

HOW THE
INFOSPHERE
IS RESHAPING
HUMAN REALITY

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SPACE

Infosphere

Technology's in-betweenness

One of the most obvious features that characterizes any technology is its *in-betweenness*. Suppose Alice lives in Rio de Janeiro, not in Oxford. A hat is a technology between her and the sunshine. A pair of sandals is a technology between her and the hot sand of the beach on which she is walking. And a pair of sunglasses is between her and the bright light that surrounds her. The idea of such an in-betweenness seems clear and uncontroversial. However, it soon gets complicated.

Because of our anthropocentric concerns, we have a standard term to describe one of the sides of technology's in-betweenness: Alice is the *interacting user*. What we seem to lack is a term for the other side of the relation, that which invites a particular usage or enables some interaction. What the sun does is to prompt the development and then the wearing of the hat. So let us agree to refer to the other side of technology's in-betweenness as *the prompter*.[1] Apart from conveying the right idea of inviting, suggesting, or enabling some particular technological mediation, it is also a virgin word in our philosophy of technology, hard to confuse with its meaning in the theatre, and it rhymes with user. Here (see Figure 12), it means that the sunshine is a prompter of the hat, the hot sand is a prompter of the sandals, and the bright light is a prompter of the sunglasses. An inventor is someone



Fig. 12. The Scheme for Technology's In-betweenness.



Fig. 13. First-order Technology.

who devises an artefact that may satisfy a user's need or want caused by some prompter. As you can see, I am slightly stretching the word 'prompter', hopefully without breaking it.

When technologies are in-between *human* users and *natural* prompters, we may qualify them as *first-order* (Figure 13). Listing first-order technologies is simple. The ones mentioned earlier all qualify. More can easily be added, such as the plough, the wheel, or the umbrella. The axe is probably the first and oldest kind of first-order technology. Nowadays, a wood-splitting axe is still a first-order technology between you, the user, and the wood, the prompter. A saddle is between you and a horse. Nail clippers and hunting bows are other instances of such first-order kind of technology, which need not be simple, and can be technology-dependent and technically sophisticated, like an assault rifle, which is sadly a first-order technology between two human sides, as users and prompters.

At this point, the word 'tool' may come to mind as appropriate, but it would be misrepresentative, because tools do not have to be first-order technologies, as I shall explain presently.

Many non-human animals make and use simple, first-order technologies, like modified sticks or shells, to perform tasks such as foraging, grooming, fighting, and even playing. In the past, this discovery determined the end of a naïve interpretation of *homo faber* as *homo technologicus*. True, we are the species that builds, but the point to be made is slightly subtler, because many other species also create and use artefacts to interact with their environments. As in the case of our



Fig. 14. Second-order Technology.

use of natural languages and other symbolic forms of communication, or the creation of artificial languages, especially to program machines, the difference between us and other species is incommensurable not because it is a matter of binary presence or absence of some basic abilities, but because of the immensely more sophisticated and flexible degree to which such abilities are present in us. It is the difference between a colouring book with which a child has played using some crayons and the Sistine Chapel. Insisting on continuity is not mistaken, it is misleading. In the case of technologies, it is preferable to talk about *homo faber* as *homo technologicus*, inventor and user of *second-* and *third-order* technologies, in the following sense.

Second-order technologies are those relating users no longer to nature but to other technologies; that is, they are technologies whose prompters are other technologies (see Figure 14).

This is a good reason not to consider the concept of a *tool* or that of a *consumer good* as being coextensive with that of first-order technology. Think of the homely example of a humble screwdriver. Of course, it is a tool, but it is between you and, you guessed it, a screw, which is actually another piece of technology, which in its turn (pun irresistible) is between the screwdriver and, for example, two pieces of wood. The same screwdriver is also more easily understood as an instance of a *capital good*, that is, a good that helps to produce other goods. Other examples of such second-order technologies include keys, whose prompters are obviously locks, and vehicles whose users are (still) human and whose prompters are paved roads, another piece of technology.

Some first-order technologies (recall: these are the ones that satisfy the scheme humanity–technology–nature) are useless without the corresponding second-order technologies to which they are coupled.

Roads do not require cars to be useful, but screws call for screwdrivers. And second-order technologies imply a level of mutual dependency with first-order technologies (a drill is useless without the drill bits) that is the hallmark of some degree of specialization, and hence of organization. You either have nuts *and* bolts or neither.

Such interdependencies, and the corresponding appearance of second-order technologies, require trade and some kind of currency, so they are usually associated with the emergence of more complex forms of human socialization, and therefore some kind of civilization, the following accumulation of some free time and leisure, and ultimately a corresponding culture. Whereas some non-human animals are able to build their own artefacts to some extent, for instance by sharpening a stick, they do not seem to be able to build second-order technologies in any significant way.

The engine, understood as any technology that provides energy to other technologies, is probably the most important second-order technology. Watermills and windmills converted energy into useful motion for millennia, but it is only when the steam, the internal combustion engine, and the electric motor become 'portable' energy-providers, which can be placed between users and other technologies wherever they are needed, that the Industrial Revolution turns into a widespread reality.

Much of late modernity—prompted by science's increasing knowledge about, and control over, materials and energy—gets its mechanical aftertaste from the preponderance of second-order technologies. The London of Sherlock Holmes is a noisy world of gears, clocks, shafts, wheels, and powered mechanisms, characterized not just by the humanity–technology–nature relation but, more significantly, by the humanity–technology–technology relation. Modernity, as a pre-hyperhistorical stage of human development, soon becomes a world of complex and networked dependencies, of mechanical chain-reactions as well as locked-in connections: no trains without railways and coal, no cars without petrol stations and oil, and so forth, in a mutually reinforcing cycle that is both robust and constraining.

As the history of the floppy disk shows, at some stage it is easier to replace the whole system—change paradigm, to put it more dramatically—than to keep improving one part of it. There is no point in having super-powerful floppy disks if the millions of drives already in place are not up to the task of reading them. This explains one of the advantages of any technological leapfrogging:[2] a later adopter does not have to deal with the legacy of any incumbent technological package (coupled first- and second-order technology), and is free to take advantage of the most recent and innovative solution. Yet, this is less simple than it looks, precisely because of the coupled nature of second-order technologies. Of course, it would be easier to introduce electric or hybrid vehicles, for example, if there were only roads but no internal combustion engine vehicles; the obvious difficulty is that roads are there because of the latter in the first place. Thus, the task of legislation that deals with technological innovation is also that of easing the transition from old to new technologies by decoupling, sometimes through incentives and disincentives, what needs to be kept (e.g., roads) from what needs to be changed (e.g., internal combustion engine vehicles).

Most of the comfortable appliances we enjoy in our houses today belong to late modernity, in terms of conception: the refrigerator, the dishwasher, the washing machine, the clothes dryer, the TV, the telephone, the vacuum cleaner, the electric iron, the sound system . . . these are all either first- or second-order technologies, working between human users and the relevant prompters. They represent a world that is ripe for a third-order, revolutionary leap. For technology starts developing exponentially once its in-betweenness relates technologies-as-users to other technologies-as-prompters, in a technology–technology–technology scheme (see Figure 15). Then we,



Fig. 15. Third-order Technology.

who were the users, are no longer in the loop, but at most on the loop: *pilots* still fly drones actively, with a stick and a throttle, but *operators* merely control them with a mouse and a keyboard.[3] Or perhaps we are not significantly present at all, that is, we are out of the loop entirely, and enjoy or simply rely on such technologies as (possibly unaware) beneficiaries or consumers. It is not an entirely unprecedented phenomenon. Aristotle argued that slaves were 'living tools' for action:

> An article of property is a tool for the purpose of life, and property generally is a collection of tools, and a slave is a live article of property.[4] [...] These considerations therefore make clear the nature of the slave and his essential quality; one who is a human being belonging by nature not to himself but to another is by nature a slave, and a human being belongs to another if, although a human being, he is a piece of property, and a piece of property is an instrument for action separate from its owner.[5]

Clearly, such 'living tools' could be 'used' as third-order technology and place the masters off the loop. Today, this is a view that resonates with many metaphors about robots and other ICT devices as slaves.

Of course, the only safe prediction about forecasting the future is that it is easy to get it wrong. Who would have thought that, twenty years after the flop of Apple's Newton[6] people would have been queuing to buy an iPad? Sometimes, you just have to wait for the right apple to fall on your head. Still, 'the Internet of things', in which third-order technologies work independently of human users, seems a low-hanging fruit sufficiently ripe to be worth monitoring. Some pundits have been talking about it for a while now. The next revolution will not be the vertical development of some unchartered new technology, but horizontal. For it will be about connecting anything to anything (*a2a*), not just humans to humans. One day, you-name-it 2.0 will be *passé*, and we might be thrilled by *a2a* technologies. I shall return to this point in Chapter 7. For the moment, the fact that the Newton was advertised as being able to connect to a printer was quite amazing at the time, but rather trivial today. Imagine a world in which

your car autonomously checks your electronic diary and reminds you, through your digital TV, that you need to get some petrol tomorrow, before your long-distance commuting. All this and more is already easily feasible. The greatest obstacles are a lack of shared standards, limited protocols, and hardware that is not designed to be fully modular with the rest of the infosphere. Anyone who could invent an affordable, universal appliance that may be attached to our billions of artefacts in order to make them interact with each other would soon be a billionaire. It is a problem of integration and defragmentation, which we currently solve by routinely forcing humans to work like interfaces. We operate the fuel dispensers at petrol stations, we translate the GPS's instructions into driving manoeuvres, and we make the grocery supermarket interact with our refrigerator.

Essentially, third-order technologies (including the Internet of things) are about removing us, the cumbersome human in-betweeners, off the loop. In a defragmented and fully integrated infosphere, the invisible coordination between devices will be as seamless as the way in which your smartphone interacts with your laptop and the latter interacts with the printer. It is hard to forecast what will happen when things regularly talk to each other, but I would not be surprised if computer and software companies will design and sell appliances, including your TV, in the near future.

Technologies as users interacting with other technologies as prompters, through other in-between technologies: this is another way of describing hyperhistory as the stage of human development when third-order technological relations become the necessary condition for development, innovation, and welfare. It is also a way of providing further evidence that we have entered into such a hyperhistorical stage of our development. The very expression 'machine-readable data' betrays the presence of such a generation of third-order technologies. To put it simply, barcodes are not for our eyes, and in high-frequency trading[7] (three-quarters of all equity trading volume in the US is HFT) the buying and selling of stocks happens at such an extremely high speed that only fast computers and algorithms

can cope with it, scanning many marketplaces simultaneously, executing millions of orders a second, and adopting and adapting strategies in milliseconds. The same holds true in any time-sensitive application, whether civilian or military. Further examples include autonomous vehicles, like driverless cars, or 'domotic appliances', the technologies that are transforming the house into a smart environment, for instance by monitoring, regulating, and fine-tuning the central heating and the supply of hot water to our habits. We shall encounter them again in the following chapters.

As is clear from the previous examples, the ultimate third-order technology is provided by ICTs. The very use of 'engine' in computational contexts (as in 'search engine' or 'game development engine') reminds us that second-order technology is related to the engine as third-order technology is related to the computer. ICTs can process data autonomously and in smart ways, and so be in charge of their own behaviours. Once this feature is fully exploited, the human user may become redundant. It is hard to imagine a modern world of mechanical engines that keeps working and repairing itself once the last human has left Earth. Mechanical modernity is still human-dependent. However, we can already conceive a fully automated, computational system that may not need human interactions at all in order to exist and grow. Projects to build self-assembling 3D printers that could exploit lunar resources to build an artificial colony on the Moon may still sound fictional,[8] but they illustrate well what the future looks like. Smart and autonomous agents no longer need to be human. A hyperhistorical society fully dependent on third-order technologies can in principle be human-independent.

Time to summarize. We saw that technologies can be analysed depending on their first-, second-, or third-order nature. The point could be refined, but without much conceptual gain. Is a clock a first- (between you and your time), a second- (between you and your pressure cooker), or a third-order technology (between your computer and some scheduled task)? Is a pair of scissors a first- (between you and the stem of a rose), a second- (between you and a piece of

paper), or a third- (between a robot and a piece of cloth in a factory) order technology? Is a computer a first- (between you and the level of water in a reservoir), a second- (between you and another computer), or a third-order (between two other computers) technology? Evidently each answer depends on the context. Yet, the fact that there is no single, decontextualized answer does not make the distinction any less cogent, it only proves that we need to be careful when using it. What is important to stress here is that the distinction is both sound and complete: there is no fourth-order technology. Of course, the chain of technologies interacting with other technologies can be extended as much as one wishes. However, such a chain can always be reduced to a series of triples, each of which will be of first-, second-, or third-order.[9]

The development of technologies, from first- to second- and finally to third-order, poses many questions. Two seem to be most relevant in the context of our current explorations.

First, if technology is always in-between, what are the new related elements when ICTs work as third-order technologies? To be more precise, for the first time in our development, we have technologies that can regularly and normally act as autonomous users of other technologies, yet what is ICTs' in-between relationship to us, no longer as users but as potential beneficiaries who are out of the loop? A full answer must wait until the following chapters. Here, let me anticipate that, precisely because ICTs finally close the loop, and let technology interact with technology through itself, one may object that the very question becomes pointless. With the appearance of third-order technologies all the in-betweenness becomes internal to the technologies, no longer our business. We shall see that such a process of technological 'internalization' has raised concern that ICTs may end up shaping or even controlling human life. At the same time, one may still reply that ICTs, as third-order technologies that close the loop, internalize the technological in-betweenness but generate a new 'outside', for they create a new space (think for example of cyber-space), which is made possible by the loop, that relies on the loop to

continue to exist and to flourish, but that is not to be confused with the space inside the loop. Occurrences of such spaces are not socially unprecedented. At different times and in different societies, buildings have been designed with areas to be used only by slaves or servants for the proper, invisible functioning of the whole house-system, from the kitchen and the canteen to separate stairs and corridors. Viewers of the popular TV drama *Downton Abbey* will recognize the 'upstairs, downstairs' scenario. What is unprecedented is the immense scale and pace at which the whole of human society is now migrating to this out-of-the-loop space, whenever possible.

Second, if technology is always in-between, then what enables such in-betweenness to be successful? To put it slightly differently: how does technology interact with the user and the prompter? The one-word answer is: interfaces, the topic of the next section.

Interfaces

Janus is the Roman god of passages and transitions, endings and beginnings, both in space (like thresholds, gates, doors, or borders) and in time (especially the end of the old and the beginning of the new year, hence January, or of different seasons, or of times of peace and war, etc.). Janus is easily recognizable among the gods, because he is represented as having two faces (bifront). Nowadays, he is our god of interfaces and presides over all digital technologies, which are by definition bifront.

One face of our bifront ICTs looks at the user and it is expected to be friendly. The other face connects the technology in question to its prompter. We may call it protocol, although, strictly speaking, this term is used only to refer to the set of rules that regulate data transmission. Any order of technology has two faces, the user interface and the protocol. Think of these two faces as being represented by the two connectors in the 'user–technology–prompter' scheme (see Figure 16).

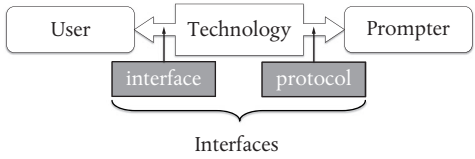


Fig. 16. Technology's Interfaces.

Depending on the order of the technological in-betweenness, the protocol face may become increasingly less visible, with the user's interface ending up being treated as *the* interface, until it too may disappear. Janus starts hiding his other side and looking more like any other god, single-faced, until even that face is no longer perceivable. Let me explain this gradual disappearance by using the examples introduced before.

We saw that the wood-splitting axe is a typical first-order technology. It fits the scheme humanity–technology–nature. The grip is the user-friendly interface, and the handle+blade is the protocol that connects the interface (transmits the force of the blow) to the prompter, the wood. Because you, the user, need to control both your interaction with the technology in-between and its interaction with the natural prompter, you have access to both of Janus' faces, the user's interface and the protocol. You can easily sharpen the blade, for example.

Consider next the quintessential second-order technology, the engine. We now have a case of the humanity–technology–technology scheme. Technological protocols may now ensure that the technology in-between takes care of the technological prompter. In some cases, you still need access to the protocol. Think of the screwdriver, and how you need to see whether the tip of its blade corresponds to, and fits, the head of the screw (are they both slotted, Phillips, Robertson etc.?). But usually, you, still the user, do not have to have access to both faces. All you perceive and interact with, for example, is the gear stick and the clutch pedal in a manual-transmission car. The protocol—that is, how the other face of the engine interacts with

the prompter represented by the rest of the car's propelling system—is not important, as long as there is no malfunctioning. For this reason, in second-order technologies we no longer tend to distinguish between the interface in general (which includes also the protocol) and the user's interface. At this point, 'interface' simply refers only to the user's interface, since the protocol is no longer quite so obvious or accessible. If something goes wrong, access to the protocol and to the prompter often requires a specialist.

Finally, consider a generic modem as a case of third-order technology. As the word indicates, this is a device that *mo*-dulates an analogue signal to encode digital information at the sender's side, and *dem*-odulates such a signal to decode the transmitted information at the receiver's side, often over a telephone line. We now have a case of technology–technology–technology scheme (if you find the modem too passé, consider a router). Since the interface (the connectors in the scheme) now connects technology to technology through some other technology, and third-order technology requires autonomous processing capacities, made possible by ICTs, the tendency is to interpret the whole interface as a set of protocols. Technological protocols ensure that the technology in-between, the two modems, take care both of the technological user, let's say your computer, and of the technological prompter, let's say my computer. The dynamic, automated process of negotiation of protocols, which sets the necessary and sufficient parameters required for any further communication, is known as *handshaking*. It is what goes on between your and my computer, between your computer and your printer, when they 'see' each other, or between your smartphone and your laptop, before they can agree to synchronize your digital diary. You and I are neither invited to, nor involved in, such a handshaking. Now both faces of Janus may be hidden from us. We are out of the loop entirely. You go home and your smartphone automatically connects to your home wireless service, downloads some updates, and starts 'talking' to other ICT devices in the house, like your tablet. As in any 'plug and play' case, all the required handshaking and the issuing data processing is

invisible to the ultimate beneficiaries, us. As in a classic Renaissance house, we now inhabit the *piano nobile*, the upper, noble floor, not even knowing what happens in the ground floor below us, where technologies are humming in the service rooms. Unless there is some malfunctioning, we may not even know that such technologies are in place. But, if something goes wrong, it is the specialist who will now have to take care of both sides of the interface, with the result that specialists are the new priests in Janus' temple. They will become increasingly powerful and influential the more we rely on higher-order technologies.

Design

Interfaces, like the technologies with which they are associated, evolve. Such an evolution is made possible by, among many things, design. It is often a successful story of improvements, even when the technology in question may be distasteful, at least to a pacifist. If you visit a military museum and look at very old, handheld gunpowder weapons, you will notice that it took a surprisingly long time before manufacturers developed what seems now utterly obvious: a hand-friendly grip. So-called hand cannons,[10] which originated in China and became popular in Europe during the Renaissance, consisted of barrels that would be aimed at enemies more like crossbows. For a long time, old handguns were almost as straight as swords.[11] They begun to bend only slowly through time and acquired the familiar L-shape quite late. This is surprising, given how obvious this design now looks to any kid who points a finger gun at you, his thumb raised above his fist, with one or two straight fingers acting as a barrel.

Sometimes, design can be intentionally retro. Apple's iMac G3, the first model of the iMac series, was, like its successors, an all-in-one computer, including in a single enclosure both the monitor and the system unit. Among its peculiarities was the fact that the casing was made of colourful, translucent plastic. You had the impression of being able to see the inside of the machine, that is, both faces of

Janus, your user's interface and the protocols on the other side. Thus, it had a friendly, first-order technology look—recall the axe—when in fact it could be used as a sophisticated, second-order system, in-between the human user and some other technological artefacts. As in the case of the engine of your car, you did not need to see the inside, and actually you did not really see the protocols, and could do nothing about them even if you saw them. It was modern aesthetics at play, functionally pointless. It did not last.

Sometimes, the design may be simply outdated, a legacy from the past. Front-loading washing machines developed from mechanical laundry systems. So they still have a door with a transparent window to check whether there is water inside—this is one of the most plausible explanations provided when they are compared to top-loading ones, which lack transparent windows—even if, in fact, you can no longer open the door if this is unsafe. The later-developed dishwasher never had a see-through door like a washing machine.

The design of good interfaces takes time and ingenuity. It may be a matter of realizing the obvious (a hand-friendly handle) or removing the pointless (a no longer useful transparent window). You do not need a bright light to signal that your computer is switched on; so many computers do not have one. But these days you still need easy access to a USB port for your USB flash drive, and having the port in the back of the computer, as some computers do, may be visually elegant but functionally cumbersome. The conclusion is that, in terms of interfaces' functionality (and there are of course other terms, including usability, economic, aesthetic, ergonomic, or energy-related ones, for example), good design is design that takes into account and makes the most of the ordering of the technology in question. In first-order technologies, both the user's interface and the protocol need to be accessible and friendly. In second-order technologies, good design needs to concentrate only on the user-friendly face of the interface, while the protocol can be invisible. It is pointless to have a transparent case for a watch that is not even meant to be repairable. In third-order technologies, both sides of the interface, the user's and the protocol,

should become functionally invisible to us. Yet such functional invisibility contributes to making the question about the in-betweenness of third-order technologies more pressing. Being out of the loop could mean being out of control. Such a concern soon turns into a political issue, as we shall see in Chapter 8. Here, let me just draw a caricature in black and white, without any nuances, for the sake of a quick and simple clarification.

The politics of technology

Interpretations of the politics of technology's in-betweenness—in more prosaic terms, the dynamics of technological R & D, deployments, uses, and innovations, all more or less shaped by human aggregate decisions, choices, preferences, mere inertia, and so forth—may swing between two extremes. No serious scholar advocates either of them, but they help to convey the basic idea.

At one extreme, one may interpret technology's in-betweenness as a deleterious kind of detachment and a loss of pristine contact with the natural and the authentic. This position may go as far as to associate technology's in-betweenness with disembodiment or at least a devaluation of embodiment, hence to delocalization (no body, no place), globalization (no place, no localization), and ultimately with consumerism, as a devaluation of the uniqueness of physical things and their special relations with humans. In this case, the politics of technological in-betweenness assume the features of, at best, a lamentable, global mistake, and, at worst, of an evil plan, single-mindedly pursued by some malevolent agents, from states to corporate multinationals.

At the other extreme, there is the enthusiastic and optimistic support for the liberation provided by technology's in-betweenness. This is interpreted as a buffer, as a way of creating more space for communication and personal fulfilment. The idea of technological in-betweenness is not seen as a dangerous path towards the exercise of power by some people, systems, or even machines over humans, but as an empowering and enabling form of control. The equation may

run somewhat like this: more space = more freedom = more control = more choice.

Clearly, neither extreme position is worth taking seriously. However, various combinations of these two simple ingredients dominate our current discussion of the politics of technology. We shall see in the following chapters that debates soon become messier and much less clear cut.

ICTs as interpreting and creating technologies

Today, when we think of technology in general, ICTs and their ubiquitous, user-friendly interfaces come immediately to mind. This is to be expected. In hyperhistorical societies, ICTs become the characterizing first-, second-, and third-order technologies. We increasingly interact with the world and with our technologies through ICTs, and ICTs are *the* technologies that can, and tend to, interact with themselves, and invisibly so. Also to be expected is that, as in the past, the dominant technology of our time is having a twofold effect. On the one hand, by shaping and influencing our interactions with the world, first- and second-order ICTs invite us to interpret the world in ICT-friendly terms, that is, informationally. On the other hand, by creating entirely new environments, which we then inhabit (the out-of-the-loop experience, functionally invisible by design), third-order ICTs invite us to consider the intrinsic nature of increasing portions of our world as being inherently informational. In short, ICTs make us think about the world informationally and make the world we experience informational. The result of these two tendencies is that ICTs are leading our culture to conceptualize the whole reality and our lives within it in ICT-friendly terms, that is, informationally, as I shall explain in this section.

ICTs are modifying the very nature of, and hence what we mean by, reality, by transforming it into an infosphere. Infosphere is a neologism coined in the seventies. It is based on 'biosphere', a term referring to that limited region on our planet that supports life. It is also a

concept that is quickly evolving. *Minimally*, infosphere denotes the whole informational environment constituted by all informational entities, their properties, interactions, processes, and mutual relations. It is an environment comparable to, but different from, cyberspace, which is only one of its sub-regions, as it were, since the infosphere also includes offline and analogue spaces of information. *Maximally*, infosphere is a concept that can also be used as synonymous with reality, once we interpret the latter informationally. In this case, the suggestion is that what is real is informational and what is informational is real.[12] It is in this equivalence that lies the source of some of the most profound transformations and challenging problems that we will experience in the near future, as far as technology is concerned.

The most obvious way in which ICTs are transforming the world into an infosphere concerns the transition from analogue to digital and then the ever-increasing growth of the informational spaces within which we spend more and more of our time. Both phenomena are familiar and require no explanation, but a brief comment may not go amiss. This radical transformation is also due to the fundamental convergence between digital tools and digital resources. The intrinsic nature of the tools (software, algorithms, databases, communication channels and protocols, etc.) is now the same as, and therefore fully compatible with, the intrinsic nature of their resources, the raw data being manipulated. Metaphorically, it is a bit like having pumps and pipes made of ice to channel water: it is all H_2O anyway. If you find this questionable, consider that, from a physical perspective, it would be impossible to distinguish between data and programs in the hard disk of your computer: they are all digits anyway.

Such a digital uniformity between data and programs was one of Turing's most consequential intuitions. In the infosphere, populated by entities and agents all equally informational, where there is no physical difference between *processors* and *processed*, interactions become equally informational. They all become interpretable as 'read/write' (i.e., access/alter) activities, with 'execute' the remaining type of process. If Alice speaks to Bob, that is a 'write' process, Bob

listening to her is a 'read' process, and if they kiss, then that is an instance of 'execute'. Not very romantic, but accurate nonetheless.

Digits deal effortlessly and seamlessly with digits. This potentially eliminates one of the long-standing bottlenecks in the infosphere and, as a result, there is a gradual erasure of *informational friction*. I am only introducing this topic here, since Chapter 5 is entirely dedicated to it. For the moment, consider 'informational friction' as a label for how difficult it may be to let some information flow from sender to receiver. For example, in a noisy environment, like a pub or a cocktail party, you need to shout and maybe even use some gestures (that is, add redundancy) to ensure that your message gets across. If you wish to order two beers, you may use both your voice and some gestures. Because of their 'data superconductivity', ICTs are well known for being among the most influential factors that facilitate the flow of information in the infosphere. We are all acquainted daily with aspects of a *frictionless infosphere*, such as *spamming* (because every email flows virtually free) and *micrometering* (because every fraction of a penny may now count). Such 'data superconductivity' has at least four important consequences.

First, we are witnessing a substantial erosion of the *right to ignore*. In an increasingly frictionless infosphere, it becomes progressively less credible to claim one did not know when confronted by easily predictable events and hardly ignorable facts.

Second, there is an exponential increase in *common knowledge*. This is a technical term from logic, where it basically refers to cases in which everybody not only knows that *p* but also knows that everybody knows that everybody knows, . . . , that *p*. Think of a circle of friends sharing some information through a social media.

Third, the impact of the previous two phenomena is also quickly increasing because meta-information about how much information is, was, or should have been available is becoming overabundant. It follows that we are witnessing a steady increase in agents' *responsibilities*. The more any bit of information is just an easy click away, the less we shall be forgiven for not checking it. ICTs are making humanity

increasingly responsible, morally speaking, for the way the world is, will be, and should be. This is a bit paradoxical since ICTs are also part of a wider phenomenon that is making the clear attribution of responsibility to specific individual agents more difficult and ambiguous.

The last consequence concerns informational privacy, but its analysis is too important so I shall delay it until Chapter 5.

Life in the infosphere

During the last decade or so, we have become accustomed to interpreting our life online as a mixture between an adaptation of human agents to digital environments (Internet as freedom from constraints and freedom of pursuits), and a form of postmodern, neo-colonization of digital environments by human agents (Internet as control). This is probably a mistake. We saw that ICTs are as much modifying our world as they are creating new realities and promoting an informational interpretation of every aspect of our world and our lives in it. With interfaces becoming progressively less visible, the threshold between *here* (*analogue*, *carbon-based*, *offline*) and *there* (*digital*, *silicon-based*, *online*) is fast becoming blurred, although this is as much to the advantage of the *there* as it is to the *here*. To adapt Horace's famous phrase, 'the captive infosphere is conquering its victor'.[13] The digital-online world is spilling over into the analogue-offline world and merging with it. This recent phenomenon is variously known as 'Ubiquitous Computing', 'Ambient Intelligence', 'The Internet of Things', or 'Web-augmented things'. I prefer to refer to it as the *onlife experience*. It is, or will soon be, the next stage in the development of the information age. We are increasingly living onlife.

The gradual informatization of artefacts and of whole (social) environments means that it is becoming difficult to understand what life was like in pre-digital times. In the near future, the distinction between online and offline will become ever more blurred and then disappear. For example, it already makes little sense to ask whether one is online

or offline when driving a car following the instructions of a navigation system that is updating its database in real time. The same question will be incomprehensible to someone checking her email while travelling inside a driverless car guided by a GPS.

Sociologists speak of *Generation X*—people with birth dates from the early 1960s (that would be your author) to the early 1980s—and of *Generation Y*, or the Millennial Generation, which includes people with birthdates from the early 1980s to 2000 or so. Suppose then that we refer to people born after the long nineties—long because they lasted until 11 September 2001—as *Generation Z*, and not just because of the previous two alphabetical generations X and Y, but also because of the Zettabyte of data available to them. To people belonging to Generation Z, the world has always been wireless; 9/11 is a chapter in their elementary or primary school's history book; the Sistine Chapel has always been bright and colourful (restorations were unveiled in 1999). For them, there has never been a world without 'google', 'tweet', and 'wiki' not merely as services but as verbs; they have no recollection of a world without Facebook being a social media, not a book, and of books not being available online (Amazon was incorporated in 1994). They are likely to think that a pocket mirror is a phone app. They use Wikipedia (founded in 2001) as synonymous with encyclopaedia. To Generation Z or, more inclusively, to members of what Janna Quitney Anderson calls *Generation AO*, the Always-On Generation (see Figure 17), the peculiar clicking and whooshing sounds made by conventional modems while handshaking, also known as the whale song, are as archeologically alien as the sounds made by a telegraph's Morse signals to the ears of Generation X. Generation Z may not conceive of life outside the infosphere because, to put it dramatically, the infosphere is progressively absorbing any other reality. Generation Z was born onlife. Let me elaborate.

In the (fast approaching) future, more and more objects will be third-order *ITentities* able to monitor, learn, advise, and communicate with each other. A good example is provided by RFID (Radio Frequency IDentification) tags, which can store and remotely retrieve data

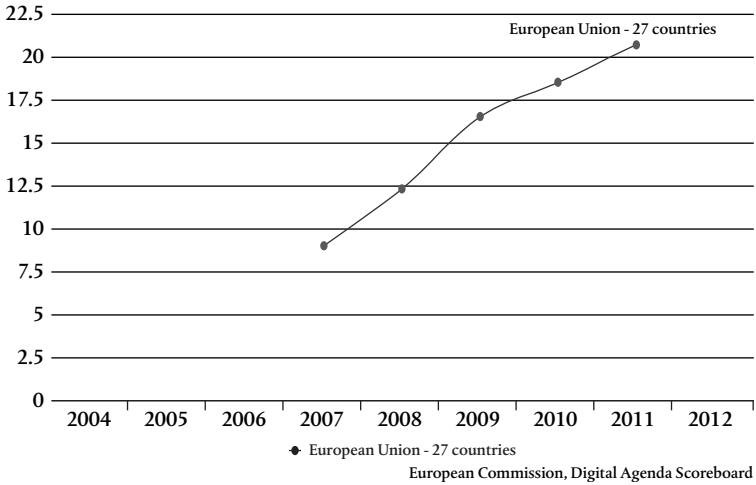


Fig. 17. In 2011, *c.*21 per cent of the EU population used a laptop to access the Internet, via wireless away from home or work.

Source: European Commission, *Digital Agenda for Europe*.

from an object and give it a unique identity, like a barcode. Tags can measure 0.4 mm^2 and are thinner than paper. Incorporate this tiny microchip in everything, including humans and animals, and you have created ITentities. This is not science fiction. According to an early report by Market Research Company In-Stat,[14] the worldwide production of RFID increased more than 25-fold between 2005 and 2010 to reach 33 billion tags. A more recent report by IDTechEx[15] indicates that in 2012 the value of the global RFID market was $7.67 billion, up from $6.51 billion in 2011. The RFID market is forecast to grow steadily over the next decade, rising fourfold in this period to $26.19 billion in 2022.

Imagine networking tens of billions of ITentities together with all the other billions of ICT devices of all kinds already available and you see that the infosphere is no longer 'there' but 'here' and it is here to stay. Nike shoes and iPod have been talking to each other since 2006, with predictable (but amazingly unforeseen) problems in terms of

privacy: old models transmitted messages using wireless signals that were not encrypted and could be detected by someone else.[16] The Nest is a thermostat that learns your heating preferences. Keep using the simple dial to select a comfortable temperature, and after a week the Nest starts tuning the temperature by itself. Its sensors basically know your living patterns, habits, and preferences. And the more you interact with it, the more it learns, fine-tuning its service. Your new Samsung smart refrigerator knows what is inside it, and can offer recipe suggestions (based on the Epicurious service) as well as reminders about available fresh food and expiring items. It synchronizes with Evernote to share grocery lists. It also issues coupons. It is easy to imagine that it may learn what you like and know what you are missing, and inherit from the previous refrigerator your tastes and wishes, just as your new laptop can import your favourite settings from the old one. It could interact with your new way of cooking and with the supermarket website, just as your laptop can talk to a printer or to a smartphone. There are umbrellas that can receive wireless signals and indicate with a coloured LED whether they may be needed. Small chips in caps now help people to manage their medications with alerts, reminders, and automatic requests for refills. These are just some examples among thousands. We have all known this in theory for some time; the difference is that now it is actually happening in our kitchens.

Even money is becoming increasingly virtual. On any sterling banknote, one can still read 'I promise to pay the bearer on demand the sum of…', but the fact is that Britain abandoned the gold standard in 1931, so you should not expect to receive any precious yellow stuff in exchange. The euro, you may notice, promises absolutely nothing. Since currencies are free-floating nowadays, money may well be just a pile of digits. Indeed, when Northern Rock, a bank, collapsed, in 2007, several banks in Second Life (the online virtual world developed by Linden Lab since 2003) followed suit.[17] Players rushed to close their accounts because Second Life was not Monopoly: the exchange (technically, redemption) rate was around L$ (Linden Dollar) 260 to $1.

Likewise, in 2013, during the Cypriot bank crisis, which involved the euro this time, the virtual currency Bitcoin skyrocketed to a record high of almost $147 per Bitcoin, as people sought an allegedly safe haven for their cash.[18] That record has been broken many times since. All this is interesting because it transforms providers of in-game currencies, like Linden Lab, or indeed the Internet, into issuers of electronic money. And since the threshold between online and offline is constantly being eroded, one is left wondering when some kind of regulation will be extended to such currencies. The problem is trickier than it looks. In 2013, the FBI arrested Ross Ulbricht, allegedly the mastermind behind Silk Road, an online black market, and sought to seize his fortune of 800,000 Bitcoins, worth around $80 million.[19] For the FBI to transfer the Bitcoins out of Ulbricht's repository it needed access to the private keys protecting them (the passwords that allow one to use the Bitcoins). However, in the US scholars have argued that forcing someone to hand over their encryption keys violates the Fifth Amendment right to protection from self-incrimination.[20] When the distinction between 'money' and 'information' becomes thinner, different legal requirements may start applying.

A similar reasoning applies to fidelity cards and 'mileage' programmes. In the US, major retailers such as Best Buy and Sears have loyalty programmes that offer redeemable points, discounts, and other similar advantages. In the UK, Tesco and Sainsbury, two major retailers, run popular loyalty-card schemes. As with comparable schemes, you earn points by spending. While the money spent might not be yours (suppose your travelling expenses are reimbursed, more on this presently), the points are as good as cash. This may seem applicable only to nerds or 'desperate housewives', but even high-flyers can exchange virtual money. They just use frequent-flyer miles. According to *The Economist*, already in January 2005 'the total stock of unredeemed miles was worth more than all the dollar bills in circulation', and you can exchange them for almost anything.[21] The temptation is to pocket the miles earned through someone else's money. In 2008, for example, Britain's Parliamentary Standards watchdog

complained that the Commons' Speaker, Michael Martin, had used Air Miles earned with public money for his family, the ultimate proof (Mr Martin, not the watchdog) that the UK is a hyperhistorical society.[22]

Mr Martin (born in 1945) and some of us belonging to Generation X may still consider the space of information as something we log into and log out from. Some of us may still believe that what happens online stays online. It is quite telling that Mr Martin tried to block the publication, under the Freedom of Information Act, of information about *c.*£5 million in yearly travel expenses by British MPs.[23] Our views about the ultimate nature of reality are still Newtonian and belong to modernity: we grew up with cars, buildings, furniture, clothes, and all sorts of gadgets and technologies that were non-interactive, irresponsive, and incapable of communicating, learning, or memorizing. However, what we still experience as the world offline is gradually becoming, in some corners of the world, a fully interactive and responsive environment of wireless, pervasive, distributed, *a2a* (anything to anything) information processes, that works *a4a* (anywhere for anytime), in real time. The day when we routinely search digitally the location of physical objects ('where are the car keys?', 'where are my glasses?'), as we already pinpoint where friends are on a map, is close. In 2008, Thomas Schmidt, Alex French, Cameron Hughes, and Angus Haines, four 12-year-old boys from Ashfold Primary School in Dorton, UK, were awarded the 'Home Invention of the Year' Prize for their Speed Searcher, a device for finding lost items. It attached tags to valuables and enabled a computer to pinpoint their location in the home.

As a consequence of the informatization of our ordinary environment, some people in hyperhistorical societies are already living onlife, in an infosphere that is becoming increasingly *synchronized*, *delocalized*, and *correlated*. Although this might be interpreted, optimistically, as the friendly face of globalization, we should not harbour illusions about how widespread and inclusive the evolution of information societies is or will be. Unless we manage to solve it, the digital divide[24] may become a chasm, generating new forms of

discrimination between those who can be denizens of the infosphere, and those who cannot, between insiders and outsiders, between information-rich and information-poor. It will redesign the map of worldwide society, generating or widening generational, geographic, socio-economic, and cultural divides, between *Generation* Z^{+} and *Generation* Z^{-}**.** Yet the gap will not be reducible to the distance between rich and poor countries, because it will rather cut across societies. We saw in Chapter 1 that prehistorical cultures have almost entirely disappeared, perhaps with the exception of some small tribes in remote corners of the world. The new divide will be between historical and hyperhistorical ones. We might be preparing the ground for tomorrow's informational slums.

The previous transformations already invite us to understand the world as something 'ALive'.[25] Such animation of the world will, paradoxically, make our outlook closer to that of ancient cultures, which interpreted all aspects of nature as inhabited by goal-oriented forces. We encountered a parallel phenomenon in Chapter 1, when discussing memory and the paradox of a digital 'prehistory'. The first thing Generation Z may do these days, when looking at an ICT screen, is to tap it, instead of looking for a keyboard, or wave a smartphone in front of it expecting some communication.[26] Unfortunately, such 'animation' of artefacts sometimes seems to go hand in hand with irrational beliefs about the boundless power of ICTs. When Heathrow Airport installed IRIS (Iris Recognition Immigration System), which checked registered passengers' ID by scanning their irises, one of the main problems was that some passengers tried to use the service believing that IRIS would somehow work even if they had never registered for such a service in the first place. They assumed Big Brother was already here because ICTs may easily be seen as omniscient and omnipotent gods, with minds of their own.

The next step is a rethinking of increasing aspects of reality in informational terms. It is happening before our eyes. It is becoming normal to consider the world as part of the infosphere, not so much in the dystopian sense expressed by a *Matrix*-like scenario, where the 'real

reality' is still as modern and hard as the metal of the machines that inhabit it; but in the hyperhistorical, evolutionary, and hybrid sense represented by an environment such as New Port City, the fictional, post-cybernetic metropolis of *Ghost in the Shell*, 'a groundbreaking Japanese anime—the movie that gave us today's vision of cyberspace'.[27] The infosphere will not be a virtual environment supported by a genuinely 'material' world. Rather, it will be the world itself that will be increasingly understood informationally, as an expression of the infosphere. Digital third-order technologies are changing our interpretation of mechanical second- and first-order ones. At the end of this shift, the infosphere will have moved from being a way to refer to the space of information to being synonymous with reality itself.

We are changing our everyday perspective on the ultimate nature of reality from a historical and materialist one, in which physical objects and mechanical processes play a key role, to a hyperhistorical and informational one. This shift means that objects and processes are *dephysicalized*, in the sense that they tend to be seen as support-independent; consider a music file. They are *typified*, in the sense that an instance (also known as *token*) of an object—for example my copy of a music file—is as good as its type, in the example your music file of which my copy is an instance. And they are assumed to be, by default, perfectly *clonable*, in the sense that my copy and your original become indistinguishable and hence interchangeable. Given two digital objects, it is impossible to tell which one is the original source and which one is the copy just by inspecting their properties, without relying on some metadata, like a time stamp, or personal experience (you know that you made *this* copy of *that* file).

Less emphasis on the physical nature of objects and processes means that the *right of usage* is perceived to be at least as important as the *right to ownership*, with an interesting twist. It may be called *virtual materialism*. The technologies that invite 'free' usage—from social media to search engines, from online services such as free emails and messaging tools to Web 2.0 applications—rely on advertisements and hence on some data mining and on some customization of

products to users. But such a reliance means that a culture of (expectations of) post-materialist, free usage of services (who would pay to have an email account or some space on a social media service?) tends to promote a market not only of services, for which you need to pay (e.g., the next holiday) but also of things that you are invited to buy (e.g., the next t-shirt). But this, in turn, favours a culture of ownership (of the t-shirt you bought). Yet, for such culture of ownership to work, potential possessions need to be commercialized as constantly renewable in order to be economically feasible (e.g., a consumer is expected to buy a new t-shirt again and again). And this closes the circle. The physical is transformed into the disposable because it is easily replaceable through free services, which are paid for by the advertisable.

When free online services promote consumerism about purchasable physical products through advertisement, the process can easily generate confusion or mistaken expectations about what is and what is not free of charge, or even whether it should be free. This confusion contributes to explaining why the more-or-less legal sharing of contents online is so popular. The Pirate Bay, the famous file-sharing site, celebrated its 10th anniversary in 2013.[28] The popularity of similar websites, which provide torrent files and links to facilitate peer-to-peer file sharing, seems more a sign of a new culture rather than damning evidence of a corrupted humanity. Anyone who argues along the materialist-historical line 'you would not steal a music CD from a shop' has not fully grasped the difficulty. Information, when treated as a commodity, has three main properties that differentiate it from other ordinary goods, including CDs and printed books. First, it is *non-rivalrous*: Alice consuming some information does not prevent Bob consuming the same information at the same time. Compare this to eating a pizza or borrowing a CD. Second, information tends to be *non-excludable*. Some information—such as intellectual properties, non-public and sensitive data, or military secrets—is often protected, but this requires a positive effort precisely because, normally, exclusion is not a natural property of information, which tends to be easily disclosed and shareable. Finally, once some information is available,

the cost of its reproduction tends to be negligible (*zero marginal cost*). This is of course not the case with many goods. For all these reasons information may be sometimes seen as a *public good*, a view that in turn justifies the creation of public libraries or projects such as Wikipedia, which are freely accessible to anyone. Because of all these properties, the previous comparison with stealing a CD from a shop is not helpful. It conflates the physical with the informational. A better analogy, when it comes to downloading illegal contents, may be: 'you would not take a picture with your digital camera in an art gallery where this is not allowed'. You immediately see that this is more complicated. Indeed I would not take the picture, but grudgingly so, and if I did take a picture, I would consider this very different from stealing the corresponding postcard from the shop. Along a similar line of reasoning, from a hyperhistorical perspective, repurposing, updating, or upgrading contents need not be expressions of mere plagiarism or sloppy morality. They may be ways of appropriating and appreciating the malleable nature of informational objects.

Our society and educational system still has to catch up with such transformations. However, some new business models are already addressing such novelties by rethinking how contents are packaged and sold in the twenty-first century. In 2013, Amazon, for example, began offering buyers of printed books the corresponding ebooks for free, or at a discounted price. Called Matchbook, the scheme applies retroactively to any title bought from the store since it opened in 1995.[29] The same holds true for music files. Amazon's AutoRip service offers a free MP3 version of the CD or vinyl albums one buys.[30] It is also retroactive. Both services make the illegal exchange of digital contents much less attractive. It is a strategy that has parallels in other corners of the entertainment industry. According to Reed Hastings, Netflix's chief executive, affordable video-on-demand services may discourage people from using piracy sites because they are easier to use and of course legal and hence less risky. In an interview in 2013, he commented that 'in Canada BitTorrent is down by 50% since Netflix launched three years ago'.[31] It is an interesting comment,

even if, for the sake of clarity, it must be said that BitTorrent is actually an Internet protocol,[32] like http, and as such it is widely adopted by many for perfectly legal purposes. It has become synonymous for Internet piracy only because of its widespread use in the illegal exchange of copyrighted contents.

Finally, the criterion for existence—what it means for something to be completely and ultimately real—is also changing. Oversimplifying, ancient and medieval philosophers thought that only that which is immutable, that is, God, could be said to exist fully. Anything that changes, such as an animal, moves from non-existence (there was no animal) to existence (the animal was born) back to non-existence (the animal is dead). Modern philosophers preferred to associate existence to the possibility of being subject to perception. The most empirically minded insisted on something being perceivable through the five senses in order to qualify as existing. Today, immutability and perceivability have been joined by interactability. Our philosophy seems to suggest that 'to be is to be interactable', even if that with which we interact is only transient and virtual. The following examples should help to make the previous points clearer and more concrete.

In recent years, many countries have followed the US in counting acquisition of software not as a current business expense but as an investment, to be treated as any other capital input that is repeatedly used in production over time, like a factory.[33] Spending on software now regularly contributes to GDPs. So software is acknowledged to be a (digital) good, even if somewhat intangible. It should not be too difficult to accept that virtual assets too may represent important investments.

Computing resources themselves are usually provided by hardware, which then represents the major constraint for their flexible deployment. Yet we are fast moving towards a stage when cloud computing[34] is 'softening' our hardware through 'virtualization', the process whereby one can deliver computing resources, usually built-in hardware—like a specific CPU, a storage facility, or a network infrastructure—by means of software. For example, virtualization can

be adopted in order to run multiple operating systems on a single physical computing machine so that, if more machines are needed, they can be created as a piece of software—i.e., as so-called virtual machines—and not purchased as physical hardware equipment. The difference between deploying a virtual or a physical machine is dramatic. Once the virtualization infrastructure is in place, the provider of virtualized hardware resources can satisfy users' requests in a matter of minutes and, potentially, to a very large scale. Likewise, terminating or halting such a provision is equally immediate. The virtual machines are simply shut down without leaving behind any hardware component that needs to be reallocated or dismantled physically. Clearly, this will further modify our conception of what a machine is, from a historical one, based on physical and mechanical views, to a hyperhistorical one that is usage-oriented and utility-based. Dropbox, Google Documents, Apple's iCloud, or Microsoft SkyDrive have provided everyday experiences of cloud computing to millions of users for some time now. The quick disappearance of any kind of 'drive' in favour of 'ports' (USB, etc.) is a clear signal of the virtualization movement. We already met the old floppy disk drive in Chapter 1. The more recent victims are CD and DVD drives.

Next, consider the so-called 'virtual sweatshops'. These are places where workers play online games for up to twelve hours a day, to create virtual goods, such as characters, equipment, or in-game currency, or take care of the less entertaining steps in a game, for example by killing thousand of monsters to move to the next interesting level. All this and more is then sold to other players. 'Virtual sweatshops' have been with us for more than a decade. They are as old as online computer games.[35] At the time of writing, End User License Agreements (EULA, this is the contract that every user of commercial software accepts by installing it) of massively multiplayer online role-playing games (MMORPG), such as World of Warcraft, still do not allow the sale of virtual assets.[36] This would be like the EULA of MS-Office withholding from users the ownership of the digital documents created by means of the software. The situation will probably

change, as more people invest hundreds and then thousands of hours building their avatars and assets. Future generations will inherit digital entities that they may want to own and be able to bequeath. Indeed, although it was forbidden, there used to be thousands of virtual assets on sale on eBay before 2007.[37] Sony, rather astutely, offers a 'Station Exchange', an official auction service that provides players with a secure method of buying and selling in dollars the right to use in game coins, items, and characters in accordance with licence agreement, rules, and guidelines. 'In its first 30 days of operation, Station Exchange saw more than $180,000 in transactions.'[38]

Once ownership of virtual assets has been legally established, the next step is to check for the emergence of property litigations. Among the oldest pieces of evidence, we find a Pennsylvania lawyer in May 2006 suing the publisher of Second Life for allegedly having unfairly confiscated tens of thousands of dollars worth of his virtual land and other property.[39]

Insurances that provide protection against risks to avatars may follow, comparable to the pet insurance you can buy at the local supermarket. Again, World of Warcraft provides an excellent example. With 11.1 million subscribers in June 2011, 10 million in October 2012, and 8.3 million in May 2013, World of Warcraft might have seen its peak.[40] Interestingly, it is being challenged by games, such as Skylanders, which are based on the onlife experience of playing with real toys that interact with the video game through a 'portal of power', that reads their tag through near-field communications technology. However, World of Warcraft is still the world's most-subscribed MMORPG. It would rank 91st in the list of 221 countries and dependent territories ordered according to population. Its users, who (will) have spent billions of man-hours constructing, enriching, and refining their digital properties, will be more than willing to spend a few dollars to insure them.

The combination of virtualization of services and virtual assets offers an unprecedented opportunity. Nowadays it is still common and easy to insure a machine, like a laptop, on which the data are

stored, but not the data that it stores. This is because, although data may be invaluable and irreplaceable, it is obvious that they are also perfectly clonable at a negligible cost, contrary to physical objects, so it would be hard for an insurer to be certain about their irrecoverable loss or corruption. However, cloud computing decouples the physical *possession* of data (by the provider) from their *ownership* (by the user), and once it is the provider that physically possesses the data and is responsible for their maintenance, the user/owner of such data may justifiably expect to see them insured, for a premium of course, and to be compensated in case of damage, loss, or downtime. Users should be able to insure *their* data precisely because they own them but they do not physically possess them. 'Cyber insurance' has been around for many years,[41] it is the right thing to do, but it is only with cloud computing that it may become truly feasible. We are likely to witness a welcome shift from hardware to data in the insurance strategies used to hedge against the risk of irreversible losses or damages.

Conclusion

Despite some important exceptions—especially vases and metal tools in ancient civilizations, engravings, and then books after Gutenberg—it was the Industrial Revolution that really marked the passage from a nominalist world of unique objects to a Platonic world of types of objects. Our industrial goods are all perfectly reproducible as identical to each other, therefore indiscernible, and hence pragmatically dispensable because they may be replaced without any loss in the scope of interactions that they allow. This is so much part of our culture that we expect ideal standards and strict uniformity of types to apply even when Nature is the source. In the food industry in the UK, for example, up to 40 per cent of all the edible produce never reaches the market but is wasted because of aesthetic standards, e.g., size, shape, and absence of blemish criteria in fruit and vegetables. This because retailers know that we, the shoppers, will not buy unsightly produce.[42] Similarly, in the fashion industry, when the human body is in

question, the dialectics of being uniquely like everybody else joins forces with the malleability of the digital to give rise to the common phenomenon of 'airbrushing'. Digital photographs are regularly and routinely retouched in order to adapt the appearance of portrayed people to unrealistic and misleading stereotypes, with unhealthy impact on customers' expectations, especially teenagers. The discussion of legal proposals to restrain such practices has been going on for years in France and in the UK, while evidence that warning labels and disclaimers would make a difference in the public perception is still debated.[43]

When our ancestors bought a horse, they bought *this* horse or *that* horse, not 'the' horse. Today, we find it utterly obvious and non-problematic that two cars may be virtually identical and that we are invited to test-drive and buy the model rather than an individual 'incarnation' of it. We buy the type not the token. When something is intrinsically wrong with your car, it may be a problem with the model, affecting million of customers. In 1981, the worst car recall recorded by the automobile industry so far involved 21 million Ford, Mercury, and Lincoln vehicles.[44] Quite coherently, we are quickly moving towards a commodification of objects that considers repair as synonymous with replacement, even when it comes to entire buildings.

Such a shift in favour of types of objects has led, by way of compensation, to a prioritization of informational *branding*—a process comparable to the creation of cultural accessories and personal philosophies[45]—and of *reappropriation*. The person who puts a sticker in the window of her car, which is otherwise perfectly identical to thousands of others, is fighting an anti-Platonic battle in support of a nominalist philosophy. The same holds true for the student plastering his laptop with stickers to personalize it. The information revolution has further exacerbated this process. Once our window-shopping becomes Windows-shopping and no longer means walking down the street but browsing the Web, the processes of dephysicalization and typification of individuals as unique and irreplaceable entities may

start eroding our sense of personal identity as well. We may risk behaving like, and conceptualizing ourselves as, mass-produced, anonymous entities among other anonymous entities, exposed to billions of other similar individuals online. We may conceive each other as bundles of types, from gender to religion, from family role to working position, from education to social class. And since in the infosphere we, as users, are increasingly invited, if not forced, to rely on indicators rather than actual references—we cannot try all the restaurants in town, the references, so we trust online recommendations, the indicators of quality—we share and promote a *culture of proxies*. LinkedIn profiles stand for individuals, the number of linked pages stand for relevance and importance, 'likes' are a proxy for pleasant, TripAdvisor becomes a guide to leisure. Naturally, the process further fuels the advertisement industry and its new dialectics of virtual materialism. Equally naturally, the process ends up applying to us as well. In a proxy culture, we may easily be *de-individualized* and treated as a type (a type of customer, a type of driver, a type of citizen, a type of patient, a type of person who lives at that postal code, who drives that type of car, who goes to that type of restaurant, etc.). Such proxies may be further used to *reidentify* us as specific consumers for customizing purposes. I do not know whether there is anything necessarily unethical with all this, but it seems crucial that we understand how ICTs are significantly affecting us, our identities, and our self-understanding, as we shall see in Chapter 3.