Post-material Meditations: On Data Tokens, Knowledge and Behaviour

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Abstract: Contemporary living is embedded in dense information environments in which a growing number of contingencies, problems or situations are increasingly framed in terms of data availability and the technologically based operations of algorithmic reasoning and statistical data crunching by means of which data are assembled to meaningful structures and categories. The implications of these developments for social practice, individuals and organizations are still dimly understood. Placed in wider historical purview, these trends, we suggest, are underlain by the prominence of cognition *qua* computation and the concomitant retraction of perception as an axial principle of human conduct, tied to palpable reality and situated encounters.

Introduction

A conspicuous manifestation of the technological developments that have been taking place over the last few decades is the diffusion of a great range of potent digital devices and their growing entanglement with the pursuits of individuals and institutions alike. Less evident is the fact that the pervasive use of these devices is embedded in a complex universe of data and information tokens that support whatever services or activities digital devices enable. While many of the automated procedures by means of which data are assembled to digital content remain often backstaged, the content itself carries over onto the human interface and intermingles with the ways individuals perceive, reason and react. After all, digital content of whatever type (e.g. digital maps, music or book lists, results pages of digital search) has to be eye scanned or carefully read, understood and related to other content and the purposes for which it has originally been invoked.

The implications these developments have for people and the ways they understand and relate to the world represent a sort of a blind spot in an otherwise mushrooming and insightful literature on social media, social networks and the Internet (see e.g. Benkler 2006; Nardi 2010; Nardi and Kallinikos 2010; Shirky 2008). A hyperbole as it may sound, the validity of this claim emerges against the backdrop of the imageries that compel the understanding of the developments we point out here. The dominant metaphors have been those of **linking** and **community building**. The description of new media and computer-mediated networks as social is far from accidental. These technologies are by and large conceived as **platforms** upon which a wide range of new and often radically different individual or collective pursuits can develop. What is, however, missing from this literature is the massive mediation of **reality** and **sociality** by expansive grids of data and information tokens, and the impact such mediation may have for the perception of the world and the quality of the ensuing social relationships.

Meaning and information are closely related to one another and the prevailing conception of information is one of **data tokens** carrying **semantic** or **cultural content** (Borgmann 1999; Kallinikos 2006). Yet, what sort of meaning do data tokens carry and how does that meaning relate to other modes of apprehension and communication? The significance and pervasiveness of information in contemporary living is far from accidental. It in fact bespeaks the diffusion of technical modes of cognition and understanding laid over more traditional ways of perceiving and acting upon the world that are mediated by language and speech and compelled by bodily presence (Heidegger 1971, 1998). The cultural content carried by data and information tokens is thus not a straightforward translation of other modes of perceiving and understanding the world (Day and Ekbia 2010). Rather, it results from entirely different preoccupations that find the most conspicuous manifestation in the computational procedures of data assembly by which cultural content is produced

and disseminated. These last are themselves the outcome of the development and maintenance of large, standardized data repositories into which the use of digital devices is embedded.

It is vital to understand the embeddedness of single digital devices within broader networks of data relations from which they gain their utility. The computational devices that populate everyday living and institutional practice alike are made potent through the growing transactivity (as opposed to connectivity) they acquire, as the outcome of being embedded within widely distributed and standardized data and information sources. In this regard, the developments we pinpoint construct a comprehensive, computationally driven **digital habitat**, whereby social and cultural states and relationships are increasingly mediated by data and information tokens (Hayles 2006; Kallinikos 2006). This may seem a long driven claim but it is not. In her recent book *Alone Together*, Sherry Turkle poignantly reports that one of her young respondents told her that RL (which is how he referred to real life) is "just one more window" and usually not his best one (Turkle 2011: xii).

These developments we suggest have important implications that reshape longstanding behavioural habits, in which the circumspection of one's immediate environment has normally been immersed in situated forms of perception and action, closely tied to the **entire spectrum of the human sensorium** (Heidegger 1971, 1998; Merleau-Ponty 1962). In the context of organization studies, some of these trends have originally been singled out and analyzed with unusual force and insight by Zuboff (1988). Many of the observations she made at that time are equally, if not more, poignant today, despite the dramatic technological and social changes that have taken place (Kallinikos 2011). As digital devices diffuse and become omnipresent, they embed human behaviour in an environment dominated by surrogate technical images and information tokens in which the description and depiction of life situations result from

procedures and strategies of data processing and assembly (Kallinikos 2009). The relationship between the **sensible** and the **intelligible**, what can be perceived by the senses and what can be thought without immediate access to tangible reality is thereby refigured (Kallinikos 2009; Zuboff 1988).

In the rest of this paper, we try to provide reasons in support of this claim. Next section describes the importance, which data capture and data analysis assume in contemporary life, and the shifts in the practices of knowledge development and sense making these trends bring about. Following it, we show how the proliferation of data tokens combines with the diffusion of computer-based devices across the social fabric to construct new forms of experience, in which a wide spectrum of life issues from trivial (e.g. shopping on the internet) to non-trivial ones (e.g. profiling and identity making) is increasingly framed in computational/cognitive terms. Next to it, we revisit the double bind of the sensible and the intelligible and attempt to show how the intricate relation of cognition to perception is refigured as the outcome of the trends, which we single out. In the last section we revisit the inescapable embeddedness of social interaction and discuss some of the problems and paradoxes that are caused by the developments to which we refer.

The Analytic Reductionism of Computation

Data availability is the distinctive mark of our age and its holy grail (Ayres 2007). If only available, data would be able to tell us of so many things; for instance, who we are beyond our delusions and deceptions by virtue of mapping the nature of our preferences as recorded in actual choices over time; or how our body feels even if our awareness fails to register it; what friends to choose and what communities to join; what travels, mortgage or insurance to undertake this year, what flights may be cheaper today, what stocks to invest over the coming few months, which films or plays to see this week, how to drive to a destination in the urban mazes of modern

cities or which crime-afflicted neighbourhoods to avoid and so forth (Ayres 2007). The assumption is that if rightly perused, the data that is massively and meticulously captured and stored everyday in all walks of life would be able to illuminate human realities and innovatively address an impressive array of issues confronting contemporary people and institutions. A large range of relevant technologies and services are already in place.

While many of these issues may appear trivial, their implications are not. Conducting an essential portion of the dealings of everyday living by relying on recommendations produced out of available data by machines signifies an important shift in core human habits. But the use of data has implications beyond the restructuring of everyday trivia. Reconstructing, for instance, the profile of people's preferences by means of computing data provided by Internet surfing habits and information on life styles, income or demographic characteristics compiled from other sources is an intricate practice with serious personal and legal repercussions (Hildebrandt and Gutwirth 2008; Hildebrandt and Rouvroy 2011). The same holds true for contemporary science with all its sophistication and institutional complexity. There is some evidence to suggest that scientific practice increasingly becomes entangled with the production and computational manipulation of data in ways that far outstrip whatever prerogatives or reliance empiricism has commonly attributed to descriptive accounts of reality. Consider the following[1]:

> What can you learn from 80 million x-rays? The secret of aging, among other things, Sharmila Majumdar, a radiologist at UC San Francisco, is using an arsenal of computer tomography scans **to understand** how our bones **wear out from the inside**.
>
> It works like this: A CT scanner takes superhigh-resolution x-rays and combines those individual images into a three-dimensional

[1] Thomas Goetz, Scanning our Skeletons, *Wired*, July, 2008.

> structure. The results are incredibly detailed; a scan of a single segment of bone can run 30 gigs.
>
> Majumdar's method is to **churn through the data to identify patterns**[2] in how the trabeculae-the material inside the bone-changes in people who have diseases like osteoporosis and arthritis. In one day of imaging, it's not uncommon for the lab to generate nearly a terabyte of data. Researchers also aggregate the data from many subjects, putting hundreds of terabytes to work. Majumdar hopes to learn why some patients suffer severe bone loss but others don't. 'We don't know the mechanism of bone loss', she notes. 'Once we learn that, we can create therapies to address it.'

The example provides a good illustration of wider shifts in core procedures of medical practice and research. It shows how the development of knowledge is increasingly made contingent on the extraction of patterns derived from permutations performed upon huge masses of data. The first step in this process is the **comprehensive mapping of reality** through the technological generation of huge amounts of data (superhigh-resolution x-rays) to be followed by **computer-driven techniques of data reduction and interpretation** that are assumed able to expose its underlying regularities (the mechanism of bone loss). The assumption is that more data leads to more adequate descriptions of reality and this is what renders millions of scans necessary.

Obviously, the conditions under which data is captured and aggregated far surpass the attention span, the register capacity and memory of humans (lay men or experts). The purpose of the bone scans, as this quote indicates, is not to provide ostensive evidence to the expert eye, at least not principally. Even though each patient's condition may be better illuminated by superimposed high resolution x-rays, the major use of the scans taken is to add data on bone conditions at a far more aggregate level. The value of particu-

[2] All bolds are ours.

lar scans is framed by the overall project of producing an adequate description of reality at the population level. This it would seem as a remarkable shift in the traditional use of scans and the medical practice of diagnosing through reading of x-rays. Accordingly, the scans taken amount to millions and a dizzying mass of data (counted in terabytes) is obtained through aggregation of individual x-rays in a common data pool.

Under these conditions, traditional forms of making sense of the world anchored into the human sensorium may not seem well suited. Indeed, there is nowhere to go by just focusing on the perception and examination of individual scans, even though the conditions of particular patients could be illuminated and some of its grave consequences perhaps alleviated. But again the purpose of scans is not to address particular patients, at least not at this stage of knowledge development. Lumped together, the resulting groups of scans make it extremely expensive and time consuming, if ever possible, to identify the mechanism of bone loss by means of the naked eye or other perception-based observations. The pattern of bone change (medical knowledge) that will eventually emerge from this data mass will be derived from the computational superiority of statistical correlations performed on terabytes of data generated by millions of scans, spanning over masses of people distributed over different ages.

While just an example, the development of knowledge by these means reflects wider trends that refigure not simply inherited perception practices but also key conceptual habits and traditions of scientific research and practice. The statistical permutations performed upon the data mass are basically **agnostic**. To a nearly cunning degree, the process of discovery conforms to the canon of induction. No theory other than statistics is needed to detect patterns in the data. The pattern, if there is one, should emerge from **bottom-up processes of data manipulation** and clustering through

statistical techniques. Data comprehensively maps reality (the scans capture bone conditions) while computer-based data mining discovers its underlying principles (the mechanism of bone loss).

In the same volume of *Wired* from which the excerpt is drawn, the information age guru and editor in chief of the journal Chris Anderson predicts the end of theory and science in the standard sense of conceptual development, based on empirical evidence of one or another type. Due to greater data availability and more accurate data, this pattern, he claims, will get intensified in the years to come and knowledge, equated with data configurations, will finally be derived inductively and exclusively through correlations performed upon huge masses of data.[3] The age in which data without theory meant noise is over, says Anderson, putting new oil in the fire maintained over centuries by the empiricism/rationalism divide. In this neo-positivist context, not only perception, even conceptual analysis (or at least a vital part of it) is rendered redundant. Cognition in the form of data analytics (or you may want to call it data alchemy) increasingly takes command. Matter and reality are regained, if ever, after a long analytic retreat, out of the cognitive dust of computational particles (data) (Kallinikos 2009).

While science may seem as a context akin to the revival of the empiricism's dream, the trends we single out here are far from limited to the development of knowledge and science. Indeed, they extend over to an increasing range of practices some of which may carry important institutional implications. Here is another illustrative demonstration, this time taken from agriculture[4]:

> Last October, agricultural consultancy Lanworth not only correctly projected that the US Department of Agriculture had overestimated the nation's corn crop, it nailed down the margin: roughly 200 mil-

[3] Chris Anderson, The End of Theory, *Wired*, July 2008.
[4] Ben Paynter, Feeding the Masses, *Wired*, July 2008.

> lion bushels. That's just 1.5 percent fewer kernels but still a significant shortfall for tight markets, causing a 13 percent price hike and jitters in the emerging ethanol industry. When the USDA downgraded expectations a month after Lanworth's prediction, the little Illinois-based company was hailed as a new oracle among soft-commodity traders-who now pay the firm more than $100.000 a year for a timely heads-up on fluctuations in wheat, corn and soybean supplies.
>
> The USDA bases its estimates on questionnaires and surveys-the agency calls a sample of farmers and asks what's what. Lanworth uses **satellite images**, **digital soil maps** and **weather forecasts** to project harvests at the **scale of individual fields**, it even looks at crop conditions and rotation patterns-combining all the numbers to determine future yields.
>
> Founded in 2000, Lanworth started by mapping forests for land managers and timber interests. Tracking trends in sleepy woodlands required just a few outer-space snapshots a year. But food crops are a fast-moving target. Now the company sorts 100 gigs of intel everyday, adding to **a database of 50 terabytes** and counting. It is also moving to world production prediction-wheat fields in Russia, Kazakhstan and Ukraine which are already in the data set, as are corn and soy plots in Brazil and Argentina. The firm expects to reach **petabyte scale** in five years. 'There are questions about how big the total human food supply is and whether we as a country are exposed to risk', says Lanworth's director of information services, Nick Kouchoukos. 'We are going after the global balance sheet.'[5]

Similar to the medical example of bone loss, the case of Lanworth illustrates a dramatic shift in the whole practice of thinking about and predicting future yields. Such a shift is made again possible by 1) the remarkable expansion and aggregation of information sources about the conditions on which food crops are dependent and 2)

[5] All bolds are mine.

the calculation of future yields on the basis of computational (statistical) techniques of data analysis and reduction. The remarkable expansion of information is the outcome of technological advances of reality documentation (satellite images, digital soil maps, weather forecasts), far beyond any human register capacity. They are also contingent on the (technological) ability to lump up that information into a single database or data repository of standardized data possible to crunch by statistical techniques. Equally to the project of understanding the underlying reality of bone loss, data availability and algorithmic reasoning emerge in the case of predicting future crops as the milestones of a new practice.

There are undeniably blind spots, hidden assumptions and simplifications in these stories of scientific journalism. One could certainly raise doubts with respect to the efficacy of the procedures of knowledge development described above and the hidden risks or even deceptions they may help disseminate (Nardi and Kow 2010). But the trends of data affluence and algorithmic data reduction they depict are hard to dismiss. They are indeed supported by both wider evidence and common sense (Ayres 2007; Gantz et al. 2008; Lessig 2008).

At the very bottom, it would seem as a displaced gesture to question whether the procedures of data availability and computational rendition that underlie knowledge development in the contexts outlined above represent such an efficacious way to truth, as for instance, Anderson claims. Most probably they do not. If anything, these stories rather illustrate how truth is currently achieved; that is, "how truth is made true" or "adequate" by recourse to the instruments, techniques and solidified knowledge procedures of computation (Foucault 1988; Hacking 1986, 1999). Thus conceived, truth is not primarily a denotative or declarative game of verifiable or falsifiable propositions but a performative one establishing as much as discovering reality. In this regard, the issue is ultimately

not whether technological representations truthfully map reality but rather how they create and establish particular versions of the world, possible to act upon, perform and manipulate (Heidegger 1977, 1998; Kallinikos 1995).

The Technological Monitoring of Daily Living

Albeit controversial and differently interpreted, the implications of the developments we single out here for scientific and economic practices may be hard to deny. The same may not however hold true as regards everyday living and the making up of life styles or patterns in which data and information tokens become primary bearers of reality. Daily living would seem to be such that the documentation of reality produced by technological means (super-high-resolution x-rays, digital soil maps or satellite images) may appear not as developed as it is in the delimited and more easily amenable to technological regulation institutional domains, considered in the preceding section.

However, upon a closer look, much of the technological and cultural change that has taken place over the last few decades casts everyday living in a similar context, saturated by information tokens and a variety of services assembled out of data permutations. It is vital to recognize that the continuously growing involvement of the Internet in everyday living and the diffusion of powerful digital handsets go hand in hand with the standardization of the content of the digital habitat in which they are embedded. A commensurable data and information space is thus established making possible the sharing and elaboration of data across the traditional (culturally and technologically based) divides of text, image and sound, and the boundaries of distinct institutional conventions through which these have been produced and consumed such as films or video, books, photographs, games, journals or magazines. Such a sharing and elaboration of data and the information-based culture and knowledge they mediate are not a common or natural

offspring of human activities. Rather, they are the outcome of a range of longstanding technological and institutional developments operating at different levels of aggregation. Through the standardization of data and the procedures by which they are acted upon, these developments have made possible the rendition of a growing range of social and cultural practices as interoperable digital content (Hayles 2005, 2006; Kallinikos 2009; Manovich 2001).

Often referred to as media convergence, these developments construct a common and trans-modal information space in which a variety of experiences, previously mediated by a wide array of incommensurable media/artefacts and deriving from different and mostly unconnected life orders, can be brought to bear upon one another (Jenkins 2006; Kittler 1997; Manovich 2001). Private life can be made a YouTube video or a Facebook story. More widely, ordinary experiences can and, in fact, are increasingly associated with mixing digital content that usually spans over texts and blogs, pictures, videos and audios (Lessig 2008; Shirky 2008). At the other end of the spectrum, companies and institutions meticulously record in databases, under still ambiguous legal conditions, the online habits of people spanning over widely different life compartments, in their effort to produce commercially relevant behaviour profiles as the basis of the services they offer to individuals (Carr 2008; Hildebrandt and Gutwirth 2008). People are said to have long digital shadows cast by the meticulous assembly of the traces their online lives produce.

An important and largely overlooked consequence of all these developments, we suggest, is the **technological monitoring of the trivia of living** consequent upon the infiltration of an ever-greater range of details of everyday life by data and information tokens. For first perhaps time in history, technology in the form of computation is extensively involved in the framing of life issues, as predominantly issues of information and communication, possible to

address by computational means. Indeed, a **new everyday** seems to be taking shape (Lessig 2008; Shirky 2008) in which even physical devices participate. By means of **embedded computing** that governs and records their operations, physical devices are increasingly drawn out of their mute isolation and inserted to the circuits of the growing data universe, the so called Internet of things. Cooking, washing, exercising can all through embedded computing and wireless transmission be transformed to data that can thus be shared with friends, relatives, neighbours or unknown people. Exercising in one's own room or cooking in one's own kitchen do not anymore need to be solitary experiences, as recorded performances and outputs obtained by the use of physical devices can be shared, compared and assessed (Yoo 2010). Routine, daily activities are thus increasingly cast in a technological context and conducted or monitored with the use of a range of computational artefacts via the World Wide Web, the Internet or other less inclusive communications networks.

Some of these trends are well illustrated by IBM's programme of *autonomic computing* in which a considerable range of experiences spanning businesses and different institutional compartments are thought possible to monitor through elaborate grids of intelligent technologies in which humans are basically seen as just the initiating agents and the receiving ends of a complex ecology and computational processes into which digital devices are embedded (Gilat 2005; Hildebrandt and Rouvroy 2011).[6] More perhaps clearly than IBM's yet speculative programme, the **infiltration of the personal space of experience** by data technologies is shown by the Microsoft-based research project *MylifeBits* in which human experience and the impressions/memories it mediates are made the object of deep-going technological mediation and monitoring. *Mylife-*

[6] See http://www.research.ibm.com/autonomic/ accessed June 5, 2011.

Bits is, as the relevant website states, "a lifetime store of everything"[7]. Here is a quote of Microsoft's relevant website:[8]

> MyLifeBits is a system that began in 2001 to explore the use of SQL to **store all personal information found in PCs**. The system initially focused on capturing and storing scanned and encoded archival material e.g. articles, books, music, photos, and video as well as everything born digital e.g. office documents, email, digital photos. It evolved to have a goal of storing everything that could be captured. The later included web pages, phone calls, meetings, room conversations, keystrokes and mouse clicks for every active screen or document, and all the 1-2 thousand photos that SenseCam captures every day.[9]

The infiltration of ordinary experiences by data and the operations by which they are assembled to meaningful digital content is perhaps most poignantly shown in the rapidly spreading use of connectible handsets, the diffusion of so called location services (GPS) and augmented reality technologies that seek to provide urban navigational routes and findability services on the spot. Such services extend far beyond what urban maps and catalogues have traditionally mediated and entail the exploration in real time of **personal preference** with **location availability** (e.g. identifying a restaurant, a particular type of shop, a tube station). This is made possible by combining information from usually google maps with databases of available services in particular locations. This contrasts with longstanding habits in which one's whereabouts in the city has been associated with haphazard pursuits of one or another kind often immersed in a range of visual and other perception-based practices. Strolling in the city has traditionally been a widespread

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[7] see http://www.mylifebit.s.com accessed June 5, 2011.
[8] http://research.microsoft.com/apps/pubs/default.aspx?id=64157 accessed June 5, 2011.
[9] The stress is our own.

and delightful habit. Set against this traditional context of city life, the burgeoning invasion of visual and perception-based practices of urban experience by GPS and augmenting reality technologies is indicative of the trends we seek to depict in this paper (Virilio 2000).

But do these developments really differ from the effects industrial capitalism produced over the course of the last century by means of which domestic life and human experience in general became drastically redefined? Placed in a historical purview, the diffusion of industrial appliances and goods across the social fabric did remake the infrastructural basis of everyday living and profoundly altered the contours of personal and cultural experience (Heller 1999). However, the shifts we seek to describe in this paper are of a substantially different nature. The issue at stake is not the share of effects industrial versus information devices and technologies have but rather the understanding of the distinct routes along which they shape life patterns. Let's us pursue this issue in a little more detail.

Perception, Cognition, Computation

As indicated in the introduction, information is a cognitive or communicative category. Placed against the rich repertory of textual and oral modes of signification, messages packaged as information entail a pragmatic or instrumental orientation (Day and Ekbia 2010), closely tied to the illumination of contingencies besetting contemporary human practices. The pervasiveness therefore of information and its computational rendition epitomize a technological understanding of meaning and communication (Heidegger 1971, 1998).

Against this backdrop, it comes as no surprise that the framing of life issues (at the personal or institutional level) in terms of computational information implies a crucial, albeit often imperceptible,

shift. Life situations tend to be defined as **cognitive problems** of a computational and navigational nature. Both vernacular practices such as how to find an address or film/play, identify things possible to buy or more serious concerns such as making friends or even a finding partner over the Internet[10] are essentially structured as issues of information. They are basically addressed by means of complex and automated computations performed upon the affluence of data and information tokens modern technologies and the life styles they instigate make available.

The diffusion of these habits and their growing involvement in social life signify the redefinition of ordinary experiences that reasserts the role of **cognition *qua* computation** at the expense of perception-based practices that have traditionally furnished axial principles of everyday conduct. The framing of life issues *qua* cognitive or analytic problems is of course intrinsic to modern life. The importance of literacy and, crucially, numeracy bespeaks the vital role cognition and the mental operations with which it is associated have assumed in modern life (Cline-Cohen 1982; Ong 1982). Without the capacity to read, write, count and calculate, humans are essentially crippled in the context of modern society. In this respect, the diffusion of reading and counting, writing and calculating has inescapably driven contemporary people away from the associative gestalts of perception and promoted analytical and abstract operations, without immediate reference to tangible reality (Borgmann 1999; Foucault 1970; Cassirer 1955).[11]

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[10] Dating websites, see http://www.top10bestdatingsites.co.uk/?kw=dating%2520com&c=7503707827&t=search&p=&m=e&a=3&gclid=CITS5uOJjakCFcod4QodL1YAkg accessed June 5, 2011.

[11] Some may find the distinction we make between perception and cognition overstated. Little wonder, perception is essential to cognition and the abstract operations that underlie cognition whereas the templates of cognition crystallized into what is called cognitive schemes furnish important receptacles to the activities of attention and perception (Anderson 1983; Neisser 1976). By perception, then, we predominantly mean situated observations and experiences that differ from sheer sensations in the sense of involving cultural mediations that do not,

The trends therefore we identify in this paper entail the accentuation of patterns of behaviour that have been highly diffused in modern times. The pervasive use of data and the textual or visual arrangements by which they are presented on digital screens should be seen as further perturbing the balance between the sensible and the intelligible and accentuate the preponderance of cognition over perception. Habitual use of digital devices often presupposes the **eye scanning** and **understanding** of what is presented on screen. The reference to urban settings made in the preceding section indicates that the diffusion of similar habits in everyday living tends to crowd our other modes of engagement that have been traditionally tied to variable visual and perception-based practices (Jay 1994).

Though not immediately evident, **digital surfaces are often deep and wide** sustained by complex assemblages of data and software. The screen arrangements are supported by information aggregated at several levels while the structure of software is itself layered (applications, interface managing software by which applications are managed, operating systems). While this complexity is often backstaged it may under particular circumstances erupt into the forefront. A more thorough assessment of what is presented on the screen may occasionally necessitate moving beyond the visual arrangements of data or image presentation inwards the deeper and far more complex reality out of which these arrangements are produced. In other instances, one source of information may consecutively lead to others. These trends provide a testimony that the diffusion of digital devices and their seductive instrumentality drive human action away from the associative gestalts of perception to a

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however, evolve into deliberate mental exercises. The distinction cannot be drawn unproblematically but it does have the merit of placing perceptual and cognitive operations at a different distance from ostensive reality.

universe dominated by data and information tokens, usually distributed across institutional contexts and life compartments. While new sensibilities are certainly developing this way, older and venerable ones may risk atrophy.

Data tokens as carriers of cognitive or cultural content is involved in the redefinition of personal living, including personal identity, in less conspicuous ways that necessitate the deconstruction of the commercial and institutional contexts within which data are gathered and assembled to digital content and services. Nowhere is this shown more clearly than in what is called **profiling**, that is, the assembly of personal data drawn from the Web into coherent patterns that reveal specific behavioural profiles. The distinctions and classifications of computational techniques, such as profiling, are not just detached analytic accomplishments. They become embedded into social life through the interaction between people and profiling institutions (Hildebrandt and Gutwirth 2008; Hildebrandt and Rouvroy 2011). Profiling classifications are thus **social** classifications, prone to turn out interactive as people assume the roles classifications delineate thus impinging on and shaping real life situations (Hacking 1999). Acting on profiling classifications entails acting on life categorizations arrived at inductively through procedures of data assembly.

The infiltration of human experience by the categories and schemes of technoscience (and power) is of course a pervasive modern theme (Borgmann 1992, 1999; Heller 1999; Mumford 1934). However, the issues which we touch upon here may be traced back to a relatively recent and recurring Foucauldian theme in social sciences (Foucault 1988), concerning the importance of statistics, actuarial techniques and accountancy, among others, on the constitution of particular forms of conduct. In a recent update of his acclaimed paper “Making up People”, Ian Hacking lists counting, quantifying and correlating among the handful of techniques of fashioning hu-

man conduct that he now refers to as "engines of making up people".[12] Counting, quantifying and correlating are at the heart of the processes that we seek to depict in this paper, brought to unprecedented heights by the pervasiveness of data and the spectacular involvement of digital devises in personal and social life.

Addendum on Embeddedness

Even in the case the portrait we have painted in this paper is taken as a valid depiction of contemporary developments, it would seem legitimate to raise objections as regards the kind of impact these developments may have on human practices and institutions. Can one really assume the unified refraction of these trends across the social and institutional fabric? Do not people and institutions appropriate these developments, interpret and remake them to fit their realities? After all, the changes we describe in this paper occur in a thick cultural and institutional context that variously conditions the introduction of new technologies and whatever habits these may propagate.

There is little doubt that the developments we have singled out in this paper are and will be variously refracted across fields and professional domains of contemporary life; medicine, for instance, is different from agriculture, architecture from law or the running of a business. Each of these institutional domains confronts specific problems. Each one addresses these problems by historically specific ensembles of knowledge, skills, traditions and practices (Kallinikos and Hasselbladh 2009). Given, thus, the distinctive profile of problems, skills and practices underlying each one of these domains, it makes sense to assume that the implications of the devel-

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[12] In a newer version of his "Making up People" with the same title in LRB, vol. 28, 17 of August 2006, Ian Hacking lists ten engines of making up people: Count, Quantify, Create Norms, Correlate, Medicalise, Biologise, Geneticise, Normalise, Bureaucratise and Reclaim our Identity.

opments we refer to here are bound to manifest differently across them (see e.g. Lessig 2006; Terzides 2005).

Reasonable as this assumption may be, it nevertheless does not exhaust the issues raised by the developments we seek to describe in this text. For, the comprehensive and deep-going character of these developments alters important premises on the basis of which reality is conceived and addressed. It does so in ways that are generic enough to transcend the specificities of particular domains of social life (Kallinikos 2011). Contemporary computer-mediated architecture, to give another context of professional experience, makes its objects calculable, describable and manipulable in innovative ways that open up new spaces for expression and human intervention (Flachbart and Weibel 2005; Terzides 2005). Such calculability, describability and manipulability are however the outcomes of the distinctive ways by means of which computation assembles the composite pictures of reality professionals and lay people confront out of data tokens and the permutations they enter (Kallinikos 2009). The same holds true for the other examples given earlier in this paper.

A new reality is brought about by these techniques and ways of construing and assessing problems and situations in which data availability and data analytics prevail. In this regard, the reality outlook of computation and the techniques of capturing, storing, making available and analyzing data transcend the confines of particular professional practices (Kallinikos and Hasselbladh 2009) and remake some of the basic premises on the basis of which facts are produced, made available, assessed and addressed. By the same token, the forms of expertise intrinsic to each one professional domain (e.g. medical, legal, economic, architectural) are changing in ways that seek to accommodate the computational rendition of reality we have been at pains to describe in this text.

Though differently, these developments carry implications, we have claimed, for the lifeworld and the patterns of ordinary experience. They cast human living in a complex environment in which data availability and the computations it occasions increasingly provide the coordinates of daily life patterns. Again, the individual or collective appropriation of these life styles and patterns inevitably entails the re-contextualization and situated interpretation of abstract and freely circulating data tokens. It is beyond any doubt that individuals and groups transform and complement the generic and de-contextualized solutions mediated by technologies (Esposito 2004). Yet, by the same token, they become accomplices in the framing and sampling of the world these technologies and the services they enable mediate (Heidegger 1977, 1998). Re-contextualization (and interpretation) is double act that changes not only **what is re-contextualized** but also **the agents of re-contextualization**. Seen in this light, the tasks and patterns of daily life that have predominantly been shaped by all those qualities and faculties we associate with human experience are subject to change, as computational techniques infiltrate the everyday living habitat. This seems to us as an important shift in which the front- and backstage (the tacit, unconscious, forgettable, beyond awareness) of human living change position (Kallinikos 1995).

In other words, the technological and cultural developments we describe in this chapter exhibit generic attributes that cut across specific contexts of social and institutional life. These generic attributes — which we have identified with the prominence of cognition over perception, the preponderance of information and computational principles in defining reality — cannot be wished away by the widespread rhetoric of technological appropriation, technological malleability or contextual adaptation that has become common over the last few decades (Bijker 2001; Bijker et al. 1987; Orlikowski 2000). They need to be conceptually decomposed and studied empirically with the view of exposing the distinctive forms

through which they are manifested, change and fuse into the fabric of social practices.

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