# 5

# The Abstraction of Labour

*Cybernetics recomposes globally and organically the functions of the general worker that are pulverized into individual micro-decisions: the 'bit' links up the atomized worker to the 'figures' of the 'Plan'.*

Romano Alquati, 1963[1]

## The bifurcation of energy and information

With unusual insight, the French philosopher Gilbert Simondon once challenged the common understanding of the industrial age. He wrote: '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.'[2] After all, the appearance of a modern notion of information is usually associated

1 'La cibernetica ricompone globalmente e organicamente le funzioni dell'operaio complessivo polverizzate nelle microdecisioni individuali: il "bit" salda l'atomo operaio alle "cifre" del "Piano".' Romano Alquati, 'Composizione organica del capitale e forza-lavoro alla Olivetti', part 2, *Quaderni Rossi* 3 (1963): 134, my translation.

2 Gilbert Simondon, 'Technical Mentality', *Parrhesia* 7 (2009): 20, originally published as 'Mentalité technique', *Revue Philosophique de la France et de l'étranger* 131, no. 3 (2006): 343–57.

with mass media such as press, telegraph, radio, and television – surely not with an industrial machine. Instead, Simondon proposed to see the industrial machine already as an *info-mechanical relay* because, for the first time, it was separating labour into energy (which was provided by natural resources such as water and coal) and information (the conscious movements and instructions of workers supervising and controlling the machine). According to Simondon's understanding, the traditional tool would be a design in which energy and information are still united: with the hammer, for example, the preindustrial artisan was still giving form and motion in the same gesture. This premodern unity of hand and mind was to be systematically disrupted by the industrial division of labour, as has been seen in chapter 3 revisiting the Machinery Question. Although it is often repeated that automation replaces labour, Simondon illustrated how automation actually displaces labour and bifurcates it into opposing lineages and hierarchies of manual and mental skill.

Writing at the end of the 1950s, in the France of the economic boom, Simondon was reading the industrial age under the influence of new technologies such as cybernetics which were also giving momentum to post-war modernist expectations.[3] Information was then an emerging notion that also affected the definition of labour. More recently, the Swedish scholar Andreas Malm has framed the industrial age from a different angle, given the current concerns about climate change and environmental degradation: the economy of energy.

Malm has argued, understandably, that the rise of the industrial mode of production was propelled by a stable and versatile form of energy, which was found in coal after the use of waterpower.[4] But according to him, coal contributed to the acceleration of industrial capitalism not just because of its energetic potential, but because its physical properties, such as lightness, homogeneity, and measurability, matched perfectly the new abstract dimensions of capital. Steam engines replaced water mills not because coal was cheaper and more abundant than water, but because it provided a more stable flow of power than rainfalls and allowed factories to move close to urban areas, where the working class

3 See Henning Schmidgen, 'Thinking Technological and Biological Beings: Gilbert Simondon's Philosophy of Machines', *Revista do Departamento de Psicologia UFF* 17 (2005): 11–18.

4 Andreas Malm, 'The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry', *Historical Materialism* 21, no. 1, (2013): 15–68.

was living at the time. Malm has registered in this way the energetic rationale for the slow emergence of fossil capitalism out of the manufacturing age. It took roughly forty years for the steam engine to be adopted in the place of the water mill: if coal came to be used across the full spectrum of production, it was because it was the most adequate source of *abstract energy*, where 'abstract' means easily computable in terms of cost, transport, stock, performance, and social organisation.

Moreover, it was also thanks to the steam engine that coal was turned into a key component of industrial capitalism, but precisely because this technological innovation could turn its energy potential into a stable and continuous motion, as Malm has noticed:

> For coal to be universalised as a fuel for all sorts of commodity production, it had to be turned into a source of mechanical energy – and, more precisely, of rotary motion. Only by coupling the combustion of coal to the rotation of a wheel could fossil fuels be made to fire the general process of growth: increased production – and transportation – of all kinds of commodities. This is why James Watt's steam engine is widely identified as the fatal breakthrough into a warmer world.[5]

The rise of the steam engine and the adoption of coal, however, were not autonomous drivers of industrial development in their own: they were responding to more profound economic dynamics such as a new regime of labour exploitation. Capitalism brought about a need for a more streamlined – *more abstract* – system of organizing the workforce. This involved utilising the clock to accurately measure labour time and implementing a precise division of the labour space, all of which were made possible under the supervision of the factory's master. The energetic versatility of coal and the mechanical exactitude of steam engines helped consolidate the new spatio-temporal abstractions of industrial capitalism.

Extending Malm's analysis to include Simondon's insight, one may add that the abstract properties of information emerged together with these spatio-temporal abstractions and the new characteristics of fossil energy, i.e., its homogeneous carbon chains, which made coal easier to

5 Ibid., 18.

be quantified and computed than traditional sources, such as water and animal power. What should be recognised in the gears of the industrial machine, then, is the bifurcation and coupling at the same time of *abstract energy* (or standardised motion), and *abstract form* (or information), both understood as quantifiable operations and means of production.[6]

If human labour was separated into abstract energy and abstract forms, this was also thanks to two new technologies of control: feedback devices like James Watt's steam governor (1788) and controllers like the Jacquard loom's punched card (1801).[7] The steam governor was a device to maintain the constant output of an engine by regulating its fuel input in real time. The punched card was a data device to store instructions of textile patterns. To be more precise, Watt's governor turned engine impulses into *abstract motion* – that is, constant rotary motion – and Jacquard's punched cards turned manual instructions into *information* – that is, computable knowledge. These two devices can be considered retrospectively as the first cybernetic devices. Watt's governor was the first example of an exact information feedback system, while the Jacquard loom's punched card would be adopted by IBM as standard storage format, almost unchanged throughout the twentieth century.

## A note on the controversy of abstract labour

It was Hegel who saw labour as an abstraction that forms machines and subjectivity and defined 'abstract labour' for the first time during his 1805–6 Jena lectures, interpreting most likely Adam Smith's passages on the division of labour and the invention of machines:

> Man's labor itself becomes entirely mechanical, belonging to a many-sided determinacy. But the more abstract [his labor] becomes, the more he himself is mere abstract activity. And consequently he is in a position to withdraw himself from labor and to substitute for his own

6 Abstract movement could be defined also as abstract labour, as Hegel did originally in the Jena lectures: see below. See also the critique of Sohn-Rethel in chapter 8.

7 James Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society*, Cambridge, MA: Harvard University Press, 1986, 17.

> activity that of external nature. He needs mere motion, and this he finds in external nature. In other words, pure motion is precisely the relation of the abstract forms of space and time – the abstract external activity, the *machine*.[8]

Later, in the *Philosophy of Right* (1820), Hegel kept defining abstract labour in a similar way: 'the abstraction of production makes work increasingly *mechanical*, so that the human being is eventually able to step aside and let a *machine* take his place.'[9] Marx subsequently hijacked Hegel's interpretation and declared that the social abstraction of concern was not only the division of labour but also wage labour, that is, the rule of capital over labour. Capitalism effectively turned human labour into an abstraction, but this abstraction was the commodity form. Under industrial capitalism, labour was quantified in abstract time units, rendered a general equivalent throughout society, and traded as a commodity like any other, in fact as the very substance of all commodities.[10] Marx saw the *abstraction of labour* primarily as a function of capital, as a wage relation.

During the industrial era, however, the process of abstraction affected space, time, energy, labour, and knowledge in different ways, and this power of abstraction cannot be considered an expression of techno-capitalism alone. In fact, everyone lays claim to abstraction. But to whom does the power of abstraction truly belong, at the end? Who or what possesses the political agency that shapes the social abstractions of history?

8 Georg Wilhelm Friedrich Hegel, *Hegel and the Human Spirit: A Translation of the Jena Lectures on the Philosophy of Spirit (1805-6)*, ed. and trans. Leo Rauch, Detroit: Wayne State University Press, 1983, 121.

9 G. W. F. Hegel, *Elements of the Philosophy of Right*, ed. Allen W. Wood, trans. H. B. Nisbet, Cambridge Texts in the History of Political Thought, Cambridge: Cambridge University Press, 1991, sections 198, 232–3. See also the third part of the *Encyclopaedia of the Philosophical Sciences*: G. W. F. Hegel, *Hegel's Philosophy of Mind*, ed. and trans. William Wallace, Oxford: Clarendon Press, 1894, §526, 123.

10 Marx, *Capital,* 137.

## The labour of information

The historian James Beniger argues that between the late nineteenth and mid-twentieth centuries, information technologies emerged because of the economic boom of Western countries and the need to govern industrial production and distribution. In other words, it was the economic acceleration which prompted the transformation of analogue media into numerical information. The genesis of the paradigms of cybernetics and information theory responded to a 'crisis of control' of Western capitalism that had to manage a commodity surplus and new large infrastructures of distribution. Rather than *information revolution*, as it is often styled, Beniger termed this development as the oxymoronic *control revolution* (which is a fitting description also of the historical drive of cybernetics for political equilibrium).[11] In order to govern a growing economy, a more abstract definition of information (that is measurable, computable, and transmissible knowledge) had to be introduced.

This historical process can be framed, once again, not just from the point of view of commodity circulation but the organisation of labour. Pace Beniger, Marxist accounts of the post-industrial age have stressed the role of labour conflicts and social struggles, rather than economic surplus, in prompting technological development. They have also contested the political neutrality of the technical notion of information, as the Italian sociologist Romano Alquati did, for instance, in his inquiry into labour conditions at the Olivetti computer factory in the early 1960s.[12]

Olivetti was a pioneering company famous for producing typewriters, electronic calculators, and mainframe computers from the 1950s. In 1959, Olivetti launched, for instance, the Elea 9003, the first transistor-based commercial computer, whose futuristic graphical user interface was designed by Ettore Sottsass. It was at the Olivetti factory in Ivrea that Alquati applied for the first time the method of workers' inquiry (or, *conricerca*) to the organisation of

11 Beniger, *Control Revolution*, 6.

12 Alquati, 'Composizione organica del capitale'. See, in particular, Matteo Pasquinelli, 'Italian Operaismo and the Information Machine', *Theory, Culture and Society* 32, no. 3 (2015): 49–68.

labour in cybernetics. Workers' inquiry was a sort of participatory action research, albeit more militant, and was based in the active involvement of workers, also with the extensive use of individual and group interviews.

Alquati discovered, then, that the cybernetic apparatus of the Olivetti factory first was an extension of its internal bureaucracy, which monitored workers at the assembly line and the production process in general by the means of 'control information'. It was via the circuits of cybernetics that bureaucracy was finally able to descend into the bodies of the workers and watch their activities closely. Although Alquati viewed cybernetics as an extension of bureaucracy, he reversed the top–down perspective that is implicit in the idea of control information. In addition to 'control information', he coined the term 'valorising information' to describe the flow of information that is generated by the workers and that, running upstream, feeds the circuits of the factory, and gives form to the final products. In this view, information is continuously produced by workers, absorbed by machinery, and eventually condensed into commodities:

> Information is 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, and elaborations in order to operate on the object of work all those modifications of its form that give it the requested use value.[13]

With Alquati, numerical information enters, probably for the first time, the definition of labour. Alquati noticed that the most important part of labour is made by the series of creative acts, measurements, and decisions that workers constantly have to perform in front of the machine and in the assembly line. He called information precisely all the innovative 'micro-decisions' that workers take along the production process, that give form to the product, but also regulate the machinic apparatus itself:

13 'L'informazione è l'essenziale della forza-lavoro, è ciò che l'operaio attraverso il capitale costante trasmette ai mezzi di produzione sulla base di valutazioni, misurazioni, elaborazioni per operare nell'oggetto di lavoro tutti quei mutamenti della sua forma che gli danno il valore d'uso richiesto.' Alquati, 'Composizione organica del capitale', 121, my translation.

> 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 *socialised*.[14]

According to Alquati, it is specifically the numerical dimension of cybernetics that can encode workers' knowledge into digital bits and, consequently, transform digital bits into numbers for economic planning (as stated in the opening epigraph to this chapter).[15]

Alquati saw an extended structure merging bureaucracy, management, cybernetic machinery, and the division of labour: this was a new system taking the place of the old factory's master. Cybernetics unveiled the machinic nature of bureaucracy and, conversely, the bureaucratic role of machines – that is, how they both work as feedback apparatuses to control and capture workers' know-how. The findings of Alquati's research can be summarised as follows: (1) labour is the source of information of the industrial cybernetic apparatus, indeed the most valuable part of labour is information; (2) information operates the cybernetic apparatus, gradually improves its design and adds value to the final products; (3) the numeric dimension of cybernetics allows us to translate labour into knowledge, knowledge into information, information into numbers, and so, numbers into economic planning; (4) the cybernetic apparatus of the factory grows and improves thanks to the contribution of workers' socialised intelligence. For the first time in a distinct way, the cybernetic or automated factory made visible the transformation of labour into measurable knowledge – that is, information.

In the early 1960s, Alquati and Italian *operaismo* started to register the transformation of Fordism and its more and more 'abstract' division of labour across society. This was clearly prefigured also by political philosopher Mario Tronti's image of the *social factory*. In 1962, Tronti wrote that 'at the highest level of capitalist development . . . the whole of society becomes an articulation of production, the whole society lives in function of the factory and the factory extends its exclusive dominion

14 'Il *lavoro produttivo si* definisce nella qualità delle informazioni elaborate e trasmesse dall'operaio ai *mezzi di produzione*, con la mediazione del *capitale costante* in modo tendenzialmente *indiretto*, ma completamente *socializzato*.' Alquati, 'Composizione organica del capitale', 121, my translation.

15 Alquati, 'Composizione organica del capitale', 134, my translation.

over the whole society'.[16] Information technologies were the material infrastructure that innervated the regime of industrial capitalism into society. Although Italian *operaismo* always had a secondary interest in science and technology, Alquati gave a key contribution on this matter. He maintained that any technological innovation, including cybernetics, always embodies the power relations and class antagonism of a given historical moment and that for this reason it should be the focus of study:

> Capital is always accumulated social labour, the machine is always incorporated social labour. Obviously. Every 'new machine', every innovation expresses the general level and quality of the power relations between classes at that moment.[17]

In the end, it is not difficult to see the rise of information technologies as part of the long evolution of the spatio-temporal abstractions that have been disciplining labour power in the past century. Information came to measure the intelligence, knowledge, and skills needed to master the production process and social relations at large.[18] Coincidentally, this meaning is not far removed from the origin of the term 'information' that was introduced to replace 'intelligence' in the early days of information theory. In 1928, the US engineer Ralph Hartley of the Bell Telephone Labs proposed to revise the act of 'intelligence' or 'interpretation of a signal', which were at that time expressions commonly used in telegraphy, with a notion devoid of any reference to human faculties and, essentially, measurable.[19] This originary role of *human intelligence* in communication technologies can be taken as further evidence of information theory's interest in the automation and

16 Mario Tronti, *Workers and Capital*, London: Verso, 2019, 26.

17 'Il capitale è sempre lavoro sociale accumulato, la macchina è sempre lavoro sociale incorporato. Ovvio. Ogni "nuova macchina", ogni innovazione esprime il livello generale e la qualità dei rapporti di forza fra le classi in quel momento.' Alquati, 'Composizione organica del capitale', 89, my translation.

18 On energy and information as metrics of labour, see Matteo Pasquinelli, 'Labour, Energy, and Information as Historical Configurations: Notes for a Political Metrology of the Anthropocene', *Journal of Interdisciplinary History of Ideas* 11, no. 22 (2023).

19 Ralph V. Hartley, 'Transmission of Information', *Bell System Technical Journal* 7 (1928). See also: Bernard D. Geoghegan, 'Information', in *Digital Keywords: A Vocabulary of Information Society and Culture*, ed. Benjamin Peters, Princeton: Princeton University Press, 2016, 173–83.

deskilling of mental labour, but also as a confirmation of a trajectory that significantly has unfolded, after a long technological cycle, into the project of *artificial intelligence*. Nowadays, the 'intelligence' that AI algorithms encode and measure extends to an increasingly wide social field, as this book has attempted to show. This type of intelligence belongs to both manual and mental labour, to explicit and tacit knowledge, but above all to the capacity of cooperation and self-organisation, which is quintessentially a political craft. Going beyond the horizon of electromechanical engineering, what information comes ultimately to measure and mediate is the antagonism between workers and capital – the 'signals' that are exchanged between these two noisy camps of the social order.