Part I
Background and Overview

Our Natural Systems: The Basis of all Human Enterprise

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Abstract Making lifestyle adjustments to benefit the Anthropocene are fundamental for human survival. Whilst the powers of twenty-first century communications systems are celebrated there is a cautionary story needed to set the scene for global advancement. Humans are the custodians of planet earth and dependent on its resources for survival. Networking and communication advances assist the monitoring processes for making possible the survival of the planet and its flora and fauna.

Keywords Nature · Urban living · Memory · Community · Values

Natural Systems as Foundational to Global Understanding

Knowing how planet earth functions is fundamental for all human existence. Natural systems fulfil our basic needs for survival. Whilst this statement may appear self-evident the realization that current generations are growing up in residential spaces increasingly removed from their survival sources is cause for concern. On current estimates more than 60 percent of the world's people live in cities. Their likely experience of everyday life is being surrounded by buildings, transport links and service providers concentrated in local neighbourhoods—themselves constructions of urban living. City life transforms rural landscapes into high rise buildings, rapid transit systems, shopping and entertainment centres, paved surfaces, and ever depleting green spaces. Intricate transport and communication systems enable exchanges of supplies, products and knowledge. 'Community' and belonging are constructions of place which urban residents find or locate in their daily interactions with each other and the systems created.

One outcome for humankind's relationship with natural systems is spatial distancing from the source of supply. Urban access to water provides a simple illustration.

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Tap and bottled water, for instance, are critical for urban survival. However, their delivery to urban populations via collection points such as dams and reservoirs must flow through often complex network systems, including political borders in addition to purification and recycling plants, and various distribution systems. All of these flows are dependent on communication systems for transfer connections to their final destination points. Put simply, the biosphere landscape is being reengineered to suit our urban demands. Of course history shows that wherever human settlement has taken a grip on the landscape water diversion techniques are evident—for human consumption as well as for stock and crops. Viaducts, simple irrigation systems and water channels are the lifeline of many rural and village communities in more remote locations in present times. They remain as remnants of a lifestyle balance with nature that is largely gone. Today the scale of reordering of nature to meet urban demands, has, and is, reshaping our heritage. Illustrative are the hydro-electric dam projects, such as the Three Gorges Dam across the Yangtze River. The question for all humankind is at what cost for the planet?

For the purposes of this discussion three interacting forces are acknowledged. Each is impacting on the fragility of planet earth, and can, in part, be explained by information systems, flows and networks. Knowledge-based, and reliant on human usage the interoperability of these global systems has irrevocability changed the order of daily living. Predictability and certainty that were once hallmarks of a settled society are now fluid constructs which require community responsibility. Readiness to change is fundamental for learning how to live sustainably in our networked world. In brief the forces are:

- First, the natural ecological balance has been disturbed with resultant climate and atmospheric events, natural disasters including floods, fires, coastal erosion, defoliation and desertification. Making adjustments to benefit the Anthropocene can be considered fundamental for human survival.
- Second, the concentration of people into megacities exacerbates the disturbance of natural systems and adds to air, water and soil pollution.
- Third, the built landscape alters the imaginaries of people. Cities *are* reality. Farming life and food production are increasingly large scale commercial enterprises. The links between people, the land and the landscapes created, reflect affluent hegemonies where daily life has departed from rural subsistence forever. Decision making lenses need to be reminded of our dependence on, and fragile links, with nature.

What We Know About Planet Earth and How Technology Is Helping

Scientists argue about the status of the Anthropocene in geological time (Gibbard and Walker 2013; Rull 2013). The Holocene period marked the beginning of human activity on earth including agricultural development, towns and cities, and

migration across continents. Paleontologists study plant and animal remains to determine historic changes in atmospheric conditions. Recent history during the latter part of the twentieth century appears to have entered a period of more marked change (Pawson 2015). This phase we define as the Anthropocene. Ecosystems are being pushed to accommodate massive growth in population, social systems and global networks that penetrate business and commerce; consumption including housing, energy and transport infrastructure; lifestyle choices including education, mobility and family, as well as decisions within macro global and local communities. In just a short period the changes in the earth's systems are remarkable. Some are listed below.

- Climate Change: "Human influence on the climate system is clear, and recent anthropogenic emissions of green-house gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems."[1]
- Greenhouse gases: The rise of greenhouse gas emission is contributing to increased incidences of drought, fires and tree mortality (Allen et al. 1999; Nurdiana and Risdiyanto 2015; Ren et al. 2015).
- Earthquake activity: Seismic activity monitored by increasingly sophisticated technology is able to forecast changes recorded at local stations. Active Earth Seismology contributes to human understanding of earth tectonics and hazardous locations[2].
- Population increase: "In 1900, world population was 1.6 billion, a total that had taken at least 50,000 years of human history to accumulate. But by the year 2000, world population reached 6.1 billion, in large part because of a dramatic positive achievement: the rapid spread of modern medicine and public health practices after World War II, starting in the 1950s." (World Population Reference Bureau[3])
- Migration and the megacities: The post World War Two Human Rights Declaration has contributed to the movement of people in search of better social, economic and political circumstances. Added to this agreement has been the commodification of transport—particularly air travel. The poverty imbalance appears unaltered with African nations and parts of Asia being amongst the global poorest.

Since life on earth the biosphere and atmosphere have interacted to produce changes. In the past simple measures enabled changes to be recorded. For instance,

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[1]See Intergovernmental Panel on Climate Change for full report at http://www.ipcc.ch/.

[2]See Active Earth interactive modelling at http://www.iris.edu/hq/programs/education_and_outreach/museum_displays/active_earth/. See also the World Meteorological Organisation at https://www.wmo.int/pages/index_en.html.

[3]World Population Reference Bureau. See http://www.prb.org/Publications/Articles/2011/world-population-7billion.aspx.

Fig. 1 Stevenson's box

climate records relied on manual plotting of temperature, rainfall and pressure data collected from mostly volunteer recorders who used telephone, telegraphic signals and ground transportation to the nearest telephone device. Scattered around the globe the Stevenson's box (see Fig. 1) symbolizes the links between land, communications and human activity. Automated readings from ground fixtures are the major change of recent times. Nowadays global networks share information disseminating from weather stations into websites around the world without interruption.

Technology improvements enable sharing of data globally in real time via satellite networks and wireless enabled portals. Streaming live via Apps to mobile devices anywhere with satellite access can be viewed as distancing the user from the data source and underlying science. Given the end-user experience of smart technologies and personal mobile devices the lived experiences of an ever increasing urban based population could not be more different from those of their ancestral past of less than one hundred years ago. Is the new reality of information readily available 'in the hand' or at the tap of a portable screen good for our earth's future? At one level the answer must be yes. Being informed helps everyone make sound decisions about personal behaviours locally. The converse of this argument is that not knowing about the origins of the data contributes to unreal expectations about planet earth.

Mega Cities and the Millennial Lifestyle

Until the mid-1800s there was relative harmony between humans and planetary systems. The human footprint was manageable. However, the development of machines for manufacturing, cars, trains and aeroplanes, electricity and radio communications marked the start of massive change. In the space of 3–4 generations humans have changed from being motivated by daily survival to consumer addicts. At the heart of much of their behavior is communication networks with incessant temptations to spend, spend and spend more on their personal wellbeing. Capital concentration in cities and the unstoppable modernization of major population nations including China and India is draining finite resources at rates that alarm the earth's scientists. Computer modelling of consumer lifestyles helps inform governments and policy makers of trends that are unsustainable (Peterson and Robertson 2012). Reversing human behavior or finding more sustainable ways to live the millennial lifestyle are major challenges. Data records reveal the stress on resources ranging across our basic needs—water, food and shelter. These are before considering demands for energy to drive electronic devices and development infrastructure including transport, machinery, and basic services including health and education.

Understanding the fragility of these sources of life on earth is a major task for education. Aimed at human survival into the future of the Anthropocene researchers strive to develop efficiencies in production processes that can reduce demand for finite resources. For instance:

- Water footprint: Recycling water in cities and reducing water intake in production processes are remediation strategies. Communicating water limits and education for household efficiencies can help change consumer habits.
- Green energy usage: Government's building policy codes reflect national commitment to the global challenges of climate change and limits on finite resources. Communicating practices through codes, labelling and monitored checks are constructive practices. Government initiatives in many nations include: upgrading electricity to low energy sources, solar paneling, and insulation in buildings, converting utilities to green energy sources, and finding alternatives such as methane gas for low energy usage.
- Public transport infrastructure: Private car ownership is one of the symbols of personal wealth that follows trends in rising GDP. Demand rises thus offsetting clean energy efficiencies. According to the OECD Library: "Since 1990, countries' efforts in introducing cleaner vehicles have been offset by growth in vehicle numbers and the increased scale of their use. This resulted in additional fuel consumption, CO_2 emissions and road building. Road traffic, both freight and passenger, is expected to increase further in a number of OECD countries."[4]

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[4]See OECD Library at http://www.oecd-ilibrary.org/sites/9789264185715-en/02/03/index.html?itemId=/content/chapter/9789264185715-20-en&mimeType=text/html.

- Renewable energy sources: Energy security is a major issue for modern nations. Challenges include competition for limited resources as well as expanding domestic needs. Non-renewable fossil fuels including coal and gas have increasing demand. However, as nations face complex issues surrounding their emissions and consider the merits of nuclear power sources as a viable alternative, renewables such as wind and solar power are adding substantially to existing renewable systems, including hydroelectricity. The energy grids are enhanced by political, economic and social awareness of the need for ethical and sustainable energy generation. Public awareness of the issues helps drive wise domestic decisions that create hope for the future.

Constructing Better Futures

Global indicators of increasing levels of consumption associated with rising wealth and associated lifestyle expectations mark the reality of the millennial condition. In his May 2015 Encyclical Pope Francis took the significant step of calling on the global community to change their habits:

> We all know that it is not possible to sustain the present level of consumption in developed countries and wealthier sectors of society, where the habit of wasting and discarding has reached unprecedented levels. The exploitation of the planet has already exceeded acceptable limits and we still have not solved the problem of poverty. The mindsets of individual consumers are the 'problem'.[5]

People who currently consume in excess can also provide the solution and fast communication networks can hurry up the process of re-education. Consider, the population 'bomb' scenario described by Paul Ehrlich in the later 1960s could be linked with China's decision to implement its one child per family policy. Communicating and implementing this decision in the large country of China has contributed to the easing of the population bomb potential. In other parts of the world where poverty, high infant mortality rates and low life expectancy rates continue agencies such as the World Health Organization are assisting with family planning and disease eradication programs. Today the impact of population behaviours and associated consumption of global resources can be modelled using informatics tools such as geospatial technologies, mathematical modelling, hydro-modelling, archeological computing, as well as the increasing array of social media communication tools. Whatever the challenges ahead during the Anthropocene period the natural systems and their protection must take precedence. Our survival depends on radical behavior changes such as that which flowed from the Ehrlich (1968) wake-up call regarding population growth.

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[5]See 'On care for our common home' at http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html.

Half a century later sharing of information is rapid and simple [see Moss et al. (2010) on climate change research]. Ranging from big data to personal communications the advent of satellite communications, underwater cabling and vastly improved service connectivity to the home, plus personal digital devices with tracking agencies, all translates to maximum impact. Disaster management relies on communications to affected locations via social media. The alarm systems of old are relatively inferior in comparison with the message speed via mobile connectivity. Added to this service, information flows related to food and water security as well as health services and agency support are improving the quality of community services globally. Examples of the links between improved communications and management of the planet's natural systems demonstrate effective ways in which humans can minimize their footprint.

Example 1: Urban Agroecology

In a nation where urbanization is a major feature of recent decades, China has been able to regulate and plan for ecological change. Publications within the Chinese scientific academy report on the innovative practices and smart usage of geo-spatial technologies that are reshaping city landscapes. As opportunities for developing new green resources become possible community action can help maintain and expand their usage. In older cities such as Beijing the issues are more problematic (see Chi et al. 2015) and like mega-cities in other global locations layers of the past along with the rapidity of immigration contribute to the urgency for solutions.

Helping to solve the problem, in part, a new green revolution in food producing areas is underway. Enhancing production and yields, Japan, for instance, offers leadership in the new era of sharing knowledge through easily established communication networks. Business economics working in conjunction with agro-science as well as biosecurity measures are revolutionizing production and product distribution.

Example 2: Green Cities; Community Gardens

Along with creative applications of informatics in urban design are innovative strategies for 'making' green spaces. Whist the allotment or small private and community gardens are part of the history of European cities, roof top and vertical gardens are examples of add-on features to buildings in contemporary design. Apartment dwellers who take up gardening related activities are not only becoming more self-reliant but are part of the sustainable urban living solution which includes reducing urban pollutants into the atmosphere.

http://www.theage.com.au/victoria/extreme-gardening-on-the-92nd-floor-of-the-eureka-tower-20150320-1m45sm.html.

Example 3: Building Community

As the process of urban growth and renewal systematically removes future generations from the rural landscapes of their ancestral pasts the matter of community and personal identity are becoming increasingly problematic. Cyclical rhythms of

nature are a feature of community practices across cultures. Rituals are often associated with seasonal changes and moon cycles—these events in nature trigger rituals and myths that contribute to the collective memory of the people and their places. Communities evolve with, and from, these shared landscape memories with traditions and shared values expressed through language, art and architecture, habits and preferences. Collective activities may focus around the local park, schools, places of worship, shopping centres and recreation grounds or increasingly through online spaces. However, competing with this coming together for social interaction, more recent neo-liberal market forces of globalization are fueling the commodification of everyday living towards what Foucault (1970) describes as the governmentality of personal agency. The resultant fragmentation of local community building forces in the modern urban settlement can simply just happen with respect for nature being a causality. What we have is an urban ecology in transition from its close connection with nature to technology enabled and sustained built environments. Landscape designers, along with residents and citizens need to imagine new communities, and the affordances of online communications simplify common interest contact. Thirdspace (Oldenburg 1991; Soja 1996) and community networks (Newing 2010) may not have the materiality of past communities. However, they can help maintain the values and virtues associated with living a life well—in harmony with nature, and with respect for fellow beings.

Our Planet

Life on planet earth demands a balance between the natural systems, and human achievements. Digital technologies are perhaps the greatest wonder of our Anthropocene age. They can both model and enable better futures for humanity through relief of poverty and abuse, and/or act as a negative force as the architect of the planet's destruction. Understanding the fragility of planet earth and assisting morally defensible decision making is thus a product of networking and communications.

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Technology Trends: Working Life with 'Smart Things'

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Abstract This chapter examines current information technology trends, including mobile, wearable and distributed computing, social networks, crowdsourcing, the Internet-of-Things, and social machines, and discuss their current and potential incremental and transformative influence on daily life and work using such technology. We outline several scenarios of working life, and raise questions and issues about the future of the working life.

Keywords Technology trends · Smart things · Ubiquitous work · Crowdsourcing

Introduction

Much has been written about work in the future, the future of work or whether work has a future. End of work stories abound. Oxford University researchers noted that with the development in robotics technology, about 47 percent of U.S. jobs would be at risk, with higher probabilities of computerisation (and so, job losses) in the areas of services, sales and construction occupations.[1] This is a rather alarming figure (for humans) based on the current technological context, considering that robotics technology has yielded products though seems to still have a long way to go before reaching the capabilities in recent movies such as *I, Robot* (http://www.imdb.com/title/tt0343818/) and *Chappie* (http://www.imdb.com/title/tt1823672/).

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[1]Full report at http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf, September 2013.

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This raises questions for countries, such as China, with a much larger labour force and whose economy depends on many labour-intensive jobs. The impact could be larger, though the nature and type of work could shift. Jobs less threatened by machines are those requiring creativity and social skills, and so, creative work and human presence would still be highly valued. What would young people do then, when the jobs are replaced by machines? Perhaps as noted by Martin Ford, the author of the recent book *Rise of the Robots* (Ford 2015), young people in their twenties could get a guaranteed income as a minimal income (possibly by government) and then be encouraged to start businesses to earn on top of that, noting that entrepreneurship would then be encouraged.

As noted in the book *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant* Technologies (Brynjolfsson and McAfee 2016), "in the next twenty-four years", there could be a thousand-fold increase in computer power world-wide, and all humans could be connected via a common digital network, with unprecedented effects on the planet's economics. This invites many questions: for example, what kind of new work or new jobs will such a digital network create? How will people use such a digital network in their work? And will the effects be transformative for all types of work or just some? And if for some, which types of jobs?

In Nagasaki, Japan the Henn-na Hotel is run completely by robots.[2] How far can this idea go? Could we have petrol stations, restaurants, tour groups, and shops completely run by robots? In China, the Internet boom will create 3.5 million employment opportunities by 2020.[3] Hence, while labour-intensive jobs could be replaced by robots in the future, affecting labour-intensive economies, a new digital economy could create new work for the many in the near future.

In the future of work report by PWC,[4] one of three possible scenarios of work in 2022 is the collaboration networks of small organizations—indeed, the power of social networks and similar technologies of the future can facilitate such a scenario. But it is also noted in the report that technology breakthroughs will be the dominant factor that will influence how people work in the future. The rise of Internet based jobs in the digital economy in China as noted above is perhaps evidence in support of this. Future technologies will further transform how we work and what we do, perhaps in some ways unanticipated, simply because some of the technological breakthroughs of the future might be unanticipated.

The notion of loosely collaborative networks of workers fuelled by emerging technology trends seems to be a direction of the future.

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[2]http://www.abc.net.au/news/2015-08-19/japanese-hotel-run-by-robots/6706822.

[3]This is based on a Boston Consulting Group study, see http://europe.chinadaily.com.cn/business/2015-08/13/content_21583905.htm.

[4]http://www.pwc.com/en/gx/managing-tomorrows-people/future-of-work/assets/pdf/future-of-rork-report-v16-web.pdf.

Changing Trends at Work

There are at least three trends in work worth noting:

- Work will happen anytime anywhere in the future, or at least can happen and will do so if management permits it. The notion of hot-desking, working from home, and working remotely are notions of work that goes beyond the typical scenario of people sitting physically in the same office or building. With advances in virtual reality, high bandwidth communications, wearable devices with various sensors and interaction modes, robotic telepresence, and collaborative systems, the notion of being there, without being there, will become an increasing possibility. People in physical and virtual environments can be co-present, blurring the distinction between the physical presence and the virtual presence.
- Rapid learning on the job will become an increasing possibility. The extreme scenario of getting a job before getting qualifications for it seems absurd. However, many people do have jobs doing work that they learn skills for while on the job. The increasing number of online courses is only a beginning of a shift in learning, when on-demand or on-the-fly learning might be part of work. Having the desired background and related skills will help, but a question remains as to how far rapid learning technologies can go to helping people get equipped on-the-fly. Changes in career pathways accompanied by uptake of new skills will become easier, perhaps only to be slowed down by the need for experience.
- Customising work will be an interesting possibility in the future. A job that needs to be done by someone can be decomposed in a number of different ways. The same job can be done in many different ways and by varying numbers of people, depending on how it is configured. Future technology in coordinating work might accommodate greater flexibility in this matter.

New Work

There are a number of technological trends that could impact work as we know it.

- **Crowdsourcing**. Crowdsourcing is a combination of outsourcing and the crowd, that is, getting work done by a crowd of people, typically via an online platform (Brabham 2013; Howe 2009; Ren et al. 2015), where humans are employed to do computational work that machines might find difficult to do, including translation, image recognition and others. Consider sorting a bunch of pictures of animals according to cuteness—this is not easy for a computer to do but can be done by humans. Another example is sorting a bunch of video clips

according to "funnyness". The work on human sorts and joins involves humans in typical database operations (Marcus et al. 2011), and platforms such as Amazon Mechanical Turk[5] allow large jobs to be broken down into small pieces of work (aptly called *microtasks*) to be done by crowds of people. For example, to translate a book, break it up into 100 sections to be translated, each section to translate is packaged as a microtask. Some people, especially, in the developing world, have begun to make a living on such crowdsourcing work alone—they might perform a series of microtasks, each microtask is done in exchange for a small payment. But doing enough of such microtasks and being paid in a strong foreign currency could just be enough to make a living in their world.

With people having idle or spare resources (e.g., a car not so often used or an empty bedroom), and a platform to advertise such resources to the public, and for people to find such resources, new markets might be created (e.g., AirBnB[6] and Uber[7]) (Chase 2015). Indeed, this model can be extended to all sorts of resources, including excess or unused bandwidth, or idle CPUs, on the mobile or at home. People with idle resources can be pooled together to create new markets, enabled by Web and mobile technologies, and people with idle time can work to obtain resources or for monetary benefits. Can this way of marketing idle resources help someone make a living without a 9 am to 5 pm job? Mobile and wearable technologies are allowing such crowdsourcing anytime anywhere but also enabling the context of workers to be an advantage when performing certain work. Simply being at the right place at the right time could be enough qualification for a worker to do a crowdsourced task (e.g., to see if there are parking spots nearby). Indeed, maps of various location-dependent situations can be created, e.g., carpark maps, bandwidth maps, maps of quiet places in a city and so on, via such crowdsourcing and perhaps updated real-time. Such maps could be useful for people to optimise their life, e.g., find carpark spaces faster, find a quiet spot to work, and go to the currently highest bandwidth hotspot, and hence, possibly bring economic benefits to society as a whole.

Social networks will play an important role in crowdsourcing opportunities. An individual belongs to multiple social networks, and while time will tell how they will grow, given the relatively young large-scale social networks that exist today, crowdsourcing tasks and obtaining advice via social networks can become a game-changing approach to problem-solving (Zoref 2015).

Many questions arise as to where crowdsourcing could go. For example, how will this way of making a living scale to richer nations? And what will crowdsourcing enable that previous ways of working could not? Also, how can

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[5]https://www.mturk.com.

[6]https://www.airbnb.com.

[7]https://www.uber.com.

we measure the economic value of crowdsourced maps of carparks, bandwidth, noise and pollution, and if such maps bring economic benefits to society as a whole, how will contributors be encouraged and compensated? Will the economic value of such maps be high enough to motivate government subsidies (e.g., tax deductions) or payments that will at least initiate the creation of such systems? What new models of markets and work will emerge with such crowd-based models? Can one work full-time sustainably as a contributor, information provider, and helper in his/her own social network (say if the social network has a large enough number of members)? Indeed, crowd work has a future (Kittur et al. 2013).

- **Social Machines, Human and Machine Synergies**. In recent workshops,[8] a paper introducing the notion of social machines (Buregio et al. 2013), and in *Reinventing Discovery: The New Era of Networked Science* (Nielsen 2011), the notion of systems that utilise human-machine synergy has been proposed. Information systems such as Wikipedia,[9] Galaxy Zoo,[10] and EyeWire[11] employ advanced machine processing but also human input in order to scale and to deal with problems current computer algorithms cannot do well in. Where such systems create information that can be reused over and over again, the effort of one person is multiplied many times, yielding a cornucopia of the commons (Loke 2015), as long as individuals are compensated and motivated (perhaps altruistically) to contribute such information. Even when individuals are self-interested, their own contributions contribute towards information bases that eventually benefit themselves as much as it benefits others.

  Questions arise as to how such systems will evolve and develop. For ex-ample, can one work sustainably as part of one or more of such systems, being a contributor to one or more such social machines, and make a living doing that? Also, how will human-robot synergies enable new ways of working and living?

- **Making Smart Things at Home**. Personal fabrication[12] and mass customization have been concepts that current modern technology has made possible. With 3D printers widely available at reasonable costs, and a huge range of printable materials, from plastic, fabric, conductive ink, to biological tissue, there is a large range of highly personalized and customized products that one can make today at home, compared to years ago. There are still relatively high costs of raw materials to be fed into such printers, but the potential for new ways of work this facilitates is greater than ever.

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[8]See UbiComp 2015 Workshop on Towards Wisdom Computing: Harmonious Collaboration between People and Machines at http://www.irc.atr.jp/en/event/1452/ and social machines at http://www.sociam.org.

[9]Encyclopaedia done by the crowd, https://www.wikipedia.org.

[10]A system for understanding galaxies, http://www.galaxyzoo.org.

[11]A system to map out the neurons in the brain, http://eyewire.org.

[12]See http://www.media.mit.edu/personalfab/ and http://fablabadelaide.org.au/what-is-a-fab-lab\.

There have been various cottage industries, from making cuckoo clocks to artistic wooden products, in settlements in rural Europe to villages in developing countries, but personal fabrication devices such as appropriate 3D printers can amplify creativity and enable new making that wasn't previously possible.

The Internet-of-Things[13] refers to an Internet consisting of things or everyday objects with computational and networking capabilities. Everyday objects, from sprinklers to umbrellas, can be Internet connected and have behaviours adapted to and enhanced with current information. The books *Smart Things: Ubiquitous Computing User Experience Design* (Kuniavsky 2010) and *Enchanted Objects: Design, Human Desire, and the Internet of Things* (Rose 2015) provide an extensive review of the range of products with not only Internet capabilities but also sensors and reasoning capabilities, yielding intelligent objects or smart things that can work together. Producing such smart things or enchanted objects at home will be an interesting scenario of work—a teenage kid could create a smart walking stick (endowed with sensors to capture surrounding information and to provide audio weather reports) for his/her visually-impaired grandfather, and perhaps for all the elderly in his/her village. A mother could design and print out a new digital fabric bracelet for her young daughter, that is not only decorative and comfortable to wear, but doubles as a communication device with basic Internet phone capabilities, using her nephew's electronic 3D component printer and her sister's 3D fabric printer. A range of 3D printers and objects created using 3D printing is gradually emerging in the market place.[14] What new enchanted objects and smart things will be fabricated in new cottage industries?

- **Helping Information Grow**. In the book *Why Information Grows* (Hidalgo 2015), MIT Researcher Hidalgo pointed out the idea that knowledge and know-how is somehow embodied in the social networks of humans. The information worker is one who creates new capabilities, partly by creating new networks of capabilities, "stored" in social networks. The complexity of producing complex products can be aided by appropriate networks of resources that can provide expertise and crowdsourced components. Will future workers contribute to information growth and economic opportunities via such networks? How far can such social networks empower the individual in creating and consuming new information? How can new social networks of capabilities be formed on demand and ad hoc for producing particular products? How does that affect the flow of expertise and the nature of work? What new jobs in the 22nd century will emerge for making information grow?

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[13]See http://www.theinternetofthings.eu, and http://www.cisco.com/web/solutions/trends/iot/overview.html.

[14]For example, see http://www.cubify.com.

Conclusion

Predicting the future of work is difficult. It does not seem the end of work but perhaps the end of work as we know it; this chapter has only painted a small part of the possible future landscape of work. Despite various ways that work might be forecasted to end, there is new work that could emerge in the future.

A domestic worker could invent and create a new generation of cleaning and tidying-up tools (or robots) or start a business making smart crafts. We have already seen virtual reality glasses made from cardboard[15]; what new innovations within the constraints of an economy can be created by millions of equipped people in developing countries or villages? Future cheap 3D printers which can make use of raw materials available in the natural settings around and within households could empower them. Crowdsourcing and social machines can empower communities, young and old, locally or across international borders, to coordinate and share resources, and to invent tools and solutions, in order to solve local problems or improve efficiencies, in urban environments, but also in villages, from issues of safety as people walk through quiet places at night or walk through long distances of un-policed areas (e.g., to wells to get water), local health issues, to issues of food security and farming. It would not just be harnessing idle human creativity, but creating work by bridging the gap between collective human creativity and everyday life problems. What would happen if schools of bright students (across disciplines) and "unemployed" people in a rich nation are allowed to invent solutions to attack problems and issues in a less educated village in a poor nation? What if such solutions then become customisable packaged solutions forming a basis for a business? Could people with idle time in rich nations be synergised to form the engine of a crowd machine acting as "teachers" mediating education for a village in a poor nation or for poor people in a rich nation? How could technologies amplify the resources of the rich and educated minds so that poor nations and the uneducated will benefit? Could an appropriate knowledge-network platform be built so that villages can exchange knowledge they gained?

It can be argued that technology is neutral but making it work best for all of us is a key challenge for global understanding.

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[15]https://www.google.com/get/cardboard/, see also 10 gadgets made from cardboard—http://www.pcmag.com/article2/0,2817,2340487,00.asp.

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Citizenship, Governance and Communication

Michael Williams

Abstract Information and communication technologies (ICTs) are transforming the engagement of citizens in political life at local, regional, national and international levels. Citizenship can be framed in nationally bounded constitutional and legal terms. It can also be framed in a discourse that is not bounded by national boundaries; ICTs facilitate communication between persons and groups who share a common language and sets of concerns. Gender equality, terrorist activity and statelessness are three global issues that highlight changing citizenship issues in the global village and the information-rich global society.

Keywords Agency · Defining citizenship

E-Citizenship and E-Governance

In recent decades, for politicians in some advanced democracies participatory citizenship is associated less with communal action, seen in the supportive work of multiple charities, voluntary agencies and informal social groups, and more with political engagement, especially with voting behaviour. In some countries there has been a marked decline in voters exercising their hard earned right to vote in local, national, and in the European Union, international elections. ICTs are increasingly being seen as an essential way of bridging the divide between the governors and the governed. Of course, the potential value of ICTs in this role is seen differently from either side of the divide. Selected publications, one from Canada and the other from an international organization, illustrate this.

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- The Canadian publication (Peters and Abud 2009) explores the democratic deficit identified in three trends: declining voter turnout, falling rates of participation in political parties, and declining trust in political leadership. These trends are not unique to Canada. They had been highlighted earlier, for example, in a British government consultation paper (Office of the e-Envoy 2002). Peters and Abud seek a "new and meaningful form of democracy" (p. 8) in which citizens engage in "deliberation and informed participation" (p. 8). Through case studies they show how through e-consultation central government can engage in processes that are alternatives to simple top-down information delivery. Their focus is on civic literacy and the involvement of citizens via ICTs in processes that go beyond consultation to include deliberation and evaluation. While this might be seen as a challenge to governments to respond to rapid changes in the information society there are more profound challenges that accompany the availability of ICTs. On the one hand, technology itself lies in the hands of powerful multi-national corporations, who may or may not be subjected to national controls. On the other hand, messages carried by ICTs may come from anywhere on the globe, and censoring these by governments becomes increasingly difficult. The power of the message has been passing to the people and the power of the technology has passed to private corporations. Through this, the local becomes the global and the global becomes the local. This, of course has a flip side. ICTs carry not only positive messages. They carry propaganda and they have enormous potential for legal and illegal, public and clandestine, surveillance of persons and organizations as they go about their legitimate and illegitimate local, national and international everyday private and public lives.
- The second publication (Economic Commission for Africa 2008) focuses on Africa. While the Canadian discussion has special resonance in the advanced and wealthier nations of the First World, a different context is to be found in the less-advanced and impoverished countries of the Third World. Half a century ago the division between the First and Third Worlds was defined in terms of wealth: financial poverty bringing with it an array of problems, not least in nutrition, health, housing and education. To the infrastructural inadequacies of these countries must now be added the inaccessibility of ICTs. The verbs "Have" and "Have not" must be redefined to take this into account. The authors of an African report (Economic Commission for Africa 1996) warn of the widening gap between information rich and information poor countries with the danger of Africans becoming second class status in a new world order. The ambitious vision of the African Information Society Initiative was of Africa becoming by 2010 "an information society in which every man, woman, child, village, public and private sector office has secure access to knowledge through the use of computers and communication media" (Economic Commission for Africa 2008, p. 8).

Looking Back

The opening sentences in the Publisher's Note to the Pelican version (1944) of Mackinder's *Democratic Ideals and Reality: A Study in the Politics of Reconstruction* read, "In the 20th century we must see things in the big. Statesmen must think in continents, industrialists in world markets". At that time many citizens were either fighting in World War II or seeking simply to survive, often in the most dangerous and difficult of circumstances. Citizens were thinking small, concerned about themselves, their families and their local communities. In the twenty-first century, it could be argued, superficially little appears to have changed, apart from the increasing use of the word globalisation to embrace a wide range of phenomena that are rapidly changing with the introduction of more and more sophisticated information and communication technologies (ICTs). More profoundly, the relationships between individuals and governments, at all levels, have changed and are changing, partly as a response to the dissemination of ICTs. An examination of the concept of citizenship helps to clarify this.

Citizenship Defined

Injecting the word citizenship into any discussion may be compared to throwing a pebble into a pond and watching the ripples spread from the point of impact to the periphery. The ripples reduce in intensity with distance as they enlarge and spread. Citizenship needs to be spatially contextualised, not least because it is most commonly defined in nationally-specific legal terms: citizenship is integral to statehood and nationality, both spatially bounded. But citizenship can be defined in terms other than those associated with national identity and legally defined rights, duties, and obligations. Citizenship "can also be applied in a wider sense, to the way an individual perceives and practises being a human being in a society, and/or as a member of an interest group, according to his or her own perception of what is right. That is, on the basis of moral judgement" (Williams and Humphrys 2003, p. 4). Beneath this simple distinction, the constitutional and the communal, lies much complexity.

The turmoil in the Middle East, focused on the troubles of Iraq and Syria, exemplifies the difficulties surrounding the definition of national boundaries. The societal pluralism found in metropolitan cities worldwide exemplifies the problems of defining society. For the latter, it can be argued, that the multiplicity of social groups within a specific place yields multiple definitions of citizenship. Thus, citizenship is perceived differently by persons according to, among others, their age, gender, class, religion, race, language, ethnicity, physical and mental ability and location. Just to complicate things further, there is increasing attention being paid to such concepts as world citizenship, transnational citizenship, dual nationality, environmental citizenship and, even, academic citizenship. Some of these can be

seen clearly in current crises in Europe, not least in Ukraine, but also in the migration of European citizens within Europe and non-Europeans trying to cross the Mediterranean and the Channel. For ordinary citizens in a stable political culture, none of these issues occupy much of their time and thinking. By contrast, in places of economic hardship, day to day survival is all consuming. Obtaining clean drinking water and an adequate supply of food and firewood is the constant preoccupation of many people, especially in Sub-Saharan Africa. The precariousness of life for persons in places threatened by such natural hazards as severe droughts, riverine flooding, tsunamis, earthquakes and volcanic activity as well as the exigencies of civil strife and war, also overwhelms any concerns with citizenship. The responses to such human disasters by local communities demonstrate citizenship in action. Such active citizenship is often seen to be more effective in the short run than any governmental efforts. All of this is some distance from political discussions about participatory citizenship.

Particular Issues

Terrorism

International terrorism has become one of the most serious, if not *the* most serious of global problems. The ability of terrorist groups to utilise ICTs for propaganda purposes, for planning and implementing activities worldwide and to recruit newcomers to their cause has challenged governments to devise counter-measures that also employ ICTs. Electronic surveillance is part of this, though its use is contentious since the methods employed can be seen as intrusions into private life and there is much scope for misuse. In some countries there is an ongoing debate about the need to censor the internet in an attempt to curb the flow of information that might benefit terrorist groups and this too is contentious.

Gender

Gender equality is one of the Millennium Goals identified by the United Nations for a programme that started in 2000 with completion in 2015. The goal was to promote gender equality and empower women. High on the list of issues prioritised by the UN are the ending of violence and harassment towards women, the equalising of educational opportunities, especially in primary schools, greater participation in political institutions and more involvement of women in political life. The plight of women and how this is handled in the media is exemplified by the attack on Malala Yousafzai in Pakistan in 2012 and the abduction in 2014 by gunmen of more than two hundred and fifty schoolgirls from a Government Secondary School in Nigeria.

In the context of citizenship and governance, at an international institutional level the gender equality agenda is framed by improving the presence of women. At street, village and community level the agenda is framed by finding ways for women's voices to be heard. As a UN Women report asserts that, for gender relations to be transformed, women and girls … "should see the expansion of the full range of human capabilities and have access to a wide range of resources on the same basis as men and boys, and they should have a real presence and voice in the full range of institutional fora …" (UN Women 2013, pp. 3–4). For women who own and control mobile phones and computers, their world has been transformed. Provided the technological infrastructure is in place and costs are not prohibitive, they have been empowered to engage in social, cultural and political communication that can lead to various forms of engagement, especially political engagement. They can seek to effect policy changes at local and national levels through formal consultation processes and direct action. Using social media they can engage in international communication, provided that there is a shared language between the correspondents. This is not to suggest that opportunities are equal even within national boundaries. Networking is much easier and quicker in cities than in rural areas, not least because ICTs are more accessible there.

Statelessness and Migration

Statelessness is a contemporary phenomenon that has several facets. For example, there is the statelessness of elite jetsetters, corporate businessmen and women who migrate from home to home and company to company in locations scattered worldwide. They are in the same category as high value sportsmen and sportswomen, and others from the entertainment communities who appear to flit with ease from one continent to another. By contrast, there are the refugees, asylum seekers and migrants whose intracontinental and intercontinental travelling is anything but easy. Regarding the latter, the United Nations High Commission for Refugees estimated that in 2014 some 59.5 million people were forcibly displaced. Of these, 19.5 million were refugees, 38.2 million were internally displaced and 1.8 million were asylum seekers (UNHCR 2015). To bring some scale to these enormous figures, it was estimated that 42,500 people were forced to migrate per day as a result of civil conflict and persecution. ICTs have converted the statistics into personal stories, bringing a sense of immediacy to the forces that have driven people to migrate on hazardous journeys sometimes across oceans and sometimes overland. The mass media project images in real time of scenes from the Mediterranean, the Pacific and the US-Mexican border. They also display similar images from pressure points in Africa and Asia. It is important to recognise that Turkey received most refugees in 2014 (1.59 million), followed by Pakistan, Lebanon, Iran, Ethiopia and Jordan. In Sub-Saharan Africa, Africa's numerous conflicts, including in Central African Republic, South Sudan, Somalia, Nigeria, Democratic Republic of Congo, together produced immense forced displacement

totals in 2014, on a scale only marginally lower than in the Middle East. The political consequences of these migrants are immense for the migrants themselves, especially for those who end up in vast camps, as well as for the governments that have to cope with the arrivals when their own resources are inadequate. Integral to the everyday life of the displaced and stateless is the loss of any rights to education, health care, housing and other aspects of life taken for granted in more advantaged communities.

Conclusions

In the context of citizenship and governance, there is an abundance of international documents produced by agencies such as the United Nations, the World Bank and the OECD that have produced discussion papers, organised conferences and published discussion papers, expert reports and published recommendations, roadmaps and sets of goals for national governments to consider. In parallel, national and local governments have addressed these issues for their citizens. Meanwhile, non-governmental organizations, operating at a variety of scales and scholars from a range of academic disciplines have set their own agendas for study, research and communal activity. There are many voices to be heard and ICTs have provided the means for individuals to contribute at many levels. Voices may or may not have power and authority. Their capacity to influence governmental policies and practices will vary according to local and national circumstances. One needs only to consider the resources and opportunities available in contrasting environments such as the megacities of the First World and the scattered rural villages of the Third World. Increasingly, ICTs are creating new inter-linked communities varying from the local to the global. They challenge our conventional understanding of citizenship and pose problems for governments seeking to function efficiently, transparently and accountably.

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