

# Machinic Capitalism and Network Surplus Value: Notes on the Political Economy of the Turing Machine

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*The Jacquard loom, invented in 1801.*

### *Abstract*

Gilbert Simondon once noticed that industrial machines were already *information relays*, as they were bifurcating for the first time the source of mechanical work (the natural energy) from the source of information (the worker). In 1963, in order to describe the new condition of industrial labour at the Olivetti factory, Romano Alquati introduced the notion of *valorising information* as a conceptual bridge between the Marxist theory of value and the cybernetic definition of information. In 1972, Deleuze and Guattari initiated their *machinic* ontology, right at moment in which cybernetics was starting to exit the factory and expand to the whole society.

With the help of this conceptual toolbox (developed almost half a century ago) this text advances the Turing machine as the most empirical model available to study the guts of cognitive capitalism. Consistent with the Marxian definition of machinery as a device for the “augmentation of surplus value”, the algorithm of the Turing machine is proposed as engine of the new forms of valorisation, measure of *network surplus value* and new ‘crystal’ of social conflict. Information machines are not just ‘linguistic machines’ but indeed *relays between information and metadata*: in this way they open to a further technological bifurcation and also to new forms of biopolitical control. A *society of metadata* is outlined as the current evolution of that ‘society of control’ pictured by Deleuze in 1990 in relation to the ‘power’ embodied into databases.

One can of course see how 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 apparatuses of which the machines are just one component. — Gilles Deleuze<sup>1</sup>

## 1. Industrial machines were already information machines

“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”.<sup>2</sup> This insight by Gilbert Simondon on the second industrial revolution is not meant to underline a *continuum* between different technological age, to say that informationalism is the same of industrialism, but on the contrary to spot, as Gilles Deleuze and Felix Guattari would record, a bifurcation of the technological lineage, or *machinic phylum*.<sup>3</sup> The subterranean history of information appears to start even earlier. Information can be found haunting also the instruments of the first industrial revolution: the Jacquard loom (invented in 1801) was in fact a mathematical device controlled by a punched card almost identical to the one standardised by IBM as data storage device in the 20th century. George Caffentzis has remarked that this invention influenced Charles Babbage's Analytical Engine itself and that it precedes the invention of the steam engine:

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<sup>1</sup> Deleuze 1990b.

<sup>2</sup> Simondon 2006.

<sup>3</sup> “We may speak of a *machinic phylum*, or technological lineage, wherever we find a *constellation of singularities, prolongable by certain operations, which converge, and make the operations converge, upon one or several assignable traits of expression*. If the singularities or operations diverge, in different materials or in the same material, we must distinguish two different phyla: this is precisely the case for the iron sword, descended from the dagger, and the steel saber, descended from the knife” (Deleuze and Guattari, 1980, p. 406).

Like it or not, Babbage was working on his Calculating Engines before Sadi Carnot published his *Reflexions on the Motive Power of Fire* (1824)—the beginning of classical thermodynamics—and certainly by 1834 Babbage had theorized the universal computer or, anachronistically, the Turing Machine. Consequently, one cannot say that the theory of heat engines antedates the theory of universal computers.<sup>4</sup>

In their steam-punk novel *The Difference Engine* William Gibson and Bruce Sterling perform the thought exercise to imagine, at the time of the British Empire, the rise of information technologies on the mere basis of steam engines (!) instead of electricity.<sup>5</sup> Of course those times were not mature to trig an information revolution and to understand the cognitive component of the new forms of production, as Caffentzis himself notices:

For Babbage and his supporters the connection between the Jacquard loom and the Analytic Engine was exactly that, a *transposition* from an industrial setting to a mathematical one, instead of an indication of a third, mathematical-industrial space that characterized the labor process in general.<sup>6</sup>

Caffentzis engages in an interesting history of the first information devices to argue against Michael Hardt and Antonio Negri's conceptualisation of the so-called immaterial labour.<sup>7</sup> But paradoxically his overview can be used to reinforce their hypothesis of cognitive capitalism in proper Marxian terms, as it will be discussed later. Caffentzis' article however is important to remind that a common ground is missing between media studies and political economy, Turing machines and Marxism.<sup>8</sup>

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<sup>4</sup> Caffentzis 2007.

<sup>5</sup> Gibson and Sterling 1990.

<sup>6</sup> Caffentzis 2007.

<sup>7</sup> See Lazzarato and Negri 1991, Hardt and Negri 2000.

<sup>8</sup> On this issue Dyer-Witheford 1999 is one of the most useful contribution.

## 2. Alquati, 1963: the surplus value of information

In same years in which Simondon was sketching a counter-ontology of cybernetics, Romano Alquati introduced the concept of *valorising information*, that can be indeed adopted today as a conceptual bridge between the notions of *information* in cybernetics and *value* in Marxism. In a long article on the 'organic composition of capital' at the Olivetti factory (an Italian company producing typewriters, mainframe computers and other automatised machines in Ivrea as early as 1950s), which was published in Quaderni Rossi in two parts in 1962 and 1963, Romano Alquati attempted one of the first Marxist analysis of cybernetics. Alquati frames the cybernetic apparatus (what we call today 'digital networks') as an extension of the internal bureaucracy of the factory, that monitors the production process by the means of *control information* [*informazioni di controllo*].

The bureaucratic apparatus is vertical as it is not "productive": it is a bundle of hierarchical lines that can be represented as vertical axes, like probes implanted into the structural nodes of valorisation in order to syphon, from productive labour, that 'control information' that allows the owner to verify if [the production] flow occurs along the arranged channels.<sup>9</sup>

Bureaucracy descends into the bodies of the workers via the mediation of the circuits of cybernetics and machinery. Alquati introduces here the concept of *valorising information* [*informazione valorizzante*] as the 'flow' running along and feeding those circuits. For the first time the modern reading of 'information' enters the essential definition of living labour and then of the Marxian surplus value itself, which is continuously absorbed by machinery and condensed into products in that way.

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

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<sup>9</sup> Alquati 1963, p. 126 (translation mine).

operate on the object of work all those modifications of its form that give it the requested use value.<sup>10</sup>

The following sentence by Alquati could be understood *avant la lettre* as the very first postulate of the so-called cognitive capitalism and we should always remember that it is dated 1963.

Productive labour is defined by the quality of information elaborated and transmitted by worker to the means of production via the mediation of constant capital.<sup>11</sup>

Easily the typical Marxist 'organic' distinction can be visualised here: *living information* is continuously produced by workers to be turned into *dead information* crystallised into machinery and the whole bureaucratic apparatus. The mediation of machinery along the whole cycle of information and knowledge production is clear: the internal bureaucracy of the factory is a specific division of labour that will be mirrored, implemented and extended by cybernetics. In fact, the important insight advanced by Alquati is the *continuum* merging bureaucracy, cybernetics and machinery: cybernetics unveils the machinic nature of bureaucracy and conversely the 'bureaucratic' role of machines, as they are feedback apparatuses that control workers and capture their know-how of the productive process. Valorising information is then what enters the cybernetic machine and it is transformed into a sort of *machinic knowledge*. Specifically it is the numerical dimension of cybernetics that is able to encode workers' knowledge into *bits* and consequently transform bits into numbers for economic planning. In other words, operating as a numerical interface between the domain of knowledge and capital, *the digital code transforms information into value*.

Cybernetics recomposes globally and organically the functions of the general worker that are pulverised into individual micro-decisions: the *bit* links up the atomised worker to the *figures* of the *Plan*.<sup>12</sup>

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<sup>10</sup> Alquati 1963, p. 121 (translation mine).

<sup>11</sup> Alquati 1963, p. 121 (translation mine).

<sup>12</sup> Alquati 1963, p. 134 (translation mine).

At the beginning of the industrial age capitalism was exploiting human bodies for their mechanical energy, but soon it was realised that the series of creative acts, measurements and decisions that workers constantly have to take is the most important value that they produce. Alquati defines as *information* precisely all the innovative micro-decisions that workers have to take along the production process and that give *form* to the product but also give *form* to the machinic apparatus.

### 3. Marx: the machine as the measure of man

For Alquati machinery always expresses the diagram of power relations between social classes. Innovation proceeds firstly by workers, as it is their living labour to propel, shape and instruct a new breed of machines. In this sense, both industrial and cybernetic machines can be defined as a 'crystallisation' of conflict and they follow the very contours of social forces.

That a computational machine may occupy the space previously described by the division of labour was already a postulate shared by the early pioneers of cybernetics, such as Charles Babbage. Marx was already quoting him in *The Poverty of Philosophy* in 1847: "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".<sup>13</sup> If machinery installs itself on a previous division of labour, it is to expand to a further level and to a higher scale of complexity.

Thanks to the application of machinery and of steam, the division of labor was about to assume such dimensions that large-scale industry, detached from the national soil, depends entirely on the world market, on international exchange, on an international division of labor. In short, the machine has so great an influence on the division of labor, that when, in the manufacture of some object, a means has

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<sup>13</sup> Babbage 1832, quoted by Marx 1847.

been found to produce parts of it mechanically, the manufacture splits up immediately into two works independent of each other.<sup>14</sup>

Logically, in the first book *Capital* the chapter on machinery follows the chapter on the division of labour. Conversely, the division of labour in itself can be considered already a sort of *abstract machine*. The important lesson we take from Marx here is precisely the refusal of technological determinism.<sup>15</sup> It was first Marx to suggest that the machine is just the reterritorialisation of previous power relations. As much as the division of labour is shaped by social conflicts and workers' resistance, so is the evolution of technology. The parts of the social 'mechanism' adjust themselves to the technical composition according to their degree of resistance and conflict. Machines are moulded by social forces and they *evolve* according to social forces.

Information machines too are crystallisation of social tensions. If we endorse this political insight, that is looking at the social relations and conflicts replaced by information machines, we get finally a political methodology to understand the generic definitions of information society, knowledge society, network society and so on. 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 have replaced a set of cognitive relations already at work within the industrial factory.

Andrew Ure, that was defined by Marx as "the Pindar of the automatic factory", was describing 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".<sup>16</sup> The so-called division of labour is, foremost, a separation of mechanical from intellectual organs. As Marx writes:

The separation of the intellectual faculties [*Potenzen*] of the production process from manual labour, and the transformation of

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<sup>14</sup> Marx 1847.

<sup>15</sup> See also MacKenzie 1984.

<sup>16</sup> Ure 1835, quoted by Marx 1867, p. 544.

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'.<sup>17</sup>

This passage (so similar to Simondon's initial insight) seems to anticipate the so-called 'fragment on machines' in the *Grundrisse*, where the simple 'intellectual organs' become a vast 'social brain' absorbed into machinery and turned into fixed capital.<sup>18</sup> The evolution of the notion of knowledge from *Capital* to the *Grundrisse* is the passage from the atomised intellectual organs of the *Gesamtarbeiter* (the 'collective worker') to a degree in which "general social knowledge has become a direct force of production". In the *Grundrisse* Marx seems to refer to an autonomous dimension of knowledge, a sort of living knowledge, before its crystallisation into machinery. Before discussing this crucial and controversial passage, it is necessary to clarify the definition of machine in relation to surplus value and disambiguate that notion of *machinic* that it has been introduced by Deleuze and Guattari into the lexicon of contemporary political philosophy.

If Marx opens the chapter on machinery of *Capital* by stating "the machine is a means for producing surplus value", he afterward clarifies machinery precisely as means for the *augmentation* of surplus value (as in Marxian terms machines cannot produce surplus value as they cannot be *exploited*, only workers produce surplus value). If in the *Grundrisse* machines incarnates knowledge, then this is knowledge to govern the augmentation of surplus value (it becomes in other words fixed capital). Alquati's idea of cybernetics as an apparatus for the accumulation of valorising information merges easily with Marx's idea of the machinery for the augmentation of

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<sup>17</sup> Marx 1867, p. 549.

<sup>18</sup> Marx 1939, p. 694.

surplus value. But in Alquati as much as in Marx the relation of the worker with the machine is a conflictive one. And the living information (or living knowledge) that feeds everyday the cybernetic machinery is a field of resistance and struggle. This border of the transformation of *living knowledge* into *dead knowledge* and between the individual brain and the social brain are the issues that set today's debates on labour and information, and that should challenge also Deleuze and Guattari's notion of *machinic*.

#### 4. The neutralisation of the machinic ontology

Deleuze and Guattari's notion of *machinic* has many genealogies that cannot be expanded here, but politically it can be considered a response to the Marxist 'productivism' in the same years in which mass media were forging consumerism and the first wave of cybernetics was entering the industrial society of North America and Europe. The notion of machinic was inspired, specifically, by the *mechanology* introduced by Simondon in *Du mode d'existence des objets techniques*,<sup>19</sup> that was itself a reaction to the rigid determinism of cybernetics, its 'feedback system' and its idea of information as a mathematical unit of measure. Since the beginning then the machinic was supposed to cover specifically the domain of information machines.

In the organic composition of capital, variable capital defines a regime of subjection of the worker (human surplus value), the principal framework of which is the business or factory. But with automation comes a progressive increase in the proportion of constant capital; we then see a new kind of enslavement: at the same time the work regime changes, surplus value becomes machinic, and the framework expands to all of society<sup>20</sup>.

In 1972, in *Anti-Oedipus* Deleuze and Guattari initiated the notion of *desiring machine* in order to constitute an immanent political economy

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<sup>19</sup> Simondon 1958.

<sup>20</sup> Deleuze and Guattari 1980, p. 458.

where 'desire' could be finally recognised ontologically (and economically) as a productive force and not just as a linguistic operator of the psychoanalytical theatre. Consistent with the notion of machinic production, Deleuze and Guattari describe also a machinic surplus value. Eight years after, however *A Thousand Plateaus* appears to introduce a more postmodern reading that focuses on *machinic assemblages* and *abstract machines*. The machinic assemblage is immanent and productive too, but it is clear here the shift to a more relational ontology. Due to this ambivalence, recently, the notion of machinic happened to be received and reduced just to this relational paradigm of *assemblages* that obliterates the very dimension of *production* in Deleuze and Guattari together with their Marxist background. As a main example of this 'assemblage theory' and the obliteration of the Marxian surplus value in their philosophy, see Manuel Delanda's works.<sup>21</sup>

Indeed, in the current studies on 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 resolved as *medium, tool, artefact, apparatus, structure*.<sup>22</sup> However, it is interesting to see how the idea of surplus and augmentation appears in fact within the very etymological root of the word. More precise dictionaries highlight specifically the ancient root *mach-* that means *growth, augmentation, amplification of a force*. The same root *mach-* surfaces, for example, both in the Latin *magia* ('magic') and *magnus* ('great, big'). 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' resonating again. Following the impressions of this etymology, we could start to define *machine as an apparatus to amplify and accumulate a given flow*, whereas device, tool, medium would be more appropriate to describe just a translation or extension of that given flow (energy, labour, information, etc.). Machine then is more about surplus than assemblage.

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<sup>21</sup> Delanda 2006, 2010.

<sup>22</sup> See Raunig 2008.

In a note of the *Anti-Oedipus* Deleuze and Guattari show to know the chapter on machinery in Marx's *Grundrisse*.<sup>23</sup> Inspired by that 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? They refer 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* (in their language, it is the same of Marx's proper 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).<sup>24</sup>

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

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<sup>23</sup> Deleuze and Guattari 1972, p. 232, note 76.

<sup>24</sup> Deleuze and Guattari 1972, p. 233.

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.<sup>25</sup>

Curiously, the notion of 'abstract machine', that Deleuze and Guattari put 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* (computer hardware or any mechanical apparatus).<sup>26</sup>

## 5. The exodus of living knowledge from the factory

If the notion of machinic is superficially applied, it may result into an *apolitical continuum*, where everything would become 'productive' and where then it would be impossible to distinguish living labour and dead labour, variable capital and fixed capital, that is exploitation and autonomy. Along the machinic relation with technological innovation, indeed Italian *operaismo* introduced a sharp polarisation. In 1966 in its famous Copernican statement in *Operai e capitale* Mario Tronti reset the primacy of the working class: class struggle drives capitalist development and not the opposite, as believed by the Marxist orthodoxy. However the autonomy and primacy of the living labour will be applied to the living knowledge only in the early 1990's, rediscovering the so-called 'fragment on machines' of the *Grundrisse* that was translated and published (with this title) in the fourth issue of Quaderni Rossi as early as 1964.<sup>27</sup>

Together with Antonio Negri and Maurizio Lazzarato,<sup>28</sup> Paolo Virno was one of the first thinkers of *operaismo* to extract and liberate

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<sup>25</sup> Deleuze and Guattari 1972, p. 234.

<sup>26</sup> Macura 2001.

<sup>27</sup> Marx 1939, pp. 690-712.

<sup>28</sup> See Lazzarato and Negri 1991.

resolutely the living knowledge from the greasy gears of the industrial machine and to make it 'breath the city air'.

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.<sup>29</sup>

The general intellect is not only 'crystallised' into machinery but *diffused* across the whole 'social factory' of the metropolis. Then, logically, if industrial knowledge was designing and operating machines, also the collective knowledge outside the factory must be 'machinic'. Here we have to look carefully at the concretions and manifestations of the general intellect across the metropolis to understand where it is 'dead' or 'living', already 'fixed' or potentially autonomous. For example, to what degree today is Free Software complicit with the new forms of value accumulation? Or, to what degree are the so-called Creative Cities just alibi for real estate speculation?

Indeed the whole debate on post-Fordism and its cultural industries can be condensed in the following question: can living knowledge/labour be autonomous? This is the original contribution that *operaismo* gave to contemporary political economy and at the same time the reason of many irrational attacks by those who still consider workers just horses performing muscular power. For sure, in this exodus from the factory, the old Marxian borders of fixed and variable capital no longer keep: a more precise notion of machinic has to be discussed in order to explore this threshold.

## **6. Anthropogenic factories: the living as fixed capital**

In an essay dedicated by the way to 'digital capitalism' Christian Marazzi underlines how the traditional fixed capital—that is capital invested into machinery in its physical form—is losing importance as

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<sup>29</sup> Virno 1992.

a factor of wealth production.<sup>30</sup> From the point of view of fixed capital, Marazzi continues, knowledge has today a massive productive agency in itself, as the case of big software companies indicate. By replacing living labour with dead labour, i.e. with new immaterial machinic apparatuses, knowledge has become a sort of ‘cognitive machine’. In such a ‘new organic composition of capital’, however, it is not only the general knowledge to become fixed capital, but also the very physical body of the human. In this sense, Marazzi describes an emerging *anthropogenic mode of production* that Robert Boyer called *production of the man by means of the man* (like in the more famous expression ‘production of commodities by means of commodities’).<sup>31</sup> This new mode of production is notoriously, and more prosaically, the service sector, or tertiary sector, that is about *soft industries* such as education, healthcare, new media and cultural industries. Under such *biocapitalism* or ‘industry of the living’, eventually Marazzi liquifies the machine to introduce so *the living as fixed capital*.

In the model of production of the man by means of the man, if fixed capital disappear in its material and fixed form, it reappears however in the mobile and fluid form of the living.<sup>32</sup>

Marazzi insists on the transposition of the *machinic fixed capital* into the human living body. “According to our hypothesis, aside from the traditional faculty of labour, the body of the labour force has to become the container of the function of fixed capital, that is machinery, ‘codified knowledge’ and ‘productive grammars’, in other words past labour”.<sup>33</sup> This passage of Marazzi is radical: if according to Marx, capital is but a social relation, indeed there is no need of heavy actors such as machinery, industrial management and scientific research to describe contemporary production—the machinic source of profit can be externalised into the workers’ body itself.

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<sup>30</sup> Marazzi 2005.

<sup>31</sup> See ‘*la production de l’homme par l’homme*’ in Boyer 2002.

<sup>32</sup> Marazzi 2005 (translation mine).

<sup>33</sup> Marazzi 2005 (translation mine).

A working hypothesis that deserves our attention is the following: in the emerging anthropogenic model of the new capitalism, the living contains in itself both the functions of fixed capital and variable capital, that is material and tools of past labour and present living labour. In other words, labour-force is expressed as the sum of variable capital (V) and constant capital (C, specifically the fixed part of the constant capital).<sup>34</sup>

These interventions by Marazzi into the grammar of political economy are crucial to underline once again that, when we talk about cognitive capitalism or the hegemony of immaterial labour, we do not refer to something 'immaterial' but to a very physical *machinic intertwining* of our own bodies and social relations. In a close reading of Marx, Carlo Vercellone attempted to systematise the whole machinic structure of knowledge under the general notion of cognitive capitalism. As he remarks, "the starting point of Cognitive Capitalism is a radical critique of the apologetic vision of the actual mutation entailed by the new liberal theories of knowledge-based economy".<sup>35</sup> For Vercellone 'general intellect' just means—very materialistically—a new division of labour and he reads history of capitalism as the following stages of antagonism: formal subsumption (manufacturing capitalism), real subsumption (industrial capitalism), 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).<sup>36</sup>

The role of machines and technological evolution is secondary in Vercellone too, as he focus on the more general 'abstract machine' of the division of labour and its antagonism.

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<sup>34</sup> Marazzi 2005 (translation mine).

<sup>35</sup> Vercellone 2005.

<sup>36</sup> Vercellone 2005b.

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'.<sup>37</sup>

In the hypothesis of cognitive capitalism, fixed capital, i.e. machinery, is absorbed by variable capital, i.e. workers. As Vercellone notices, also Marx in the *Grundrisse* recognised that the principal fixed capital was becoming man himself.<sup>38</sup> Here the division of labour appears to follow movements of deterritorialisation and reterritorialisation, as Deleuze and Guattari would say: industrial machines reterritorialise the division of labour of manufacturing inside the factory, whereas information machines deterritorialise the division of labour across society.

To conclude: there is a machinic dimension of knowledge external to the industrial capital fixed into machinery. The collective dimension of *machinic knowledge* is called by Marx in the *Grundrisse* 'general intellect', 'general scientific labour', 'general social knowledge', etc. This collective dimension is productive in two ways: as physically embodied into industrial machinery, communication infrastructure and digital networks, but also as a *mass intellectuality* managing the division of labour of the *social factory* and producing new *forms of life*. The individual dimension of the so-called immaterial labour can be distinguished in itself into *cognitive labour* (creating new material, immaterial or social machines) and *informational labour* (operating in front of a machine and producing valorising information). Of course the distinction between machinic knowledge and mass intellectuality, cognitive labour and informational labour is blurred. What is important to remark here is the primacy of living knowledge and living labour against any

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<sup>37</sup> Vercellone 2005b.

<sup>38</sup> Marx 1939, p. 711, quoted in Vercellone 2005b.

fatalistic reading of machinery and new technologies as a perverse obstacle to the autonomy of the living.<sup>39</sup>

## 7. The Turing machine as engine of valorisation

Curiously all the metaphors employed to describe the machinic dimension of knowledge exiting machinery are still adopted from industrialism, see for instance 'cultural industries' or 'edu-factory'. At his time, Caffentzis reminds, Marx himself was influenced by the language of physics and chemistry in the description of labour as 'crystallised' into machines.<sup>40</sup> But, more generally and practically, we may say that at Marx's times *the industrial machine was taken as the universal measure of the man*, and so of labour. In thermodynamics, interestingly, the term 'work' refers in fact to the energy transferred from one system to another and 'watt' is the name of the measure of *work per unit of time*. Which are the paradigms and the empirical measurements that can be used today to describe the landscape of production?

Beside the *machinic turn* of post-structuralism, in the postmodern discourse it was the *linguistic turn* to be hegemonic for several years. In 1994 Marazzi had the intuition of merging the two and proposing the Turing machine as a model of that *linguistic machine* that is governing labour under post-Fordism.<sup>41</sup> The language of post-Fordism is in fact not just the language of creativity and *virtuosity* but a logico-formal language able to carry operative *instructions*. Indeed diverse are the concretions of the general intellect and mass intellectuality, but here I advance the Turing machine as the most general *empirical model* at hand we can use to describe the guts of the so-called immaterial labour and cognitive capitalism. That is to say that the Turing machine is proposed as the *empirical measure* of the new relations of production, engine of the new forms of valorisation and 'crystal' of social conflict. Its formula should help to

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<sup>39</sup> See for instance the notion of *grammatisation* in Stiegler 2009.

<sup>40</sup> See also Mirowski 1989.

<sup>41</sup> Marazzi 1994.

disclose the promiscuous relation between living knowledge and dead knowledge in cognitive capitalism. Precisely if it is true that machines are moulded by social forces, we should recognise in the Turing machine the *silhouette* of living knowledge.

If Simondon defined the industrial machine as a relay between the two flows of energy and information, I introduce a distinction within the Turing machine itself between three kinds of flow: information, metadata and machinic code. If Simondon noticed that the flow of electricity could be used to carry both energy and information,<sup>42</sup> I will suggest looking at the raw flow of digital information as the medium also of a machinic component (that is software code). The overlapping of these four dimensions on the same medium of electricity—namely energy, information, meta-data and machinic code—is, of course, source of confusion. It is by extracting the machinic dimension of digital code that I will try to align the Turing machine with the Marxian idea of the machine as device for the *accumulation* and *augmentation* of surplus value.

## 8. Digital code is machinic

If, following Marx, both industrial machines and information machines can be identified as apparatuses for the augmentation of surplus value and crystallisation of the general intellect, however the Turing machines introduce a different organic composition between information and knowledge, labour and capital. All the material and intellectual 'organs' of Ure's automaton that was installed at the core of the factory are today organised by a pervasive digital network that is covering the whole globe. As Marazzi reminds, the accumulation of capital has changed and "no longer consists, as in the Fordist period, of investment in constant and variable capital (wage), but rather of investment in *apparatuses* of producing and capturing value produced outside directly productive processes".<sup>43</sup> Cybernetic machines, in other words, escaped the factory and increasingly

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<sup>42</sup> Simondon 2006.

<sup>43</sup> Marazzi 2010.

transform social cooperation and communication into productive forces. It is difficult today to find a *virtuoso*, as Virno would define the post-Fordist worker,<sup>44</sup> whose performance is not mediated by a digital device.

The *linguistic turn* has fascinated political economists as much as the early scholars of digital culture. Humanities have been shaping the field of new media theory since the beginning and so importing an approach that was rendering digital code primarily as a *text* (sometimes even as a poem!) and computer languages as similar to natural languages.<sup>45</sup> This confusion has been produced in academic and popular perception also by the historical debut of the first Turing machines, that were used to decrypt the secret codes of the German Wehrmacht during WWII. In his entry on 'Code' for the lexicon *Software Studies*, Friedrich Kittler quotes Alan Turing when he stated that computers have likely been created with the primary goal to decode plain human languages.<sup>46</sup>

Alexander Galloway has underlined however that "code is a language, but a very special kind of language. *Code is the only language that is executable*".<sup>47</sup> And as Kittler himself remarked: "there exists no word in any ordinary language which does what it says. No description of a machine sets the machine into motion".<sup>48</sup> Indeed the executability of digital code must not be confused then with the performativity of human languages, Florian Cramer warns.<sup>49</sup> Code "is a machine to convert meaning into action", concludes Galloway.

The term 'digital code' may refer 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 or textual source of the software programs (that embodies the logic form of an algorithm). In this text I propose to focus on the *algorithm* as the inner machinic logic of information machines and the so-called digital code. The central role of the

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<sup>44</sup> See Virno 1993.

<sup>45</sup> See Kittler 1999 and Manovich 2001.

<sup>46</sup> Kittler 2008.

<sup>47</sup> Galloway 2004.

<sup>48</sup> Kittler 1999b.

<sup>49</sup> See Cramer 2008.

algorithm is recognised by many scholars of media theory and unanimously, of course, in cybernetics, where the algorithm is the essential component of the notion of ‘abstract machine’.<sup>50</sup> And how it is clear in the case of videogames, an algorithm is not just a mathematical abstraction but it projects a very physical subjectivity. The algorithm exits the screen and *play* the operator that works in front of it. As Galloway has explained:

A video game is not simply a fun toy. It is also an algorithmic machine and like all machines functions through specific, codified rules of operation. The player—the “operator”—is the one who must engage with this machine. In our day and age, this is the site of fun. It is also the work site. [...].<sup>51</sup>

The conceptual operation that I suggest here is to apply the notion of machinic to the algorithms of the digital code in order to recognise digital code and software programs as a form of machine in Marxian sense, that is a machine that is used to augment surplus value (even if we will have to discuss further the unit of measure, or better *dismeasure* of such a surplus value).

## 9. Network surplus value and the society of metadata

Algorithms are not autonomous objects, but they are shaped themselves by the pressure of external social forces. The algorithm discloses the machinic dimension of the information machines against the interpretations of language-based paradigms of early media theory and software studies. But two kinds of information machines or algorithms must be distinguished then: algorithms to translate *information into information* and algorithms to accumulate

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<sup>50</sup> “Historically, the algorithm occupies the central position in computing science because of the way that it encapsulates the basic logic behind the Turing machine” (Goffey 2008). And also: “All code, formally analyzed, encapsulates an algorithm. Algorithm—recipes or sets of steps expressed in flowcharts, code or pseudo-code—epitomize the operationality of software. It is hard to conceptualize software without algorithm” (Mackenzie 2006).

<sup>51</sup> Galloway 2006.

information and extract metadata, that is *information about information*. It is in particular the scale of metadata extraction that discloses a new perspective on the economy and governance of the new means of production. The scale of metadata accumulation has prompted such an economic shift that it has been defined by the Economist as a very 'industrial revolution of data'.<sup>52</sup>

If, as seen before, Simondon recognised the industrial machine as already an *info-mechanical* relay, today a further bifurcation of the machinic phylum can be introduced to recognise the information machine as a *meta-informational* relay, that handles information and metadata (or information about information). Metadata are 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 information produced by workers, but it is specifically the information about information, or metadata, that improves the organisation of the whole factory, the design of machinery and the value of a given product.

Thanks to this intuition by Alquati, Turing machines can be defined more generally as machines for the *accumulation of information, extraction of metadata and implementation of machinic intelligence*. The diagram of the Turing machines offers a pragmatic model to understand how living information is turned into machinic intelligence. As thermo-machines measure surplus value in term of *energy per time*, info-machines set it inside a social hypertext and measure it in terms of *links per node* (like it is clear for example in the case of Google PageRank algorithm).<sup>53</sup>

The massive accumulation of information and extraction of metadata that are performed everyday by the global digital infrastructure—by its search engines (e.g. Google), social networks (e.g. Facebook), online stores (e.g. Amazon) and many other services—has so many different outcomes. Briefly, here metadata are said to be used: 1) to measure the accumulation and value of social relations;

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<sup>52</sup> See Economist 2010 and Pasquinelli 2010.

<sup>53</sup> See Pasquinelli 2009.

2) to improve the design of machinic knowledge; 3) to monitor and forecast mass behaviours (dataveillance).

1. *Metadata are used to measure the value of social relations.* At a first level, the accumulation of information mirrors and measures the production of social relations in order to turn them into commodity value. Indeed digital technologies are able to condense and provide a detailed cartography of those social relations that constitute the nature of capital in Marx (and compose what Hardt and Negri call ‘the production of the common’).<sup>54</sup> See social media like Facebook and the way they turn collective communication into attention economy, or see the prestige economy established by the Google PageRank algorithm. Metadata describe here the *network surplus value*—where the network is the network of social relations in Marxian terms (‘capital as a social relation’).
2. *Metadata are used to improve machinic intelligence.* At a second level, the extraction of metadata provides information to improve and ‘tune up’ the machinic intelligence at any level, from software programs to knowledge management, from production design to interface usability, from mobility to logistic. The digital sphere is a sort of self-adjusting *automaton*: the flows of information are used to improve its internal organisation and to create more efficient algorithms. Like in the cybernetic factory described by Alquati, the flows of valorising information are transformed into fixed capital: that means they are transformed into the intelligence of machines. See here again the Google PageRank algorithm and the way it evolves according to data traffic. Metadata describe here the *code surplus value*—where the code is the crystallisation of living knowledge and the Marxian general intellect.
3. *Metadata are used for biopolitical control (dataveillance).* More than for profiling of a single individual, metadata are used for crowd control and prediction of mass behaviours, like it happens today

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<sup>54</sup> See Hardt and Negri 2009, p. 136.

with any government tracking online social media, flows of population on public transportation or supply of commodities on distribution chains (including RFID tags and other offline devices in the datasphere). Online real-time statistics of specific keywords can map in a very accurate way the spread of diseases across a country as much as social unrest (see here Google Flu and Google Trends services). Social media like Twitter and Facebook can be easily manipulated by data mining. Metadata describe here a *society of metadata* that is an evolution of that 'society of control' introduced by Deleuze,<sup>55</sup> as it is based on live *datastreams* that are actively produced by users' everyday activities.

A proper political analysis of all these issues is still to come. In conclusion Turing machines are defined as *devices to accumulate valorising information, extract metadata, calculate network surplus value and feed machinic intelligence*. To borrow few metaphors from Brian Holmes's work on financial cybernetics, I guess it is time to move from the *white cube* of 'digital creativity' and dig deep into the *black box* of network surplus value and the algorithms designed for the capture of the common.<sup>56</sup>

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<sup>55</sup> In the society of control: "individuals become *dividuals*, and masses become samples, data, markets, or [*data*] banks" (Deleuze 1990).

<sup>56</sup> See Holmes 2010.

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