THEME 02

What makes our Information Age so special?

ECONOMIC GROWTH | HYPERHISTORY | INFORMATION AGE

Until the turn of the 20th century, human knowledge doubled roughly every 100 years. After 1900, however, what had been a linear function changed into an exponential one as a result of digitization. Hence, by 2025, the "Knowledge Doubling Curve" will show a doubling of all human knowledge every day. However, this quantitative leap is not the essence of the Digital Revolution; a closer look at the nature of today's information and communication technologies reveals that we will move towards a radically different model that is based on the logics of networks and ever-changing and multi-layered objects, both human and non-human.

Our observations

- Alonzo Church and Alan Turing defined problems as sequences that are basically composed of binary yes-no questions, with differing degrees of complexity. Following this definition, they defined intelligence as that which can find a finite string of instructions (i.e. questions with "yes" or "no" answers) in order to answer and solve a problem, given an unlimited supply of memory, time and energy. A Turing machine is thus a machine that exhibits intelligence and is able to solve every informational problem.
- There are many theories on the value of connectivity: Reed's Law (social media platforms) Sarnoff's Law (broadcast networks) Beckstrom's Law (computer networks) Meltcalfe's Law (telecommunication networks). Coupled with exponentially increasing computing power, decreasing storage costs and higher speed of communication in the emerging sensor-based economy, their shared idea is that the value of network and the data it contains will increase exponentially. As a result, such networks will play an important role in the organization of our society and economy, as they optimize data flows and thus the intelligence we can generate from it.
- Digital flows of data and information were virtually nonexistent 15 years ago, but now account for a larger impact on global GDP growth than trade in goods and services, primarily by raising productivity and efficiency. Over a decade, digital flows have raised global GDP by at least 10%; this value totaled $7.8 trillion in 2014 alone. Furthermore, the digital economy grew three times as fast as the real economy in the U.S. between 2005 and 2016, and now accounts for 6.5% of GDP.
- The shift from a historical and materialist worldview to a hyperhistorical and informational worldview based on dephysicalized flows and digital objects has already been imagined in movies such as *The Matrix* and *Ghost in the Shell*.

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Connecting the dots

We tend to think of information and communication technology (ICT) in terms of digital data, computers and the internet. However, those manifestations of ICT are merely the latest additions to a long string of technologies that have helped people to record, accumulate, and transmit information about events, people and things for future consumption. In fact, the earliest of these technologies (e.g. clay tablets, painted pots) marked the passing from pre-history to history. Without these artefacts, collective knowledge could not have been passed on (other than through storytelling) and organized civilizations could not have developed. History thus only starts with the emergence of 'informational regimes'. There have been many of these throughout history, such as the Bronze Age, the Chinese civilization, the Middle Ages and modernity. However, given the limitations of their (ever-evolving) ICTs, these early informational regimes could not be integrated into a larger informational system and they remained poorly connected, if not isolated.

This changed with the emergence of the digital ICTs of the 20th century. These, finally, allow for hitherto disparate sources of information to converge and spread, almost limitlessly, across time and space. That is because computer algorithms, communication channels and software protocols are not fundamentally different from the digital data they manipulate. For example, computer algorithms can distill the information stored in a digital picture while different types of media can be broken down into data flows that can be sent and constructed somewhere else (e.g. a computer, a smartphone). Church and Turing already showed that ICTs and the digital data they process have become the same thing: digits of information, in contrast to the pictures on a painted pot or writings on a clay tablet. As such, all forms of information are broken down into their binary and digital building blocks, which then become interchangeable and can be integrated into larger, meta-information systems: we move to a "hyperhistory" in which all informational regimes are interconnected. The most obvious consequence of this Digital Revolution, which has given rise to the Information or Digital Age, is that developed economies have seen an accelerated shift of value creation based on ICT and data, which has spawned various new industries, such as social media, streaming, high-frequency trading, computer programming, and online marketplaces. Indeed, in his book *The Fourth Revolution: How the Infosphere is Reshaping Human Reality*, philosopher Luciano Floridi states that digital ICTs and their data processing capabilities have become a necessary condition for the maintenance and any further development of societal welfare, personal well-being, as well as intellectual flourishing. As such, digital ICTs are the defining technologies of hyperhistorical economies, just as the steam engine was for the Industrial Age: we increasingly interact with the world through ICTs, and our economies generate most added value with informational activities, instead of material production (e.g. agriculture, manufacturing). Traditionally, countries have moved from a traditional and agricultural (primary sector) economy to a modern state with high value-added economic activity in the industrial (secondary) sector. When countries further shift towards high-income economies, manufacturing and industrial production is outsourced and income is earned in the services (tertiary) sector: a shift from blue to white-collar work. For high-income countries, the service economy provides about 70% of GDP. At the highest stage of economic development, the service economy transforms into a knowledge economy, depending largely on innovation, design and creative ideation (e.g. financial services, architectural design) instead of repetitive and low-skilled service jobs (e.g. call-center work, cleaning). Indeed, the quality of the knowledge economy is one of the most significant and positive contributors to future economic growth for high-income economies.

Currently, we still have a "Newtonian" idea of things: artefacts with a fixed goal and a predefined set of applications. But with digital ICTs and data, products become bundles of layers that are built onto each other. That makes that informational objects are never finished or have a finite form: every piece of information can always be used as the input for a subsequent process and new output. For example, Tesla's car updates really change the specifications of the car, while devices (e.g. a pacemaker, implanted payments microchips, digital lenses) inside our organs can change our health and alter our biological body: we are already cyborgs. In the future, networks of information and ICTs will increasingly come to define our identity (e.g. on social media networks), our economy (e.g. knowledge networks), society (e.g. a network society), our ontology (e.g. the nature of consciousness or virtual realities), and even our geopolitics (e.g. the primary organization is that of networks of likeminded users instead of countries that are arbitrarily determined by geographical boundaries).

Implications

- In hyperhistorical societies, ICTs are the defining technologies and we interact with the world and with our technology through ICTs (and ICTs invisibly amongst themselves). This means that humans are going to interpret the world in ICT-friendly terms, namely in data and information. However, of the 163 zettabytes of data we will generate globally by 2025, more than 80% will be unstructured: data without a clearly defined model and/or with unclear reference to real-world properties. As such, it is becoming ever more important to validate and organize data in an effective way so that it is clear which and how meaningful insights can be extracted from it. Because of this, the expertise and discipline of hermeneutics is becoming increasingly important.

- In ancient and medieval times, philosophers said that only what is immutable (e.g. God) truly exists, while modern philosophers stated that only that is real which can be subject to perception (empiricism) or thought (rationalism). The emerging informational ontology in hyperhistory will add that everything that can be interacted with is real. Floridi argues that we might therefore see a revival of animistic worldviews in which we are deeply connected and shaped by things we interact with and the world we co-create. By moving from the Platonic world of types and objects to this nominalist world of unique, tokenized objects, we might move towards a digital barter economy.

- The future divide will be between hyperhistorical and historical societies and economies, just as prehistoric societies died out in the face of modern ones. Countries succeed if they are well prepared for living and working in hyper-historical societies that depend on digital ICTs, information flows and networks. An example is the Netherlands, which ranks seventh on the Information Society Index, fourth on the Digital Economy and Society Index and sixth on the Networked Readiness Index.

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