through the use of computer networks, codes, and other digital means.

haves and have-nots In connection with the digital divide, the "haves" relate to those who have the ability and the skills to access information and communication technologies, while the "have-nots" relate to those who, while lacking the ability to access these technologies, may demonstrate an interest in obtaining the skills related to information literacy or technical competence.

hegemonic elite A dominant political, social, economic, or cultural group that exerts power and influence over the remaining members of a society.

hierarchical observation Describes how people's behaviour can be controlled through simple observation by those in positions of power.

hierarchical organizations Entities or organizations that operate using a systematic power arrangement that positions one single individual or group at the top with the remaining members or participants in various levels of subordination.

high-definition media A term McLuhan used to describe media that provide their users with well-defined and detailed data.

holistic approaches Approaches to the study of phenomena through multiple perspectives, often relying on multiple sources of data and data collection and analysis methods.

horticultural societies Societies that relied on simple tools to plant and tend crops on a small scale.

hot media A term used by McLuhan to describe forms of media that require little effort on the part of viewers to process and understand the content.

household technology (or **domestic technology)** The incorporation of applied science into the home, such as a dishwasher or a vacuum.

how-to knowledge An understanding of how an innovation is properly used and employed.

human agency The belief that humans have the ability to make, choose, shape, and act upon decisions that have a genuine impact on the world.

human controlled The ability of humans to control, design, and shape the actions of a technology or technological system.

hunter–gatherer societies Communities or societies in which the primary method of subsistence involves having its members obtain food by way of hunting animals or gathering edible plants without participating in the domestication of either.

hybrid spaces The combination of media and physical spaces, where the use of information or communication technologies (digital spaces) merge with physical spaces.

icons Constitutes an image or visual representation symbolizing an application, a capability, or entity which will allow the user to perform a task on a computer, smartphone, or other digital device.

ideal speech situation Jürgen Habermas's term for a situation where individuals can openly express their thoughts as they are being evaluated solely on the basis of reason.

imitation (or **cyclical fluctuations**) In Schumpeter's model of economic development, innovation does not occur evenly spread over time but, rather, in spurts or episodes.

immaterial labour A form of labour that creates products or services that are not tangible and readily observable, such as knowledge or information.

immediate privacy concerns Privacy concerns that occur shortly after the disclosure of personal information online.

implementation stage The period in which an individual begins to use an innovation.

inclusivity The practice of including people who might otherwise be excluded in events or services.

income quartile A statistical method used to categorize the population into groups based on average household income from poorest to richest. The division is based on the distribution of incomes, with each quartile representing 25 per cent of the overall population.

Industrial Revolution A historical period beginning in eighteenth-century Western Europe spearheaded by changes in manufacturing, transportation, and technology, which markedly affected the production and distribution of goods as well as socioeconomic conditions.

inequality Differences in society in terms of access to social goods, such as the labour market, income, education, and the healthcare systems, as well as means of political participation. The discrepancies exist along socially defined grouping, including gender, age, social class, and ethnicity.

information In Rogers's diffusion of innovations model, it is knowledge, fact, or advice communicated to an individual about an innovation.

information age Also known as the computer age; relates to an era in which individuals can access and manipulate information with a high degree of sophistication and speed through the advent of information and communication technologies, such as computers, the Internet, and cellphones.

information and communication technologies (ICTs) All devices that will store, retrieve, manipulate, exchange, or receive information digitally.

information and communication technologies for development (ICT4D) Describes the use of technologies that facilitate communication, the storage and reuse of information, and data analysis for the purpose of improving the economic and social conditions in countries in the Global South.

information commons A system, community, or institution designed to develop, store, share, and conserve knowledge and information. Physical libraries represent a traditional model of an information commons. In contemporary use, the term can also refer to digital services and/or virtual spaces that promote and adhere to these ideals, such as Wikipedia.

information literacy The ability to successfully use, navigate, and operate information resources and information and communication technologies.

information overload The large amount of information that a single individual manages in a day as a result of information and communication technologies (ICTs).

informational production forms of production that focus on information.

information revelation The disclosure of personal information on the Internet, for instance on social network sites.

information revolution The changes that have occurred in the types of technologies needed and their related services and products as a result of the shift toward the information society.

information society A society in which the utilization, dissemination, diffusion, and development of information is an integral component in social, economic, and cultural life.

information systems development Customized software development, where software is designed to meet the needs and requirements of a particular client or user group.

information technology (IT) The development and application of computer-based technologies designed for the principal purpose of creating, exchanging, and storing electronic information.

informational production forms of production that focus on information.

innerworldly asceticism Refers to the Puritan ethic of self-discipline and self-control and its associated behaviours, norms, and values.

innovation An idea, a practice, or an object that members of a social group perceive as being new.

innovator-entrepreneur In accordance with Schumpeter's model of economic development, the innovator-entrepreneur is the most important driver of economic growth. This is an individual who develops new ideas, practices, or objects despite the risks and uncertainties associated with these innovations.

in real life (IRL) These are behaviours and activities that take place offline and are often contrasted with behaviours that occur on the Internet.

Instafame A type of microcelebrity, or a person that has a large number of followers on the social networking site Instagram.

institutional privacy Protection of personal information from companies and institutions (e.g., access to personal information by Facebook and its partners).

instrumentalism A theory that analyzes technology as neutral tools or instruments whose purpose is to fulfill the specific tasks of their user.

intellectualization A term introduced by Weber to describe a shift in how decisions are made; instead of relying on superstitious or mystical beliefs, decisions are based on knowledge and rational choice.

intelligent agents Entities capable of accruing knowledge and displaying intelligence to achieve goals related to their environment.

interactivity The ability of users to provide content in response to a source or communication partner.

interconnectedness The extent to which social groups are geographically or socially connected to one another, allowing for the flow of goods and the exchange of ideas, information, knowledge, and innovations. A high degree of interconnectedness allows for the easy transfer of technologies and technological know-how.

interconnectors A role serviced by the early majority, who act as a bridge between early and late adopters and provide relevant information on new innovations to the latter.

interdependence Describes the high level of connectivity currently existent in the world, which makes events that happen in one part of the world have a short- and long-term trickle-down effect on all other parts.

Internet access The ability to connect to the Internet using a device (such as a computer, or smartphone), to access services such as the World Wide Web.

Internet censorship Measures used by various countries to control the information that flows both into and out of a country, radically undermining citizens' ability to access and distribute information.

Internet kill switch Refers to the act of shutting down the Internet to control access to information and communication primarily by governments.

Internet of Things (IoT) The extension of Internet connectivity into objects or devices that do not need the Internet to function, in order for devices to communicate and interact with each other or be controlled and monitored remotely.

Internet Research Agency (IRA) A Russian company creating disruptive online content for Russian businesses or political interests.

Internet service provider (ISP) A company that provides the services to allow users to access, use, and participate in online media.

interpretive flexibility (IRA) A term that refers to how the meaning of artifacts is always created in a socio-cultural context.

invention Considered a creative process, in which a person discovers a new behaviour, way of understanding, process, or object. Contrary to *innovation*, where a completely new idea is developed, in the case of invention the process consists of combining already existing elements in unexpected ways.

inverse surveillance Practices that can be subsumed under sousveillance, but that emphasize surveillance as inquiry into social norms and expectation; involves the recording, monitoring, analyzing, and questioning of surveillance technologies and their proponents, and also the recording of how surveillance takes place by authority figures, such as police officers, guards, and border patrols.

invisible audience Audiences that are not known to the creator of content when content is posted on the Internet.

iron cage A concept introduced by Weber to describe how society through the introduction of rules of rationalization and bureaucratization has limited the ability of individuals to make their own choices and exert free will.

Keystone XL pipeline A project proposed to run a 36-inch-diameter crude oil pipeline, beginning in Alberta and extending to Nebraska.

KickStarter A website that facilitates the activities entailed in crowdfunding for a project.

killer app (or **application**) Describes a computer program that people consider to be essential and valuable, and results in their purchasing the technology on which the program runs.

knowledge stage In Rogers's model of the diffusion of innovations, this is the period in which an individual learns about an innovation for the first time.

labour-saving technology The use of technology to reduce the amount of time and effort a person spends on a specific task.

Layton's model of technology An idea of technological development in which ideas are translated into designs. In the model, technology is embodied in ideas, techniques, and design.

Lidar sensor A remote sensing method that uses light to generate a three-dimensional representation of an object on Earth.

Lifeline A program by the Federal Communications Commission (FCC) that provides low-income individuals with a discount on telephone and broadband services.

liquid surveillance Contemporary surveillance in a "liquid modern world" where paths of life are mobile and flexible, and surveillance is constant.

literate societies Societies that use writing to preserve information, as compared to oral societies, which rely on oral communication.

locative media app Media applications that are location based, providing users with information on their social and material surroundings.

low-definition media A term McLuhan used to describe media that provide users with less information, requiring them to fill in the blanks.

makerspace Physical spaces where those with an interest in, for example, technology, science, computing, or digital art come together to chat, look at artifacts, or create artifacts.

markets An economic infrastructure or system that allows and encourages the practice of selling or exchanging goods and services for payment.

Marxist tradition A critical theoretical approach to society based on the writings and ideas of Karl Marx.

mass consumption A socio-economic system that nurtures a yearning to purchase increasing amounts of mass-produced goods under the auspices of social improvement and personal gratification.

mass production The production of large quantities of standardized materials, made possible by streamlining the manufacturing process and adopting technology such as the assembly line.

material culture Artifacts used by the ancestors of modern humans.

material substance Viewing technology as being its physical or material properties separate from its interactions with society.

mechanical arts (or Artes Mechanicae) The medieval concept for practical skills and technology know-how contrasted with the traditional seven liberal arts.

mechanical solidarity A society based on social cohesion, where members share similar social norms and expectations, as they occupy similar social roles.

mechanism Designated by Heidegger to represent the means through which to achieve a goal.

media bias Innis's term to describe the effect of media on how societies operate. He distinguished between a space and a time bias.

megacities Metropolitan areas containing more than 10 million inhabitants, such as New York City.

memorial profiles After a person passes away, someone with access to their account can choose to memorialize their social media account, such as their Facebook page, as a place for friends and family to share memories after a person has passed away.

mental health outcomes Negative outcomes that arise from poor mental health, such as depression, loneliness, and anxiety.

microcelebrities Small-scale or specific-area celebrities. An example of this would be YouTubers, individuals who become famous for making videos on YouTube in areas such as beauty, travel, or "Let's Play."

microtask once whole work activities get split into small units

minimum amount of Internet connectivity The standard amount of Internet connectivity set by Canada's auditor general, applied across the entire country (Canada).

misinformation Either wrong or misleading information, or the act of misleading someone, or being misled by someone.

model of regressiveness Baudrillard's term for the manner in which society, distracted by ideas of technological progress, morally degenerates due to a lack of critical discussion about social inequalities and injustices brought about by the system of production.

modem A device that allows digital data from a computer to be converted into an analog signal of a telephone line, which connects home computers to the Internet.

modern technologies Technologies that affect nature and humankind in radical ways; they have an active process and a dynamic impetus.

moral backwardness Baudrillard's term to indicate the stagnation of morality brought about by ideas of technological progress and the trappings of materialism.

moral dilemma A situation where a choice must be made between at least two courses of action, where all will entail transgressing a moral principle.

moving assembly line A sequential manufacturing process that enables parts to be assembled within a specific order to create a product. This process was made famous by Henry Ford's production line, which allowed for the mass assemblage of automobiles.

mutual shaping A term used in STS to describe the close interrelation that exists between social and technological factors.

National Security Agency (**NSA**) The US agency whose mission consists of the global monitoring, collecting, decryption, and analysis of massive amounts of data for foreign intelligence and counterintelligence.

National Telecommunications and Information Administration (**NTIA**) An agency of the US Department of Commerce whose information-based functions and policies relate to issues of telecommunications access and development.

nation-state Self-identified and sovereign entities that cover a territorial unit, integrating individuals who live in a specific geographical area and who share an identity.

Neolithic period An era of technological development beginning around 9500 BCE characterized by the transition from hunter–gatherer societies, which encompasses the advent of farming and settlement practices and ends with the widespread employment of metal tools.

Neolithic Revolution The first agricultural revolution, which precipitated the shift from hunter–gatherer societies toward settlement and agricultural development.

net neutrality The belief that ISPs should provide all users with equal access to all online content, applications, and platforms without intervention.

Netlytic A software developed for the collection and analysis of social media data coming from tools such as Twitter, Facebook, and YouTube.

network A term used by Latour to denote relationships or interactions between people, objects, and organizations whose shared purpose transforms these connections into an extensive collection of resources and participants that enables them to function as a single unit.

networked individualism Sees society as moving away from a model where people are embedded in groups toward more loosely connected social networks.

networked individuals One of three types of social connectivity proposed by Wellman, Quan-Haase, and Harper (2019). These individuals embrace multiple digital channels to expand their networks, to have ease of connectivity, and to maintain both personal and professional ties.

networked organization New forms of management that do not rely on a hierarchical structure of organization to achieve organizational goals; instead, employees are loosely associated.

network of security partners A theory that describes how various security partners, such as the police, private security, and the public, need to work together to deal with societal threats.

neutral point of view (**NPOV**) A guiding principle of Wikipedia that stresses the expectation that participants will input information that is reliable and objective.

neutrality of technology argument Technology is considered impartial because it lacks a set of moral values and direction.

new surveillance The application of technical means to collect and record personal data.

newly industrializing nations Nations whose economic, technical, and social development is outpacing developing nations, particularly through an emerging industrial sector. China and India represent newly industrializing nations.

nomadic tribes Communities of people who prefer to roam from one area to another rather than settling in a single specific location.

nowcasting The prediction of events in the present or in the near future.

observability The visibility of an innovation and its effects on members of a social group. By observing the innovation, members are more likely to discuss and gain information about it.

oceanic superclusters A group of businesses, post-secondary institutions, and NFPs working together to accelerate innovation and sustainable economic growth from Canada's oceans by harnessing emerging technologies such as marine renewable energy, fisheries, aquaculture, and more.

OFFensive Swarm-Enabled Tactics (OFFSET) A DARPA program that is aimed at spurring rapid innovation in the deployment of swarm drones in urban war zones.

One Laptop per Child (OLPC) A US nonprofit organization whose guiding principle is to create educational opportunities for the world's poorest children through information technologies.

online communities Virtual communities whose members interact primarily online via synchronous or asynchronous forms of communication.

online piecework The employment of people by websites to complete low-level repetitive tasks (such as data entry, or transcribing), where individuals are paid by each piece of work they complete.

opinion leaders Individuals within the early adopter category whose influence and opinions help guide the decision-making process of others in the social group.

oral societies Non-literate societies that preserve culture, knowledge, and norms via oral means.

organic solidarity A quality of modern and industrial societies that feature a specialization of social roles, division of labour, and diverse social norms.

Organisation for Economic Co-operation and Development (OECD) An international organization, consisting of 34 country members, that uses evidence-based analysis to promote policies on economic development and trade, with the aim of improving the economic and social well-being of people around the world.

organizational chart A diagram featuring an organization's structure, rankings, levels, and components.

outsourcing Obtaining goods or services (such as contract work) from outside of your company or country.

packaged software development Software that is produced in large quantities and can be obtained off the shelf.

Panopticon A building that functions as a prison, providing complete control over the inmates. It also denotes an entire social system based on techniques of control through surveillance.

pasteurization A process developed by Louis Pasteur by which food or drink is heated in order to slow microbial growth.

pastoral era (or **pastoral societies**) A utopian characterization of pre-industrialized life, where communities were composed primarily of locally based interactions in closely bounded groups.

peer monitoring Family members or friends that watch or observe an individual's behaviour.

penetration rate The percentage of users of a technology in relation to non-adopters. It is used as a standard measure for comparing user groups when discussing the digital divide and global digital divide.

perpetual beta The release of software to users before being complete, under the understanding that the software would continue to be improved based on user feedback.

persistence Describes how data on social media and other digital tools are archived for later retrieval and use.

perspective effects The development and application of techniques designed to provide the impression of depth and symmetry.

persuasion stage A period when potential adopters actively seek out information about an innovation.

phablets A term combining the words *phone* and *tablets* to describe cellphones with all the features common to this technology, but larger in size and therefore closer to tablets in this respect.

platform economy Economic and social activity facilitated by online platforms.

political economic theory A field of study that has different meanings. Often, the term refers to analysis based on Marxian theory. Other times, the term refers to studies influenced by the Chicago school.

post-Fordist (or **post-industrial**) A system of production and consumption that features greater technical and individual specificity in production and labour roles.

post-typography A society that after having relied on print as a form of communication moves again toward a heavy reliance on orality.

predictive analytics By extracting and analyzing data, patterns are found that can predict future outcomes.

primary orality A term coined by Havelock to describe societies that rely only on oral forms of communication to transmit knowledge, information, and culture.

principle knowledge An understanding of the mechanisms behind an innovation.

privacy The right of individuals to choose what personal information they want to disclose to which audiences.

privacy paradox How users disclose large amounts of personal information on the Internet, despite concerns about their privacy.

private effects The benefits brought to individuals through their social connections.

probes Aphorisms consisting of ideas designed to inspire critical thinking about the media.

process of circular flow A term Schumpeter uses to describe phases in the economy characterized by stability and a balance between demand and supply.

produsage A term coined by Bruns describing the movement toward user-led areas of development, content creation, and collaboration of technologies and services, such as open-source software and interactive virtual communities.

prosumer A term introduced by Toffler in 1980 to describe the merging of producers and consumers.

prosumption Modes of production in which consumers perform a significant role in a product's design, development, and use.

public effects The benefits brought by living in a community bound by intimate social or cultural ties.

public sphere Public spaces where citizens can gather to share their perspectives and voice their opinions.

qualitative methods Contrasted with quantitative methods, these methods rely on numerical analysis and answer questions of causality, while qualitative methods rely on interviews, focus groups, and other text-based sources and answer "why" and "how" questions.

quantified self The use of personal data, collected by incorporating technology into a person's daily life, to improve the quality of a person's physical and mental performance.

rational choice A theory that models and attempts to understand social and economic behaviour.

rationalization A new mode of operation in society, where social action is aimed at increasing efficiency and supporting a capitalist system of production rather than based on grounds of morality or tradition.

rear-view mirror approach "[W]e march backwards into the future" and a new social order is not perceived until it is already in place.

reflectionism Ideas and procedures of using technology to mirror and confront surveillance.

regressive force An influence that causes an entity, such as society, to degenerate or reverse from its established course, way of life, or mode of thinking.

relative advantage The process by which the merits of an innovation are examined in relation to those of a previously existing idea, practice, or object.

relevant social group Social constructivist concept pertaining to the group who gives meaning to an artifact.

replicability Capabilities provided online to reproduce content (text, pictures, and videos) and insert it in other contexts.

reproductive technology The use of technology to assist human reproduction, such as birth control, foetal monitoring, and infertility programs.

research and development (**R&D**) Characterized by a focus on the design, development, and implementation of innovations and inventions.

retro-analysis The analysis of a situation after it has occurred; hence, it relies on memory, archives, and other documentation.

return on investment (**ROI**) Describes the economic gain to be made as a result of capital investment. It is usually measured as the ratio of monetary input to output.

reverse salient (or **salience**) In the context of system theory, when a system grows unevenly, some components develop quickly, creating imbalances.

"rich get richer" hypothesis That the Internet will primarily benefit those who are already connected and have large social networks instead of those who are isolated and have small social networks.

robot workforce The idea that robots and AI will replace humans in the workplace.

robotics The design, creation, and use of robots (machines) to perform tasks previously done by humans.

safe harbour A legal provision that creates a protection from liability or penalty under specific situations, for example, being unaware of a law when breaking it.

science and technology studies (STS) An interdisciplinary field concerned with the study of how scientific and technological change intersect with society.

scientific management A theory of management which attempts to use scientific methods to improve worker efficiency and productivity. Pioneered by Frederick Winslow Taylor in the late nineteenth century, it is often referred to as Taylorism.

screen time The time spent using a device (such as a computer, tablet, cellphone, television, or game console).

searchability The ability to quickly locate information on people via the Web.

secondary orality A term coined by Havelock to describe societies that move away from print and toward sound as a result of electronic media (including radio and television).

Second Life An online virtual world, first launched in 2003, where users can create avatars (virtual versions of themselves), explore the grid, and meet and socialize with other users.

sedentary societies Small or large types of permanent settlement that are entirely immobile.

self-tracking Recording information, or data, about an individual's diet, health, or other activities, systematically using technology.

SGT STAR A chatterbot used on the US Army website to provide visitors with information about army life.

sharing economy Encompasses all business models and capital earning activities that are facilitated by collaborative websites, mobile apps, and social networking sites. These platforms create an open marketplace for goods or services produced and provided by individuals and act as a matching service that connects labour providers with workers.

simulation Creating and enacting technologies that imitate the human mind or body within a computerized form.

skills divide The gap between those who have the necessary skills to use information and communication technology and those who do not.

slacktivism The practice of supporting a cause in a minimal way with the use of social media, such as signing an online petition.

smart appliances Appliances that use modern computer and communications technology for faster, cheaper, and more energy-efficient functioning, by running from a central system. For example, they can sense an electrical surge and shut off their power or sense a water failure and turn off the main water line.

smart cities Cities that incorporate information and communication technologies (ICT) to enhance the quality and efficiency of services within the city.

social accessibility The ability to control how others can contact us either in real life or in the digital sphere.

social affordance Characterizes the relationship between the features of a system and the social characteristics of a group, facilitating or undermining particular social behaviours.

social after-effects The social results of selecting or adopting one technology over another, which influence social relations and experiences.

social capital The relationships forged through social interactions, networks, and connections, and the resources available through these relationships.

social change Major change of structured social action or social structure taking place in a society, community, or social group.

social comparison The theory that individuals determine their own worth based on how they compare to others.

social construction of technology (SCOT) The belief that technology is shaped by human needs and social factors. The cultural norms and values within a social system influence the construction, diffusion, and utilization of the technological product.

social determinism The idea that social factors alone determine and shape uses of technology.

socially connected individuals One of three types of social connectivity proposed by Wellman, Quan-Haase, and Harper (2019). These individuals appreciate digital media and have a large social network, yet they use digital media to socialize with the same people, not to expand their networks.

socially limited individuals One of three types of social connectivity proposed by Wellman, Quan-Haase, and Harper (2019). These individuals have small, less diverse networks and their use of digital media is limited.

social media Web-based technologies, such as Facebook and YouTube, designed for social interaction; they often include a user profile, links between users, and virtual spaces for users to express their ideas.

social networking sites (SNSs) Online websites, applications, or platforms centred on developing or maintaining virtual social relationships between individuals with shared interests, experiences, or connections.

social networks The social structures formed by individuals' patterns of social interaction.

social privacy Protection of personal information from other people that we know, such as friends, co-workers, and family.

social structure The arrangement of social organizations, institutions, and relationships within a society.

sociomaterial assemblage The coming together of diverse material and social elements.

socio-technical perspective The study of how social factors affect technological and scientific developments.

software cowboy Programmers and developers of software who excel in their ability to write code and design software products.

sousveillance The recording of events and activities via mobile technologies, such as cellphones, tablets, or wearable technologies.

space bias Emerges in literate societies and favours imperialism and commerce. A space bias emerges because writing allows for the easy dissemination of ideas and information over vast distances.

spaces of negotiation One of the two types of spaces of actor network theory (ANT) theorized by Jonathan Murdoch, spaces of negotiation "will be spaces of fluidity, flux, and variation as unstable actors or coalitions of actors come together to negotiate their memberships and affiliations" (Murdoch, 1998, p. 370).

spaces of prescription One of the two types of spaces of actor network theory (ANT) theorized by Jonathan Murdoch, spaces of prescription "are likely to be spaces of relatively fixed co-ordinates and will tend to be marked out by formal and standardized sets of heterogeneous relations" (Murdoch, 1998, p. 370).

spiral of silence A theory proposed by Elisabeth Noelle-Neumann to describe how individuals who feel that their opinion is in the minority will not speak up because of fear of being excluded and ostracized.

S-shaped curve of adoption The form that the adoption curve takes when we plot frequency of adoption rate on the *y*-axis and time on the *x*-axis.

stabilization The point in which a relevant social group has assigned a very specific meaning and use to an artifact.

startup companies Companies that start their operations based on a promising idea, often with limited capital and no revenue. The label *startup company* became well known during the 1990s technology boom, when a new company surfaced every day.

status In the public sphere, opinions need to be voiced regardless of a person's social status.

Stone Age A prehistoric era typically defined by the use of stone in the construction of tools.

strategic action Planned action aimed at accomplishing specific goals with optimal results.

subculture A small cultural group within a larger culture, often defined by things that make them stand out.

substantivism A theory arguing that technology brings forth new social, political, and cultural systems, which it structures and controls.

superclusters According to the government of Canada, a supercluster is an innovation hotbed that is home to a strong industrial cluster (a dense area of business activity containing a critical mass of large and small companies, post-secondary institutions, and other innovation actors), linked through their shared reliance on specialized inputs, including technologies, talent, and infrastructures.

supplement argument of the Internet Argues that the Internet does not completely change social structure but, rather, becomes embedded in existing patterns of interaction.

supplier factory Factories are dedicated solely to the mass production of goods that are then sold to consumers by vendor companies.

surplus population The unemployed and underemployed population, including those unable to work.

surrounding awareness capabilities A knowledge and understanding of ambient conditions outside of one's physical self.

surveillance The monitoring of a person's behaviour or information, often with the use of technologies for recording and storing data.

surveillance capitalism The monetization of personal data captured from various means of monitoring individuals movement or behaviours, such as, through the study of online searching habits, and self-tracking devices (like a FitBit).

system A configuration of components that are joined through linkages into a network.

system growth Stage three of the design and development of technology, suggested by Hughes (1983), is the examination of the growth of a system.

systems approach A system proposed by Ludwig von Bertalanffy that assumes that breaking down a complex concept into simple units helps in better understanding the concept's complexity.

systems theory The field that studies social and biological systems that are self-regulating through, for example, feedback mechanisms.

Taylorism A system of management developed by Taylor that aimed to make work more efficient and to increase productivity through the application of scientific standards and processes.

technical (or **technocratic**) **elite** A class of people who, according to social theorist Bell, emerge as the technocratic elite in a post-industrial information society because of their understanding of theoretical knowledge, technology, and information.

technical competence The knowledge and/or skills required to demonstrate an understanding of the practices and tasks necessary to effectively use and master information and communication technologies.

technique A term used by Heidegger to describe how technologies constitute an object, a goal that the object fulfills, and a mechanism through which the goal is achieved.

technocracy An organization, group, or collective comprising individuals from scientific, technological, and research-based fields, whose knowledge and technical expertise either influences or performs a defining role in making decisions regarding technical or scientific development.

technological affordance The tasks users can perform with technology at their disposal.

technological determinism A theory proposing that technology is the driving force in developing the structure of society and culture.

technological imagination A shared representation of technology that shapes the design and use of technology.

technological inequality The gap between the haves and the have-nots, resulting in disadvantages for the latter.

technological redlining The use of data collection in technological systems to profile people and systematically deny various services based on this data analysis.

technological regression Rare cases where a technology is adopted and then later abandoned for social, political, cultural, or religious reasons. The social group then rejects the technology and returns to previously established practices and habits.

technological society The pervasiveness and intrinsic centrality of technology in contemporary society.

technological utopianism A belief that views technology as a largely positive force with the potential to create an idealized world through improved work conditions and lifestyles.

technological waste The waste that results from obsolete, out of fashion, or broken gadgets that are no longer used.

technology development Stage one of the design and development of technology, suggested by Hughes (1983), is the invention and development of a technology.

technology transfer The flow of technological innovations from one country or region to another.

technopoles Cities built within cities in order to produce the content, devices, and applications for the information society.

thanatechnology A term Sofka uses to refer to the Internet; an instrument through which people can express emotional responses to death.

"the medium is the message" An aphorism coined by Marshall McLuhan that proposes that the type of medium through which an individual encounters content may affect the manner in which an individual understands this content. McLuhan underlined the need to examine the impact of media on people instead of focusing only on the influence of content.

the right to be forgotten The concept that individuals have the civil right to request that personal information be removed from the Internet.

third places Places that give people the opportunity to be social. Examples include coffee houses, taverns, restaurants, bars, libraries, and other locations that people visit routinely.

3D printers Machines that allow for the printing objects in 3D format with various materials from a digital blueprint.

time acceleration The rapid development of tools, specifically digital tools in recent years.

time bias Innis's term to describe oral societies in which there is an emphasis on community and metaphysics. In these societies, change occurs slowly because the only transfer of culture, information, and knowledge is through oral means.

time–space compression This is the sense that constraints of time and space have been lifted as a result of technologies that bridge these barriers.

togetherness Being close to another person or people.

Toronto School of Communication A group of scholars working at the University of Toronto from about the 1940s to the 1970s, whose scholarship focused on the impact of media—including the alphabet, writing, television, and the radio—on society.

toxic workplace environments One explanation for the absence of women in the IT industry is that work environments are male dominant and females struggle to feel accepted.

traditional technologies Technologies of the pre-industrialized era, which are described as stationary and passive and having little effect on the natural environment.

transformation The ability of separate entities in actor network theory (ANT) to convert into a single unit through a network.

transhumanism A belief in the convergence of technology and the human body by using biotechnological components to augment or substitute existing physical human characteristics or parts with technological replacements.

trialability Provides potential adopters with an opportunity to reduce the uncertainty associated with new innovations by gathering evidence about its potential value and risks.

Triple Revolution a theory proposed by Rainie and Wellman to describe changes in society resulting from mobile technologies, social relations, and digital technologies.

troll farm An organization or state that gathers members to create disruption and conflict online by posting provocative content.

Turing Test A test developed by Turing to determine a machine's ability to showcase human intelligence.

Twitter Revolution A term that describes the central role that Twitter played as an information and communication platform to organize and mobilize the citizens of a country to protest their government.

2030 Agency for Sustainable Development A global framework of action (undertaken by Canada and 192 other UN members), attempting to accomplish 12 Sustainable Development Goals over 15 years—including erasing poverty and hunger.

uncertainty A state of being unclear about the outcome of a particular innovation.

underemployment The under-use of a worker's skills, education, or availability to work.

unintended effects Consequences of technological invention or application, which are often only realized and understood after the technology has been used.

United Nations Development Programme (UNDP) A global development program enacted by the United Nations to assist in solving global and national socio-economic problems related to education, poverty, and the environment.

unverifiability of power Refers to the principle that one cannot determine whether one is being observed.

user-actor gender gap Women are users of specific technology or tools, yet they do not engage in the development of these tools.

user interface (UI) A channel in which individuals and computers interaction.

utopian perspective of technology The belief that technology has a positive role in society and can be harnessed to create a more perfect world. Utopians embrace technology to improve efficiency and progress.

utopian perspective of the Internet Views the Internet as leading toward positive social change, in particular by strengthening social relations and communities.

value-laden A belief that technology is actively shaping or being shaped by culture, politics, or social values.

value-sensitive design (VSD) A theoretical approach to the design of technology that looks at human values, preferences, or lifestyles as a primary design factor.

venture capital firms Firms that specialize in investing in startup companies that have a high potential for growth.

video on-demand services (VOD) Technology that gives users the flexibility to watch videos when it is convenient to them instead of having to rely on scheduled broadcast times as was the case with over-the-air programming in the twentieth century.

virtual mourning The use of Web-based media to mourn, commemorate, or provide support following the death of a family member, friend, or colleague.

virtual self Contrasted with the in-real-life (IRL) self, describes the creation of a self through posts, pictures, etc. on the Internet, particularly social media sites.

visibility of power The principle that power is centrally displayed with the aim of intimidating.

wearable computing Types of computers that are worn on the body. For instance, the WearComp is a type of wearable computer.

WearComp A wearable computing system developed by Mann.

Web 2.0 Web-based applications that encourage and make possible interaction, information-sharing, and collaboration among users and producers.

white-collar workers Professional or educated workers whose job does not involve manual or physical labour.

wider context Describes, in the context of social construction of technology (SCOT), how the value system of a social group influences the meaning given to and the use of a technology.

WikiLeaks An international, non-profit, journalistic website whose purpose is to make secret information from anonymous sources available to the media and the public at large.

Wikipedia A popular editable and collaborative non-profit, Web-based encyclopedia administered by the Wikimedia Foundation.

women inclusion view The belief that women should be apart of the technology debate as active participants, rather than just passive users.

women's liberation view The belief that technology can liberate women by support fertility choices, helping with household chores, and creating alternative work environments that are flexible and more suited for women.

women's oppression view The belief that women will be negatively impacted by technology by being enslaved through technological advancement, having fewer choices, and becoming dependent on technologies.

Notes

Chapter 1

1. This reference to *Star Trek* was used previously in Hogan and Quan-Haase with reference to the rapid changes occurring in the realm of social media (2010).
2. The definition of *artifact* was taken from *The Concise Oxford Dictionary of Archaeology* and focuses primarily on the distinction between objects created by humans and objects occurring naturally. (The *Concise Oxford Dictionary of Archaeology.* Timothy Darvill, ed. Oxford University Press, 2008. Oxford Reference Online. Oxford University Press.)
3. Information on the cyborg models comes from the Wikipedia entry on Terminator (character). Retrieved 4 June 2012 from http://en.wikipedia.org/wiki/Terminator_(character)
4. For a similar list describing the challenges associated with studying the effects of the Internet on society, see Quan-Haase and Wellman (2004).

Chapter 2

1. Information from the Stone Age comes from the Southern Africa entry from the *Encyclopaedia Britannica Academic Edition Online*. Retrieved 13 October 2010 from www.britannica.com/EBchecked/topic/556618/Southern-Africa?cameFromBol=true
2. Further information is available on the CBC McLuhan archives. Retrieved from http://archives.cbc.ca/arts_entertainment/media/topics/342-1818/

Chapter 4

1. The GDP measures a nation's standard of living as it is an indicator of the value of goods and services produced, usually within a one-year period, and it was first introduced by Simon Kuznets in 1934. It is usually calculated as GDP = consumption + gross investments + government spending + net exports.

Chapter 5

1. This information comes from Arvind Singhal's speech for the introduction of the award ceremonies for Professor Everett M. Rogers when he was named the 47th Annual Research Lecturer at the University of New Mexico, Ohio University, 24 April 2002. Retrieved 5 July 2010 from www.insna.org/PDF/Connections/v26/2005_I-2-2.pdf

Chapter 6

1. Often, software products are updated as new features are developed and integrated into the system.

Chapter 10

1. The concept of friendship is also closely linked to the distinction made by Granovetter (1973) between weak and strong ties. Strong ties are with individuals who one trusts, has frequent contact with, and who provide social support in times of need.

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