SCANNING OUR FUTURE: INITIAL EXPLORATION OF TECHNOLOGICAL DEVELOPMENTS AND RESILIENCE IMPACTS

PROLOGUE

Jeremy Green and Fred Barker, January 2018

Introduction: setting the scene

It's been said at other times in history, but some might say we stand at a point where developments in technology, including but not limited to the 'Fourth Industrial Revolution', can provide the material basis for all humans to have a life of material and cultural abundance.

Drudge work – both mental and physical – can be eliminated through automation, leaving more time for creativity, community and caring for each other. We can optimize and minimize our use of resources in line with the capacities of our planet, and use information to guide and shape our patterns of consumption. We can escape from the tyranny of the long production run to make things locally that meet our specific needs. We have the power to enhance significantly our health and wellbeing, though new treatments and preventative measures, and through health-promoting behaviour change. We can make our treasury of culture – art, music, literature, film – available to everyone at prices so cheap it would be absurd to charge for them. We can be better informed than society has ever been, open the practices of government and corporations to public scrutiny and practice deliberative democracy that far surpasses the current model of occasional elections.

But this cornucopia has arrived, not on to a blank slate, but in a specific time and place, and a specific social and economic framework. Here, productive activity is organised around an economic and financial system that requires most work and transactions to take place in the context of financial profit.

Many clever people spend their waking hours thinking about how the capabilities of transformative technologies can be fitted in to this economic model – how they can be 'monetized', and become part of a 'sustainable business model'. They need to be clever, because their task is a difficult one. These transformative technologies have the potential to create abundance, but the economic model is based on scarcity. The technologies could do lots of wonderful things, but for some of the most powerful technologies, it's not obvious how they could make money for anyone[1].

We return to this conundrum below, under 'further observation and discussion', but first outline the nature of our main report and headline findings.

Scanning the future of technology: our main report

In our main report we identify how 11 technological developments are emerging, or have emerged, within this social and economic framework. The 11 developments are: artificial intelligence and automation, augmented reality, connected objects, cryptocurrencies, distributed manufacture, drones, gene editing, green chemistry, smart drugs, the hidden web and video analytics.

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[1] It's hard to find a better formulation of this issue than the somewhat famous quote from Marx: A "At a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or… with the property relations within the framework of which they have operated hitherto. From forms of development of the productive forces these relations turn into their fetters."

For each of these technological developments, we have applied two main stages of assessment: identification of key characteristics (including definition, drivers, barriers, readiness assessment, core functions and concerns); and use of 'resilience grids' for identification of potential resilience impacts (based on initial judgements of whether technology specific core functions and concerns are likely to have, respectively, positive and negative impacts against a series of generic resilience qualities.)

For the purposes of initial assessment, we have used the following resilience 'qualities':

- **Individual** - personal capacities to adapt or transform in response to challenges

  - o awareness of and connection to the natural and human-made systems that support our daily well-being
  - o sense of own agency
  - o sense of belonging to a group or community (social cohesion)

- **Group** (including front line service providers)

  - o Reflectiveness – the ability to learn from experience or new evidence
  - o Resourcefulness – the ability to find different ways to do things
  - o Robustness – being well conceived, constructed and managed
  - o Redundancy – having intentional spare capacity (includes having diverse ways to do something)
  - o Flexibility – the ability to evolve or change
  - o Inclusiveness – positive engagement with all people regardless of gender, sexual preference, race or class
  - o Integration – across sectors and scales

- Additional **super-resilience** qualities:

  - o Ability to anticipate futures (including being attuned to weak and early signals of possible change)
  - o Transformative potential (the capacity to identify and move to new development pathways)

Scanning the future of technology: our headline findings

Key headline findings from our initial assessment cover: patterns of resilience impacts, a way of focusing on specific resilience qualities, and addressing concerns and negative resilience impacts.

Patterns of resilience impacts

Each technological development has its own distinctive pattern of positive and negative resilience impacts. These patterns can be used to compare impacts across technological developments.

It is notable that the number and breadth of impacts varies significantly across technological developments. For example, augmented reality displays a large number of positive and negative resilience impacts across a wide range of core functions and concerns. In contrast, drones and green chemistry both display a relatively small number of impacts. For drones, one core function delivers most of the positive impacts, and for green chemistry the positive impacts arise from very specific and important functions.

For some technologies impacts can be concentrated around specific core functions or concerns. For example, for AI and automation, the core function relating to the performance of tasks beyond current

human capabilities holds promise for positive impacts across a wide range of resilience qualities. A similar observation applies to the uses of connected objects that are enabled by tracking, monitoring and control capabilities. In other examples, a concentration of positive impacts can arise from the organisational form in which the technology is deployed. This arises with distributed manufacture (from the decentralised and small-scale function) and gene editing (from the democratisation of research function).

For some technologies, impacts can be concentrated around specific resilience qualities. In particular, for cryptocurrencies and the hidden web, there is a concentration of potential positive impacts around the individual qualities of agency and social cohesion, and the group quality of resourcefulness.

A Way of focusing on specific resilience qualities

One potential use of the resilience grids is as a 'point of entry' into which functions and uses of which technologies are likely to deliver positive or negative impacts relating to specific resilience qualities. This could be helpful if there is a desire to focus on specific individual, group or super resilience qualities and to develop thinking on the contribution that technological developments can make to building up or enhancing a specific quality. For example, a look across the resilience grids indicates that:

- The individual resilience quality of 'sense of belonging to a group or community' (social cohesion) could be impacted positively by one or more core functions of connected objects, cryptocurrencies, drones, gene editing and green chemistry, and negatively by one or more concerns associated with almost all the technologies considered.
- The group resilience quality of 'having intentional spare and/or diverse capacity' (redundancy) could be impacted positively by one or more core functions of augmented reality, cryptocurrencies, distributed manufacture, drones and gene editing, and negatively by one or more concerns associated with AI and automation, augmented reality, connected objects, cryptocurrencies and gene editing.
- The super resilience quality of 'the capacity to identify and move to new development pathways' (transformative potential) could be impacted positively by one or more core functions of nearly all of the technological developments considered, with the exception of drones and video analytics. However, this quality could be impacted negatively by one or more concerns associated with all the developments considered.

Addressing concerns and negative resilience impacts

Any use of the resilience grids as a 'point of entry' to help develop thinking on the contribution that specific technological developments could make to building up or enhancing specific resilience qualities should, however, be tempered by a parallel consideration of how the concerns and negative resilience impacts associated with a technology can be addressed. There is, unfortunately, no technological 'magic bullet' for building super resilience. Our evaluation tables do, nonetheless, contain some 'seeds' or pointers towards ways of addressing concerns and negative resilience impacts, and to organisations and groups that are seeking to influence the way specific technologies are developed. For example:

- On an individual basis, there are actions that can be taken, ranging from exercising personal responsibility to stay within laws and regulations (e.g. not using drones for illegal activities, and not abusing access to surveillance capabilities provided by video analytics), to adopting a sustainable lifestyle (e.g. not succumbing to consumerist pitfalls associated with distributed manufacture and green chemistry).

- On a group basis, there are various types of actions that could be taken, including: the advice and advocacy role of professional groupings (e.g. the Green Chemistry Network and the Partnership on Artificial Intelligence, or health practitioner organisations on the mental and physical health impacts of various technological developments); and consideration of the organisational and legal forms of community bodies or businesses established to apply technologies (e.g. establishing co-operatives to further the democratisation of gene editing research).
- On a national basis, there is much that can be done on a regulatory, strategy or policy level, particularly by Government. In its recent Industrial Strategy, the UK Government acknowledged that the world is undergoing a "technological revolution" of unprecedented scale, speed and complexity, and presented a strategy for exploiting opportunities and addressing challenges and impacts. Some current Government initiatives are referred to in our technology specific evaluation tables, for example, relating to AI and automation, the Government is establishing the UK Centre for Data Ethics and Innovation, and on drones it has announced a range of measures, including a commitment to new powers and systems for registration and testing of leisure pilots.

Further observations and discussion

The way in which the technology industries, and their finance backers, have responded to the conundrum raised in the introduction goes a long way towards explaining why technology developments are the source of so much anxiety, and why technology is often perceived to have negative rather than positive implications for personal and community resilience.

A number of themes in industry's response are discernible from our initial assessment, including: extension of the monetization of peoples' attention; redefinition of the boundaries of privacy; and shifting the definition of ownership and personal property. They have also encouraged the belief that both governments and society are powerless in the face of the inevitable forward march of technology, a view that extends from the inability of governments to censor or control information, through the growth of digital currencies and markets for illegal services, to the inability of governments to collect taxes from the technology giants.

Further observations on these four themes are:.

- **Attention:** Google and Facebook (and Twitter, and all the others…) didn't invent advertising, but the tools available to them have allowed them to bring it to a new level. What they are selling is not the 'services' they provide to users, but those users' attention. They are already good at it, and they keep getting better. That's why the services are so distracting and so compulsive; that is how they are meant to be. In terms of personal resilience, the challenge is to manage this distraction and compulsion. For an example of this, see our discussion (in the main report) on augmented reality.
- **Privacy**: The assault on attention is armed with information about our preferences, desires and behaviour. The technologies we discuss in automation and AI, connected objects, and drones, all illustrate this. In signing the 'End User Licence Agreement' for the shiny stuff that we buy, we consent to give up information that we might once have considered private. Apple and Google know where we walk, how long we stay there, where we drive and where we park, what we are thinking of buying (though not apparently, when we have bought it), what news sources we regularly look at and how long we spend looking at them. If we buy a wearable device they know how often we exercise, whether our performance is improving. If we buy 'smart' objects for our homes they know how warm we like it, and when we're not in. Robot vacuum cleaners map out the layouts of our homes and send the information to the manufacturer so that they can sell it on.

- **Ownership**: It is not just our data that we do not own. There is an increasing trend towards 'servitization', whereby companies seek to sell us services where they would once have sold us things. This makes for continuing revenue streams on the balance sheet, reduces our ability to repair what we have 'bought', constrains the extent to which we can find innovative uses for our things, and limits our ability to share. This is even more the case with digital goods, where sharing is re-conceptualized as 'piracy'.
- **Regulation and control:** notwithstanding our headline finding above on the role of Government in addressing concerns and impacts, over recent decades the state has become less able to regulate markets and transactions in the name of society. Communications technology, digital currencies and online markets do not respect borders, as our discussion of cryptocurrencies and the hidden internet illustrate. Weakening the state's ability to control such markets has some upside (as we discuss) but it undoubtedly makes for a more fragmented, less cohesive society in which consumption is purely a matter of personal preference.

Responding to the challenges posed by technology

In addition to the headline findings above on the ways in which individuals and groups can start to address concerns and negative impacts, it is possible to discern other elements of strategies that may be useful for the project's client groups. These include:

- Adaptation and Assimilation: learning to come to terms with a technology, including developing techniques to mitigate and minimize their negative impact (e.g. social media diets, digital detox, "weekend Luddite"). There are several writers and organisations seek to develop techniques and tools; some are about developing better mental habits, while others are as simple as adding extensions to browser software, such as ad blockers.
- Hacking and Subversion: learning how to change a technology so that it does more of what we want and less of what we don't want (e.g. privacy settings, rooting/jailbreaking smartphones). Here too there is much activity and advice; some of this is more than a little paranoid and engages with a largely unachievable objective of defeating surveillance by government agencies. A useful primer of relatively simple tools for privacy can be found here https://www.extremetech.com/internet/180485-the-ultimate-guide-to-staying-anonymous-and-protecting-your-privacy-online)
- Embrace: careful and selective adoption of technologies which can contribute significantly to individual or group resilience (e.g. drones for community mapping projects). There are lots of projects in this area; Mapping for Change (http://mappingforchange.org.uk/) is a good example.
- Shape: engaging with the development of technology, especially at the level of development funding to maximise the positive and minimize the negative impacts (e.g. participating in P2P networks, user support groups, hackathons. There is much exciting work going on at the moment around the development of 'platform cooperatives; the proceedings of 'Open 2017' are good way in to the landscape within the UK.
- Influence: seeking to influence public bodies at local, regional and national level, including local authorities and government.

Potential future collaborators and partners

In order to develop thinking about strategies, and how they might be applied, consideration could be given to approaching potential collaborators and partners, including the 'influencers' identified for each technological development in our main report.

In particular, we have identified the following organisations, but expect that others will arise from the main stream of the Phase 2 SOF work.

- P2P Foundation (https://p2pfoundation.net/ "The P2P Foundation…is a non-profit organization and global network dedicated to advocacy and research of commons-oriented peer to peer (P2P) dynamics in society.")
- Electronic Frontier Foundation (https://www.eff.org/ "The Electronic Frontier Foundation is the leading nonprofit organization defending civil liberties in the digital world. Founded in 1990, EFF champions user privacy, free expression, and innovation through impact litigation, policy analysis, grassroots activism, and technology development.")
- Open Rights Group (https://www.openrightsgroup.org/ "…the UK's only digital campaigning organisation working to protect the rights to privacy and free speech online. With almost 3,000 active supporters, we are a grassroots organisation with local groups across the UK."
- Open Data Institute (https://theodi.org/ "We bring together commercial and non-commercial organisations and governments around specific sectors to address today's global challenges…Driven by needs, and focused on timely challenges, we help people identify and address how the web of data will impact their businesses and their sectors.")
- The Restart Project (https://therestartproject.org/ "…a London-based social enterprise that encourages and empowers people to use their electronics longer in order to reduce waste. We help people learn to repair their own electronics in community events and in workplaces, and speak publicly about repair and resilience."