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What is This?

Italian *Operaismo* and the Information Machine

Matteo Pasquinelli

Abstract

The political economy of the information machine is discussed within the Marxist tradition of Italian *operaismo* by posing the hypothesis of an *informational turn* already at work in the age of the industrial revolution. The idea of *valorizing information* introduced by Alquati (1963) in a pioneering Marxist approach to cybernetics is used to examine the paradigms of mass intellectuality, immaterial labour and cognitive capitalism developed by Lazzarato, Marazzi, Negri, Vercellone and Virno since the 1990s. The concept of machinic by Deleuze and Guattari (1972, 1980) is then adopted to extend Marx's analysis of the industrial machine to the algorithms of digital machines. If the industrial machine can be described as a bifurcation of the domains of energy and information, this essay proposes to conceive the information machine itself as a further bifurcation between information and metadata. In conclusion, the hypothesis of the *society of metadata* is outlined as the current evolution of that *society of control* pictured by Deleuze (1990) in relation to the power embodied in databases.

Keywords

algorithm, cognitive capitalism, information machine, immaterial labour, metadata, *operaismo*

Each kind of society corresponds to a particular kind of machine – with simple mechanical machines corresponding to sovereign societies, thermodynamic machines to disciplinary societies, cybernetic machines and computers to control societies. But the machines don't explain anything, you have to analyze the collective

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apparatuses of which the machines are just one component. (Deleuze, 1990b: 169)

Introduction

'The industrial modality appears when the source of information and the source of energy separate, namely when the Human Being is merely the source of information, and Nature is required to furnish the energy. The machine is different from the tool in that it is a relay: it has two different entry points, that of energy and that of information' (Simondon, 2006: 17). This passage from a posthumous text by Simondon should be adopted as a general intuition to start casting a different light on the machines of industrial revolution. The bifurcation between energy and information that is here predated at the core of the industrial machine is not meant to underline a *continuum* between different technological ages, between industrialism and informationalism, but on the contrary to spot, as Deleuze and Guattari would record, a historical bifurcation of the technological lineage or *machinic phylum* (Deleuze and Guattari, 1980: 406).

The initial part of this essay explores the hypothesis that the subterranean history of information started already within the industrial factory and it was diversely recorded by Marx in his reading of Babbage's division of mental labour and in his notes on the productive role of the 'general intellect' in the *Grundrisse*. What was totally absent in Marx's analysis of machinery was of course a definition of information in contemporary terms. Trying to fill the gap between Marxism and cybernetics, this essay rediscovers a pioneering work by Romano Alquati (1962, 1963) that was published in *Quaderni Rossi* (the first journal of Italian *operaismo*) and never translated into English. During a 'militant inquiry' at the Olivetti computer factory in Ivrea, Alquati mapped and described the conditions of labour in front of new cybernetic apparatuses. In Marxian terms Alquati introduced then the notion of *valorizing information* as a conceptual bridge between the definition of information in cybernetics and the notion of living labour. This notion of *valorizing information* will be useful to see in perspective and test notions such as mass intellectuality, immaterial labour and cognitive capitalism that the thinkers of *operaismo* started to develop in the 1990s to focus the political transition to post-Fordism.

In the second and final part of the essay, expanding the theoretical field of *operaismo,* the notion of *valorizing information* is used to imagine a further bifurcation of the *machinic phylum* within contemporary information economy. The concept of machinic by Deleuze and Guattari (1972, 1980) is adopted as a mediator between Marx's industrial machine and the algorithmic form of the digital machine. The algorithm is illuminated as the very machinic nature of the information machine against

the excessive focus of early digital studies on the notions of 'code' and 'language'. If the industrial machine can be described as a bifurcation of the domains of energy and information, this essay proposes to conceive the information machine itself as a further bifurcation between information and metadata. Consistent with *operaismo*'s philosophy and particularly with Alquati's initial insights, the hypothesis of the society of metadata is outlined as the current evolution of that society of control that was already pictured by Deleuze (1990a) in relation to the power embodied into databases.

Marx, Babbage and the Division of Mental Labour

Information media were indeed found haunting the first textile instruments of the industrial revolution. The Jacquard loom invented in 1801 was in fact a mathematical device controlled by a punched card very similar to those standardized as data storage devices in the early 20th century. This invention also influenced Charles Babbage, who was planning to use similar cards for his 1837 Analytical Engine. In her notes to the project, Ada Lovelace (1961 [1853]) herself underlined that 'the Analytic Engine weaves algebraic patterns just as the Jacquard-loom weaves flowers and leaves'. Therefore the development of the medium of information could be framed as an autonomous *machinic* lineage parallel to the evolution of other industrial technologies such as the heat engine. Of course the 18th century was not mature enough to trigger an information revolution on its own and to understand and valorize foremost the cognitive and intellectual component of labour. In Marx's *Capital* there are few accounts of the 'intellectual organs' operating around the industrial machine and only in the posthumous *Grundrisse* the cognitive component of production emerges in a more visionary way. It is interesting to register, however, that the description of industrial machinery and the related division of labour were inspired in Marx by the pioneer of computational machines, Babbage.

In Marx, machines are never autonomous agents in themselves but are immersed and shaped by the field of power relations between classes, being 'the most powerful weapon for suppressing strikes' (Marx, 1867: 562). Yet machinery is not a negative instrument in itself: 'it took both time and experience before the workers learnt to distinguish between machinery and its employment by capital, and therefore to transfer their attacks from the material instruments of production to the form of society which utilizes those instruments' (Marx, 1867: 554). Conceptually, machines are defined by Marx as an instrument to occupy and replace a previous division of labour. Logically, in the first volume of *Capital* the chapter on machinery follows the chapter on the division of labour. The idea that a machine occupies the space previously

described by the division of labour was introduced by Babbage. Marx had quoted Babbage already in *The Poverty of Philosophy*:

> When, by the division of labour, each particular operation has been simplified to the use of a single instrument, the linking up of all these instruments, set in motion by a single engine, constitutes – a machine. (Babbage, 1832: quoted by Marx, 1847)

Babbage was a visionary for his time: in his book *On the Economy of Machinery and Manufactures* he proposed also a 'division of mental labour' that would be the basis of his computing machines: 'the division of labour can be applied with equal success to mental as to mechanical operations, and . . . it ensures in both the same economy of time' (1832). Babbage's idea of the division of mental labour replaced by machinery can be extended, in a Marxian fashion, also to contemporary information machines. As much as industrial machines were not just replacing workers' *horsepower* but a whole set of relations that was developed under the regime of manufacturing, in the same way information machines can be said to have replaced a set of cognitive relations already at work within the industrial factory.

Andrew Ure, who was defined by Marx as 'the Pindar of the automatic factory', described the industrial apparatus as 'a vast *automaton*, composed of various mechanical and intellectual organs, acting in uninterrupted concert for the production of a common object, all of them being subordinate to a self-regulated moving force' (Ure, 1835: quoted by Marx, 1867: 544). The so-called division of labour was, foremost, a separation of mechanical from intellectual organs. Marx writes:

> The separation of the intellectual faculties [*Potenzen*] of the production process from manual labour, and the transformation of those faculties into powers [*Mächte*] exercised by capital over labour, is, as we have already shown, finally completed by large-scale industry erected on the foundation of machinery. The special skill of each individual machine-operator [*Maschinenarbeiter*], who has now been deprived of all significance, vanishes as an infinitesimal quantity in the face of science, the gigantic natural forces, and the mass of social labour embodied in the system of machinery, which together with those three forces constitutes the power of the 'master'. (Marx, 1867: 549)

This passage from *Capital* resounds very similarly to the so-called 'fragment on machines' in the *Grundrisse* (Marx, 1939: 690–712; notebook VI, written in February 1858)*,* where the simple 'intellectual organs' become a vast 'social brain' and the 'general intellect' is absorbed into the

fixed capital of machinery (Marx, 1939: 694). The evolution of the role of knowledge between *Capital* and the *Grundrisse* is the passage from the atomized intellectual organs of the *Gesamtarbeiter* (the 'collective worker') to a degree in which 'general social knowledge has become a direct force of production' (Marx, 1939: 694). In the *Grundrisse* Marx seems to refer to an autonomous and collective dimension of knowledge before its incarnation in machines: this insight by Marx will be famously adopted and emphasized by *operaismo* in the 1990s as a prediction of post-Fordism and the knowledge economy.

If Marx opens the chapter on machinery in *Capital* by stating in an imprecise way that 'the machine is a means for producing surplus value' (Marx, 1867: 492), he afterward clarifies the machine exactly only as a means for the *augmentation of surplus value* (Marx, 1867: 572). In Marxian terms machines cannot produce surplus value, as they cannot be 'exploited': only workers are exploited and are the very source of surplus value. In the following parts I will try to read the tradition of *operaismo* and the notion of the information machine involving two insights also inspired by Marx: 1) information machines occupy, replace and extend the relations of the *division of mental labour* that were already present in the industrial age; 2) as much as industrial machines, information machines are not a tool for the production but just for the *accumulation and augmentation of surplus value*. Still, the Marxian grammar of industrial machines appears insufficient to enter and frame the age of information machines: it is in the work of Romano Alquati, one of the first authors of Italian *operaismo,* that we will find a conceptual bridge capable of connecting Marx with the age of cybernetics.

The Notion of Valorizing Information by Alquati

Against the common perception that notions such as immaterial labour and cognitive capitalism are recent theoretical acquisitions of *operaismo*, it must be noted that as early as 1961 Alquati initiated an inquiry into labour conditions at the Olivetti computer factory in Ivrea. Across the industrial landscape of the north of Italy, Olivetti was a pioneering company famous for producing typewriters, electronic calculators and mainframe computers as early as the 1950s (the Elea 9003, for instance, the first transistor-based computer in the world, was produced there in 1959). The debate on machinery in 'neocapitalism' was central in the first issues of *Quaderni Rossi* (the founding journal of *operaismo*), also thanks to the contribution of Panzieri (1961), that influenced the analysis of the 'social factory' by Tronti (1962) too. However, it is in his verbose essay 'Organic Composition of Capital at the Olivetti Factory' that Alquati (1962, 1963) undoubtedly made the first analysis of cybernetics ever attempted by autonomist Marxism.

Alquati interviewed the workers of the Olivetti computer factory, intrigued by the new cognitive dimension of labour in that new environment: he discovered then the category of 'information' as a new mediator between the traditional Marxist categories of *variable capital* and *fixed capital*, that is, between the categories of living labour and machinery. Alquati proposed the idea of *valorizing information* as a conceptual bridge to unify the Marxian notion of value and the cybernetic definition of information. Alquati's essay features no bibliographic references and it is impossible to reconstruct his understanding of the definition of 'information': certainly he knew that 'information' was defined as a quantitative measure in the early information theory (see for instance Shannon, 1948) and also as a sequence of symbols: Alquati uses, for instance, the very English word 'bit' that was quite uncommon at that time. Alquati was clearly looking for a Marxist definition of information that could condense both its cognitive and economic dimension and that could go beyond the mere mathematical and physical measurements of information theory. In the following passages the term 'information' must be understood as closer to this extended meaning employed by Alquati.

In his research at the Olivetti factory, Alquati encountered first the cybernetic apparatus as an extension of the internal bureaucracy of the factory, that monitors the production process by the means of *control information* ['*informazioni di controllo*']. Bureaucracy descends into the bodies of the workers to record control information via the mediation of the circuits of cybernetic machinery. Right here Alquati introduces the concept of *valorizing information* ['*informazione valorizzante*'] to describe the flow running upstream and feeding the cybernetic circuits of the whole factory. Such a valorizing information is continuously produced by workers, absorbed by machinery and eventually condensed into products.

> Information is the essential to labour-force, it is what the worker – by the means of constant capital – transmits to the means of production on the basis of evaluations, measurements, elaborations in order to operate on the object of work all those modifications of its form that give it the requested use value. (Alquati, 1963: 121, translation mine)

At the beginning of the industrial age capitalism started to exploit human bodies for their mechanical energy, but soon it became clear, Alquati notes, that the most important value was originated by the series of creative acts, measurements and decisions that workers constantly had to perform. Alquati calls *information* precisely all the innovative micro-decisions that workers have to take along the production process, that give *form* to the product, but also that give *form* to the

machinic apparatus itself. If information enters in this way the Marxist definition of production, thereafter it has to affect also the traditional definitions of living labour and surplus value.

> The *productive labour* is defined by the quality of *information* elaborated and transmitted by the worker to the *means of production* via the mediation of *constant capital,* in a way that is tendentially *indirect*, but completely *socialized.* (Alquati, 1963: 121, translation mine)

Published in 1963 but actually written in 1961, the above passage by Alquati could be understood *avant la lettre* as the very first postulate of the paradigm of cognitive capitalism that *operaismo* will start to develop only many decades later. In Alquati workers are no longer thermodynamic animals sweating in front of industrial machinery, but already brain workers producing sophisticated information. From the point of view of the *technical composition of capital*, valorizing information is what enters the cybernetic machine via the worker and it is transformed into a sort of machinic knowledge.

According to Alquati, it is specifically the numerical dimension of cybernetics that is able to encode workers' knowledge into digital bits and consequently transform digital bits into numbers for economic planning:

> Cybernetics recomposes globally and organically the functions of the general worker that are pulverized into individual microdecisions: the 'bit' links up the atomized worker to the figures of the Plan. (Alquati, 1963: 134, translation mine)

In other words, operating as a numerical interface between the domain of labour and capital, cybernetics transforms information into surplus value. Easily the Marxian distinction of the *organic composition of capital* can be imagined and applied here: *living information* is understood as continuously produced by workers to be turned into *dead information* crystallized into machinery and the whole bureaucratic apparatus of the factory. The mediation of cybernetics along the whole organic cycle of information and knowledge accumulation is manifest. The internal bureaucracy of the factory is a specific division of labour that is just mirrored, implemented and extended by cybernetics. Alquati's important insight is a *continuum* merging management, bureaucracy, cybernetics, machinery and the division of labour: cybernetics unveils the machinic nature of bureaucracy and, conversely, the bureaucratic role of machines as they work as feedback apparatuses to control workers and capture their know-how. With Alquati we visit the belly of an abstract machine that is a concretion of capital no longer made of steel. For the first time

the cybernetic apparatus made palpable and visible the transformation and sedimentation of information into fixed capital. Applying Marx's lesson on machinery to the early computer age, Alquati himself repeats that no matter what 'new' machine or technological innovation is developed, it will still always express the power relations between classes (Alquati, 1962: 89). Thus Alquati seems to suggest that information machines themselves are a crystallization of social conflict.

The results of Alquati's research can be summarized in this way: 1) labour is a source of information for the industrial apparatus: actually the most valuable part of labour is *information*; 2) the information machine is crossed and operated by flows of *valorizing information* that are produced by workers and gradually improve the design of the machine, the management of the division of labour and the final value of products; 3) it is the *numeric dimension* of digital information that makes it possible to translate knowledge into information, information into numbers, and numbers into value; 4) the cybernetic apparatus of the factory grows and improves thanks to the contribution of workers' socialized intelligence.

Deleuze and Guattari's Machinic Surplus Value

As much as with Marx, a reading of the notion of information machine across *operaismo* has to be compared with the legacy of Deleuze and Guattari (1972, 1980). Their famous notion of *machinic* has many genealogies that cannot be illustrated here, but politically it can be considered a response to socialist productivism in the same years in which mass media were forging consumerism and the first wave of cybernetics was absorbed by Western society. Similarly to *operaismo,* the machinic philosophy was the attempt to expand the *technical composition of labour* that Marxism was relegating from the perimeter of the factory to the whole metropolis. This notion was also inspired by the *mechanology*, introduced by Simondon (1958), that was itself a reaction to the rigid determinism of cybernetics. Since its beginning the machinic was supposed to respond and incorporate in a critical way the new domain of information.

In a note in *Anti-Oedipus*, Deleuze and Guattari seem to refer to the chapter on machinery in Marx's *Grundrisse* (Deleuze and Guattari, 1972: 232, note 76). Surely inspired by its reading, in the same page they try to introduce the concept of 'machinic surplus value produced by constant capital ... recognizing that machines too *work* or produce value, that they have always worked, and that they work more and more in proportion to man, who thus ceases to be a constituent part of the production process, in order to become adjacent to this process'. How to receive such a definition of machinic surplus value? Deleuze and Guattari are referring clearly to the process of transformation of general intellect into

constant capital, that is, the transformation of a *surplus value of code* (knowledge) into a *surplus value of flow* (Marx's surplus value):

> [E]very technical machine presupposes flows of a particular type: flows of code that are both interior and exterior to the machine, forming the elements of a technology and even a science. It is these flows of code that find themselves encasted, coded, or overcoded in the precapitalist societies in such a way that they never achieve any independence (the blacksmith, the astronomer). But the decoding of flows in capitalism has freed, deterritorialized, and decoded the flows of code just as it has the others – to such a degree that the automatic machine has always increasingly internalized them in its body or its structure as a field of forces, while depending on a science and a technology, on a so-called intellectual labor distinct from the manual labor of the worker (the evolution of the technical object). (Deleuze and Guattari, 1972: 233)

These passages show that already in 1972 Deleuze and Guattari were aware of the new form of value accumulation driven by knowledge and by an *active cognitive component* that is part of the surplus labour produced by any subject.

> In brief, the flows of code that are 'liberated' in science and technics by the capitalist regime engender a machinic surplus value that does not directly depend on science and technics themselves, but on capital – a surplus value that is added to human surplus value and that comes to correct the relative diminution of the latter, both of them constituting the whole of the surplus value of flux that characterizes the system. Knowledge, information, and specialized education are just as much parts of capital ('knowledge capital') as is the most elementary labor of the worker. (Deleuze and Guattari, 1972: 234)

Curiously, the notion of 'abstract machine' that Deleuze and Guattari (1980) will put later on at the centre of their ontology in *A Thousand Plateaus* is inspired by the same term used in cybernetics, where an *abstract machine* is the project of an algorithm that subsequently can be implemented in a *virtual machine,* such as computer software, or in a *material machine,* that is, computer hardware or any mechanical apparatus (Macura, 2001). Indeed *A Thousand Plateaus* appears to underline a tendency towards abstraction that emerges clearly also in the notions of *machinic assemblage*. The machinic assemblage is immanent and very productive too, but it is evident with this notion that there is a shift to a more relational ontology. Due to this ambivalence, recently the notion of machinic has been received and reduced just to a paradigm of

assemblages that obliterates the very dimension of production in Deleuze and Guattari together with their Marxist background. As a primary example of this 'assemblage theory' that obliterates the Marxian surplus value from their philosophy see DeLanda (2006, 2010).

In the current studies about post-structuralism, when the notion of machinic is traced back to its etymology, that is to the Latin *machina* and the Greek *mechané,* it is always resolved as medium, tool, artefact, apparatus, structure (Raunig, 2010). Yet it is interesting to see how the idea of surplus and augmentation appears in fact within its very etymological root. More precise dictionaries highlight specifically the ancient root *mach-* that means growth, augmentation, amplification of a force (Klein, 1971). The same root *mach-* surfaces, for example, both in the Latin *magia* ('magic') and *magnus* ('great'). Similarly, in Old High German the word *macht* refers to power, skill, ability and wealth in a similar way to the Latin *potentia*. In other words, when Deleuze and Guattari were referring to *machinic surplus value* they were just making the ancient root of the word 'machine' resonate again. Impressed by this etymology and still in accord with Marx, the (information) machine could be defined as *an apparatus to accumulate and amplify a given flow*, whereas device, tool and medium would be more appropriate to describe just a translation or extension of that given flow (energy, labour, information, etc.). The concept of machine appears then to be related to surplus rather than just assemblage.

The Linguistic and Cognitive Turn of Italian *Operaismo*

The years of the rise of the network society were initially framed by *operaismo* as a *linguistic turn* of labour rather than as a technological turn. *Operaismo* has always put the primacy of the antagonism of labour at the centre of its political ontology. Indeed, as Lazzarato (1997: 14) pointed out: 'the problem is to define living labour, not labour'. This means that the new technologies were studied from the point of view of the *living labour* feeding them rather than in their own intrinsic nature. In this sense the transition to post-Fordism was understood by *operaismo* primarily as the transformation of labour towards more linguistic and cognitive skills. Such a *linguistic turn* emerged in the texts by Lazzarato, Marazzi, Negri and Virno that were published in the 1990s in journals such as *Luogo comune* (Rome) and *Futur Antérieur* (Paris) in the attempt to radicalize the new subjectivities of post-Fordism after the 'political winter' of the 1980s. In those years *operaismo* went back to the famous 'fragment on machines' of the *Grundrisse* (Marx, 1939: 690–712) that was translated into Italian by Renato Solmi in the fourth issue of *Quaderni Rossi* as early as 1964. Virno (1990) reminds us how this 'fragment' was used in the 1960s to question the supposed neutrality of science and in the 1970s as a critique of state socialism and the ideology of work, but only in

the 1980s was it finally recognized in the very productive forms of post-Fordism. The first article on the 'hegemony of immaterial labour' is by Lazzarato and Negri (1991). Marazzi's *Il posto dei calzini* (1994), Lazzarato's *Lavoro immateriale* (1997) and Virno's *Grammatica della moltitudine* (2002) represent the best synthesis of *operaismo*'s debate on the *linguistic turn* of post-Fordism. Virno in particular was one of the first thinkers of *operaismo* to extract resolutely Marx's idea of the general intellect from the gears of the industrial machines and scientific laboratories to find it diffused in the new forms of production across the whole of society:

> Mass intellectuality is the composite group of postfordist living labour, not merely of some particularly qualified third sector: it is the depository of cognitive competences that cannot be objectified in machinery. Mass intellectuality is the prominent form in which the general intellect is manifest today. (Virno, 1990: 9)

According to Virno the error of traditional Marxism is to consider the general intellect only as *fixed capital* crystallized into industrial machinery and not as *living labour* diffused across the whole *linguistic* activity of the metropolis: 'A good example of mass intellectuality is the speaker, not the scientist', remarks, interestingly, Virno (1990).

Generally, all the authors of *operaismo* failed at focusing the specific machinic ontology of new information technologies. For Lazzarato, for example, the new machines of post-Fordism appear to be still predominantly the *video machines* of the television age. In *Videofilosofia* (1996), Lazzarato defines the new video technologies as 'machines that crystallise time' (Lazzarato, 1996: 49), but the specific form of information machines is not further investigated. Only in Marazzi (1994) is there an attempt to frame the role of the Turing machine within the post-Fordist production, but once again as *linguistic machine*:

> Formal-logical language was at the basis of the 'linguistic machine' theorized in 1936 by the English mathematician Alan Turing, which is at the origin of today's information technologies. This was a 'linguistic' machine for which the most important element is the organization of a grammar whose symbols move on a magnetic 'assembly line,' moving back and forth between one position and another. The linguistic organization of the production process doesn't characterize only the 'Turing machine' and information technologies. The same management models are inspired by the principles expressed by Alan Turing: their goal is to organize the firm as a 'data bank' able to self-determine its actions by virtue of a smooth, fluid, 'interfaced' linguistic communication process. (Marazzi, 1994: 27 [2011: 35])

In this passage Marazzi describes the model of the Turing machine as one of the base forms of post-Fordism, yet this intuition is not explored further and remains focused only on the general dimension of language. More recently, in an essay dedicated to digital capitalism, Marazzi (2005) returns to the new ontology of machinery: he notes that in big corporations (especially software industries) fixed capital is under the form of a 'cognitive machine'. Marazzi describes then an emerging *anthropogenic mode of production* that is based on what Boyer (2002) has called the *production of the man by means of the man*, that is, the becoming machine or fixed capital of 'the living'. This new mode of production is more prosaically the service sector, or tertiary sector – *soft industries* such as education, healthcare, new technologies and cultural industries. Following Deleuze and Guattari's ontology, in *Empire* Hardt and Negri (2000: 367) synthesized this shift as a general 'machinic metamorphosis' of the multitude.

With more precision Vercellone (2005, 2006, 2007) has attempted to systematize all the analyses on immaterial labour and mass intellectuality under the paradigm of cognitive capitalism. For Vercellone the idea of the general intellect means materialistically a new division of labour. The history of capitalism is read by Vercellone along three stages of antagonism and exploitation: formal subsumption (*manufacturing capitalism*), real subsumption (*industrial capitalism*), and general intellect (*cognitive capitalism*).

> Marx uses the notions of formal subsumption, real subsumption and the general intellect in order to qualify, in their logical-historical succession, profoundly different mechanisms of subordinating the labour process by capital (and of the type of conflicts and of crisis which they generate). (Vercellone, 2007: 19)

The role of machines and technological evolution appears secondary in Vercellone, but only because he focuses on the more general technical composition and more general 'abstract machine' of the division of labour. As does machinery in Marx, knowledge also occupies *machinically* the space of a previous division of labour.

> The conflictual dynamic of the relation of knowledge to power occupies a central position in the explanation of the tendency of the increase of the organic and technical composition of capital. This tendency, Marx writes, results from the way the system of machines arises in its totality: 'This road is, rather, dissection [*Analyse*] – through the division of labour, which gradually transforms the workers' operations into more and more mechanical ones, so that at a certain point a mechanism can step into their places'. (Vercellone, 2007: 18)

In the hypothesis of cognitive capitalism the technical composition of labour appears to follow movements of deterritorialization and reterritorialization: industrial machines reterritorialize the division of labour of manufacturing inside the factory, whereas cognitive capitalism machines deterritorialize the division of labour across the whole society. The logical chain described by Vercellone between antagonism, division of labour, machinery and general intellect describes a general abstract machine capable of comprehending within its organic composition also the old features of capitalistic organization and not just its new cognitive ones.

In general, a machinic dimension of *living knowledge* external to industrial machinery and management is found in all the accounts of the new technical composition sketched by *operaismo*. Such a collective dimension of knowledge was called 'general intellect', 'general scientific labour', 'general social knowledge', etc. in the *Grundrisse* (Marx, 1939: 690–712). This collective and machinic dimension of knowledge is productive in two ways: as embodied into industrial machinery (Marx, 1939) but also as *mass intellectuality* (Virno, 1990) that manages the new division of labour of *cognitive capitalism* (Vercellone, 2005) and produces 'forms of life' and new services within the so-called *anthropogenic industries* (Marazzi, 2005). The individual dimension of *immaterial labour* (Lazzarato, 1996) can be distinguished in itself as *cognitive labour* creating new material, immaterial and social machines (Marazzi, 2005) and, more traditionally, as *informational labour* operating in front of a machine and producing *valorizing information* (Alquati, 1963). If *operaismo* happened to embrace the machinic paradigm of Deleuze and Guattari to expand its analysis of post-Fordism, however, the proper ontology of the information machine is left mostly unexplored.

The Algorithm as the Machinic Dimension of Digital Code

The *linguistic turn* of post-Fordism fascinated political economists and Marxist philosophers as much as the early scholars of digital culture. Missing other methodologies, humanities have been shaping the field of new media theory since its origin and have been importing an approach that rendered digital code primarily as a *text* (sometimes even as a 'poem') and computer languages as equivalent to natural languages (Kittler, 1999a; Manovich, 2001). This confusion was produced in academic and popular perception also by the historical debut of the first Turing machines that were developed during the Second World War in England to decrypt the secret codes of the German Wehrmacht. In his entry on code for the lexicon *Software Studies*, Kittler (2008) quotes Turing himself when he stated that computers have likely been created with the primary goal to decode plain human languages. Galloway (2004) has underlined, however, that digital 'code is a language, but a very

special kind of language . . . the only language that is executable'. And Kittler (1999b) himself remarked that 'there exists no word in any ordinary language which does what it says. No description of a machine sets the machine into motion'. Indeed the executability of digital code must not be confused with the performativity of human languages, Cramer (2008) warns, since code 'is a machine to convert meaning into action', concludes Galloway (2004). Still, a definition of digital code that is consistent with a *machinic* ontology is missing.

The term 'digital code' refers usually to three different things: the binary digits encoding an analogue input into 0 and 1 impulses; the language in which software programs are written (such as C + +, Perl, etc.); the script of a software program that translates the logic form of an algorithm. In this essay I propose to focus only on the third element: the *algorithm* as the inner machinic logic of the code running information machines. The central role of the algorithm is recognized by many scholars in media theory (Goffey, 2008; Mackenzie, 2006) and unanimously, of course, in cybernetics, where the algorithm is the essential component of the Abstract Machine. A more attentive focus on the topology of the algorithm would help to disclose the machinic dimension of the digital against the language-based interpretations of the early media theory and software studies. Unquestionably the notion of algorithm is at the centre of a growing interest for its cultural, political and economic implications. In media theory such a *hegemony of the algorithm* has been described across different fields: in everyday technologies (Bunz, 2012), war scenarios (Amoore, 2009), biometrics (Cheney-Lippold, 2011), finance (Lenglet, 2011), gaming (Galloway, 2006), architecture (Parisi, 2013), art (Holmes, 2010). In other words, algorithms are progressively understood in their *extensive* fashion (and not just in the *intensive* definition given in cybernetics) and perceived in their nature of 'social assemblage', as used by Deleuze and Guattari (1980) to describe any form of machinery.

Indeed, from a Marxist point of view, algorithms are never autonomous objects in themselves and like Marx's machines they are continuously redesigned and reinvented by the pressure and changes of external forces. Basically two kinds of algorithms have to be distinguished at this point: algorithms to translate *information into other formats of information* (like the majority of software programs and also the text editor on which I am writing this essay right now) and algorithms to accumulate information and extract metadata, that is, *information about information* (like Google's PageRank algorithm, financial algorithms and academic software indexing publications). Metadata represent the shift to a different and higher dimensional scale in relation to information: they disclose the collective and 'political' nature that is intrinsic to all information. Similar to Alquati's reading of information, metadata should be understood here in both a quantitative and qualitative way, that is, politically

and technically at the same time. The accumulation of information and extraction of metadata performed every day by the global digital infrastructure is massive: take, for instance, search engines like Google, social networks like Facebook and Twitter, online stores like Amazon and any global logistics service. The new global scale of metadata extraction has started only recently to disclose a new perspective on the governance of the means of production: this shift has been famously acknowledged by recent business literature as 'big data' or the 'industrial revolution of data' (*Economist*, 2010; Pasquinelli, 2010).

Some Hypotheses on the Society of Metadata

Applying Deleuze and Guattari's notion of machinic back to the algorithms of the digital code may help to recognize them as a machine in a Marxian sense, that is, as a machine for the control, accumulation and 'augmentation of surplus value'. In this sense Deleuze and Guattari's notion of machinic works as a conceptual mediator between Marxism and digital studies, but this time towards a repoliticization of the notion of information machine and not towards a neutralization of the concept of machinic surplus value.

If Simondon recognized already the industrial machine as an *info-mechanical* relay between flows of energy and information, a further bifurcation of the machinic phylum should be proposed to recognize the information machine as a *meta-informational* relay whose algorithms handle both flows of information and metadata. Metadata can be logically conceived as the 'measure' of information, the computation of its social dimension and its transformation into value. As Alquati showed, the cybernetic apparatus needs to be continuously fed and sustained by the flows of valorizing information proceeding from workers, but it is specifically the accumulation of valorizing information, and therefore the accumulation of information about information (or metadata), that improves the organization of the production line, the design of machinery and the final value of the product. Thanks to this intuition by Alquati and the mediation of Deleuze and Guattari within the paradigm of cognitive capitalism, information machines can be generically defined as machines for the *accumulation of valorizing information, extraction of metadata, calculation of network surplus value* and *implementation of machinic intelligence*.

In conclusion, as a set of provisional hypotheses within the rising society of 'big data', metadata are said to be used for: 1) measuring the value of social relations; 2) improving the design of machines and machinic intelligence; and 3) monitoring and forecasting mass behaviours.

1. Metadata as the measure of the value of social relations. The accumulation of information via the mediation of digital machines mirrors and measures that production of those social relations which Marx

himself considered the very nature of value ('capital is not a thing, but a social relation between persons which is mediated through things'; Marx, 1867: 932). Digital technologies like social networks provide today a punctual cartography of these productive relations (see, for instance, how Facebook and Twitter turn collective communication into attention economy). As much as thermo-machines have been used to measure value in terms of *quantity of energy per time*, info-machines appear to measure value in terms of *number of links per node*. This is evident, for example, in the case of Google PageRank algorithm and in many ranking and rating techniques employed today (see Pasquinelli, 2009). The extraction of metadata describes here a *flow surplus value* (Deleuze and Guattari, 1972: 233) or a sort of *network surplus value*.

2. *Metadata as implementation of machinic intelligence*. The extraction of metadata provides also precious information to optimize machinic intelligence at any level: from software programs to industrial management, from advertisement campaigns to logistics. In this sense the digital sphere is still very similar to Alquati's computer factory: the flows of information are used to improve its internal organization and to create more efficient algorithms. Also within the infrastructure of the internet, the flows of valorizing information are transformed into fixed capital; that means that knowledge is transferred and incarnated into machinery. See once again Google's PageRank algorithm and the way it has been evolving according to data traffic and the collective behaviours of the global audience. Metadata describe here a *code surplus value* (Deleuze and Guattari, 1972: 233).

3. *Metadata as new form of biopolitical control (dataveillance)*. Rather than profiling individual inclinations, metadata can be used for crowd control and prediction of mass behaviours, as happens today with any government tracking usage of social media, spin doctors mapping political elections, city councils measuring traffic flows and companies following supply chains. Online real-time statistics of specific search keywords can map the spread of diseases across a country as much as social unrest (see Google Flu and Google Trends services, for instance, and imagine the same algorithms applied to political and social issues). If Deleuze (1990a) had already warned against the specific techniques of a *society of control* based on the power virtually embodied in the collective information of databases, today the new regime of dataveillance can be described as a *society of metadata*, as it is no longer necessary to target individual behaviour but just collective trends (see the PRISM scandal in 2013).

An analysis of the new political dimensions of metadata or 'big data' is still to come. In conclusion, the algorithms governing the new society of metadata have been properly illuminated thanks to one of *operaismo*'s most important intuitions: applying the theoretical and political point of view of *valorizing information* (that is *living labour*) rather than the

perspective of a mere technological determinism. As Deleuze reminds us in the interview with Negri quoted at the beginning of this essay: 'machines don't explain anything, you have to analyze the collective apparatuses of which the machines are just one component'.

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