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Toward a critique of the information economy

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Introduction

Over the past decade several scholars have argued that society is moving into a new stage of development: Dahrendorf's post-capitalist society; Barnett's post-petroleum; Brezinsky's technotronic; Etzioni's post-modern; and the most popular one, coined by Harvard sociologist Daniel Bell, the post-industrial society (Bell, 1980, 1973). One of the basic premises of the post-industrial society theories is that economic activity is moving into a new stage, the information stage. The basic idea is that knowledge and information are becoming the strategic resources and transforming agents in the post-industrial era. It is argued that the economy is shifting from a goods producing, industrial society to a service, information-based economy with the emergence of scientists, technicians and administrators as the pre-eminent social class, replacing business entrepreneurs and skilled workers.

This information economy is defined as one in which a very high percentage of the labour force is engaged in the production, processing and distribution of information goods and services; a considerable percentage of wages and salaries derive from information jobs and activities; and a high percentage of the gross national product (GNP) can be attributed to the production and distribution of information goods and services. One of the basic indicators used in the literature to analyse the transition of an industrial society to a post-industrial or information society is the composition of the labour force. The larger the employment in

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information activities, the closer an economy is to the post-industrial era. It is the purpose of this article to concentrate on this specific claim of information economy theory by analysing the nature of information labour within the debate on productive and unproductive labour and its impact on the process of capitalist accumulation.

The information economy: basic premises

As components of US domestic activity, the information industries have received a good deal of attention. Until recently there was little empirical evidence on the economic importance of information activities, with most researchers relying on Machlup's studies on the knowledge industries. As early as 1960 Machlup (1962) brought to light the significance of information industries in the national economy by formulating estimates of the proportion of the GNP accounted for by 'knowledge production' in the US. He concluded that total knowledge or information production accounted for almost 29 percent of the adjusted GNP in 1985 and that 32.4 percent of total employee compensation was accounted for by information occupations.

In an effort to overcome the limitations of previous studies and to generate a conceptual scheme that would distinguish an information sector, Porat (1973) broke down the National Income and Product Accounts and the Input-Output Matrix of the US economy for 1967. He concluded that 46 percent of the GNP was represented by information activity, and nearly half the labour force held some sort of 'informational' job, earning 53 percent of labour income. Porat argues that the structure of the labour force is a basic indicator of a nation's stage of development.

Agricultural activities, which engaged 50% of the US labor force in the 1860's now occupy less than 4%. Industrial activities, which engaged nearly 40% of the workforce in the early 40's now occupy around 20%. And informational occupations, which engaged only 10% of the workforce at the turn of the century now account for 46% of all jobs. (Porat, 1978: 4)¹

The OECD, wanting to establish the degree to which its member countries had already been transformed from industrial to information economies, conducted an analysis similar to Porat's

(OECD, 1981, 1976). OECD findings point to the same trends observed for the US, showing that information jobs have increased at an average rate of 3 percent over five-year periods and that approximately 22 percent of the labour force in most OECD member countries is engaged in information activities.

The theoretical arguments and the empirical evidence presented by these studies, among others,² advance the hypothesis that the transition to the information economy is an irreversible and necessary process and that the only way to economic growth is the road to the information economy.

The urgent need to go from an industrial stage to an information stage is, starting from today, valid in all places regardless of the level of industrialization, development or wealth of any society or any nation. The transition from the old mode of production to the new one is valid in all places and in all times. (Servan-Schreiber, 1982)

The US is now an information economy and Japan and most European countries are rapidly being transformed into information societies. Developing countries will have to emerge as information economies if they are to attain their long-desired development.

Developed countries are rapidly evolving into information economies, and given the increasing internationalization of trade and interdependence, developing countries will also have to become information economies if they are to achieve higher economic growth rates. (Sweeney, 1981: 113)

If the composition of the Mexican labour force is analysed according to the four main divisions proposed by Porat it is possible to see that information labour in Mexico has continuously increased over the years, representing in 1980 29 percent of the Mexican labour force. If these data are compared to those obtained in the 1970s by the OECD, one can see that the participation of the Mexican labour force in information activities in 1970 (23.5 percent of the workforce) was as high as that of any OECD country in that year.

On the basis of this data one could argue that somehow Mexico is on the road to becoming an information economy. However, it is important to stress that there are still very significant differences between developed and developing countries. In developed countries agricultural labour represents the smallest part of the work force. In a developing country such as Mexico, although agricultural labour has decreased from 61.8 percent of the labour force in 1950 to 32.2

percent in 1980, it still represents the sector with the highest labour force participation. It is important to consider that in the Mexican agricultural sector a substantial amount of subsistence agriculture can still be found. Because this type of agriculture does not participate in the system of capitalist relations of production and/or distribution in a direct and substantive way, one would expect the official statistics to be conservative with respect to estimates of this type of labour. In addition the 2.3 percent of the US labour force engaged in agricultural activities is responsible for one of the largest agricultural trade surpluses in the world, while the 32.2 percent share of the Mexican work force devoted to agricultural activities does not produce enough to feed even the Mexican population, not to mention the trade deficit in this sector.

In developed countries, information activities, as well as services, tend to increase in relative and absolute terms, while industrial and agricultural labour tend to decrease. Analysis of the Mexican data shows that industrial labour tends to increase both in relative and absolute terms, although information activities and services increase at a faster rate. But the service sector in an advanced economy is formed mainly by business services while the same sector in a developing economy encompasses all kinds of services, including personal services which are usually very large and a useful category for dumping disguised unemployment.

As absurd as this might sound, the information economy arguments have been used already to justify the 'deindustrialization' processes in countries like Argentina and Chile. The argument has been to avoid wasting resources on industrialization when they can be devoted to the 'informatization' process and with it achieve modernization much faster (Fajnzylber, 1982). These arguments have also been used to justify intensive sales efforts of telecommunication goods and services as well as computers and data services to developing countries by the developed countries and their transnational corporations (TNCs). The nature of this information labour which seems to play such an important role on the 'road' to the information economy needs to be critically analysed.

On the nature of information labour

The Marxian definition of productive and unproductive labour

First we must define what is meant by information labour. Porat (1973) defined it as all labour related to information activities. Thus he included the following workers: (1) workers whose output or primary activity is the production and selling of knowledge, like scientists, inventors, teachers, librarians and journalists; (2) workers who handle information within firms such as secretaries, messengers, managers, clerks and typists; and (3) workers who operate information machines and information technology that support the two previous categories, such as telephone operators and drivers. For orthodox economic theory the specific characteristics of this information labour are irrelevant. The definition of labour poses no problems, mainly because everything is defined in the market. If someone is willing to pay for a good or service, and it is demanded in the market, the labour that produces it is considered to be productive labour. For orthodox theory there is no formal definition of unproductive labour.

Unlike neoclassical theory, for classical political economy the distinction between productive and unproductive labour is crucial, mainly because of its relation to the analysis of the accumulation and reproduction of capital. Labour that contributed to the creation of the 'wealth of nations' was considered productive, while labour that used up a portion of existing wealth without resulting in the creation of new wealth was considered unproductive labour.³ Wealth considered in terms of its 'materiality' led Smith, Ricardo and even Malthus to agree that productive labour produced a material or physical object while unproductive labour produced a service.

In Marxian analysis the nature of the commodities into which labour is materialized is totally irrelevant. They can be 'physical' (goods) or 'non-physical' (services) use-values and they can be destined for reproductive or unreproductive consumption. The distinction between productive and unproductive is derived not from the nature of the commodity produced but from the social relations of production within which commodities are produced. Productive labour is exchanged against capital *and* results in the creation of surplus value. Hence the classical and now popular distinction between goods and services is irrelevant for the analysis of

productive labour. The characterization of labour as productive or unproductive does not lie in the nature of labour nor of the commodities produced but in the nature of the social relationship of labour to capital.

The Marxian definition of labour considers three different levels of abstraction. At the first level⁴ Marx deals only with the process of *capitalist production*, that is industrial capital per se. At this level productive labour is all labour exchanged against capital and productive of surplus value while unproductive labour is all labour exchanged against revenue. Productive workers use up use-values to create new wealth with their labour. The value of the final product can be divided into dead labour, C (the value of the means of production used in the labour process), and living labour, L . The latter in turn can be divided into necessary labour, that is, the value of the means of consumption that is consumed by workers, V , and surplus value (or surplus product), S . The ratio S/V is called by Marx the rate of surplus value. *Ceteris paribus*, the higher the rate of surplus value, the larger the amount of surplus value appropriated by the capitalists and the larger the profit.

It is very difficult to directly increase S by either lengthening the working day or reducing wages. Surplus value has to be increased in an indirect way by increasing the productivity of labour and lowering costs through the process of mechanization. When this process reaches those sectors devoted to the production of commodities that constitute the real wage, V , then the value of workers' consumption requirements is decreased, and with it the rate of surplus value is increased.

Marx argued that the production of 'physical' use-values made up most productive labour and that labour engaged in the production of services was so small that it could be left out of the analysis:

[Sometimes] production cannot be separated from the act of its producer, as is the case with all performing artists, actors, teachers, doctors, parsons, etc. . . . All these manifestations of capitalist production in this sphere are so insignificant compared to total production that they can be left completely out of account. (Marx, 1979: 195)

Even though Marx does not deal directly with productive labour in the service sector, he examines in considerable depth unproductive labour in the service sector such as commercial activities. This leads to another level of analysis.

At a second level Marx deals with the process of the *reproduction of industrial capital* where he turns his attention to the sphere of circulation. For industrial capital there are two types of circulation labour. One is labour that operates in the sphere of actual circulation of commodities, such as transportation. When these circulation activities become independent branches of investment, they are constituted as spheres for the investment of productive capital.⁵ Therefore the labour is productive. The other type of labour is engaged in pure circulation activities such as trading and accounting. This labour does not create any surplus value and, although unproductive, is a necessary activity for the reproduction of capital. When these activities become independent branches they maintain their unproductive character and give rise to unproductive capital.

At this level of analysis Marx is dealing with division of labour within industrial capital and even within the firm. His definition of productive labour is restricted to that labour exchanged only against productive capital. At the same time he extends his definition of unproductive labour to include not only labour exchanged against revenue but also labour exchanged against unproductive capital, that is, capital devoted to circulation and realization activities.

At a third level of analysis he deals with the process of the *reproduction of social capital* where unproductive activities, due to a process of social division of labour, get constituted as independent branches of investment, such as banking and trading. The definition of unproductive labour is further extended to include all labour engaged in a whole branch of unproductive economic activity. Thus the Marxian definition of productive labour includes all labour exchanged against *productive* capital that produces surplus value. Unproductive labour includes all labour paid out of revenue, for example, personal servants; all labour paid out of unproductive capital within the industrial sector, such as managers, accountants, supervisors and messengers; and all labour exchanged against unproductive capital in those sectors devoted to circulation activities like the trading sector.

Information labour: productive or unproductive labour?

Let us now examine the definition of information labour presented above in terms of the division between productive and unproductive

labour. If the categories proposed by the OECD (1976), which are very similar to Porat's, are used, the results exhibited in Table 1 are obtained.

TABLE 1
Information labour: productive and unproductive
(OECD categories)

Categories	Productive labour	Unproductive labour
A. Producers of information	Technicians, scientific personnel	Social scientists, commercial agents, real estate agents, advertising executives, inspectors, business services
B. Processors of information		Administrators, supervisors, administrative personnel
C. Disseminators of information		Teachers and instructors,* communicators*
D. Operators of communications infrastructure	Printing workers, telecommunications operators	Calculating and accounting machine operators, messengers

*These workers could be productive workers if their labour power were bought by productive capital.

Almost all occupations in the information sector are unproductive. It will be recalled that the information society theories argue that information and service activities show the highest rate of growth in the post-industrial society. But if information labour is mostly unproductive, then the post-industrial society is a society made up of unproductive workers.

In order to study the information economy from this perspective, the US labour force will be divided between the production sector and the non-production sector. The production sector includes all industries where use-values are produced such as manufacturing, mining and construction. The non-production sector includes all economic branches devoted to the circulation and distribution of money and the use-values of production such as trade, finance, insurance, real estate and business services. All labour within the non-production sector is unproductive while labour in the production sector can be further divided into productive and unproductive labour (Shaikh, 1981).

Production sector	
Productive	Unproductive

Non-production sector
Unproductive labour

TABLE 2
Four sector aggregation of the US labour force

Year	Information sector	Agriculture sector	Industry sector	Service sector	Total
1860	480.604	3,364.230	3,065.924	1,375.525	8,886.283
1870	601.018	5,884,971	4,006.789	2,028.438	12,821.216
1880	1,131.415	7,606.590	4,386.409	4,281.970	17,406.384
1890	2,821.500	8,464.500	6,393.383	5,074.149	22,754,032
1900	3,732.371	10,293.179	7,814.652	7,318.947	29,159.149
1910	5,930.193	12,377.785	14,447.382	7,044.592	39,799.952
1920	8,016.054	14,718.742	14,492.300	8,061.342	45,288.438
1930	12,508.959	10,415.623	18,023.113	10,109.284	51,056.979
1940	13,337.958	8,233.624	19,928.422	12,082.376	53,582.380
1950	17,815.978	6,883.446	22,154.285	10,991.378	54,844.087
1960	28,478.317	4,068.511	23,597.364	11,661.326	67,805.518
1970	37,167.513	2,466.883	22,925.095	17,511.639	80,071.130
1980 ^a	44,650.721	2,012.157	21,558.824	27,595.297	95,816.999
<i>Percentages</i>					
1860	5.8	40.6	37.0	16.6	100
1870	4.8	47.0	32.0	16.2	100
1880	6.5	43.7	25.2	24.6	100
1890	12.4	37.2	28.1	22.3	100
1900	12.8	35.3	26.8	25.1	100
1910	14.9	31.1	36.3	17.7	100
1920	17.7	32.5	32.0	17.8	100
1930	24.5	20.4	35.3	19.8	100
1940	24.9	15.4	37.2	22.5	100
1950	30.8	11.9	38.3	19.0	100
1960	42.0	6.0	34.8	17.2	100
1970	46.4	3.1	28.6	21.9	100
1980 ^a	46.6	2.1	22.5	28.8	100

a. Bureau of Labor Statistics Projection.

Source: Bell, Daniel (1981) 'The Social Framework of the Information Society' in Michael Dertouzos and Joel Moses (eds), *The Computer Age: A Twenty-year View*. Cambridge, Mass.: The MIT Press.

TABLE 3
Employment by sectors, selected countries
(percentages)

Country	Year	Information	Services	Industry	Agriculture
France	1954	20.3	24.1	30.9	24.7
	1975	32.1	28.1	29.9	9.9
Japan	1960	17.9	18.4	31.3	32.4
	1975	29.6	22.7	33.8	13.9
Sweden	1960	26.0	26.8	36.5	10.7
	1975	34.9	29.8	30.6	4.7
Great Britain	1951	26.7	27.5	40.4	5.4
	1971	35.6	27.0	34.2	3.2
United States	1950	30.5	19.1	38.4	12.0
	1970	41.1	24.1	31.5	3.3
Germany	1950	18.3	20.9	38.3	22.5
	1978	33.2	25.9	35.1	5.8

Source: OECD (1980).

An analysis of production and non-production activities in 1947 shows that 63.4 percent of the US labour force worked in the production sector while 36.6 percent worked in the non-production sector. For 1980 the percentages were reversed with only 46.1 percent in the production sector and 53.9 percent in the non-production sector. If labour in the production sector is now divided into productive and unproductive labour, that is, workers are differentiated from supervisory personnel, secretaries, messengers, etc., productive labour in 1947 consisted of approximately 15 million workers, representing 84 percent of production labour. For 1980 these productive workers had increased to 22 million. Nevertheless, they decreased in relative terms to represent a 61 percent participation of production labour and 28.4 percent of the total work force. What this means is that in 1947 unproductive labour (unproductive workers in the production sector and all workers in the non-production sector) represented 46.4 percent of the work force while in 1980 it had increased to 71.6 percent. The post-industrial society is a society of unproductive workers.⁶ (See Tables 2 and 3.)

In the Mexican case, workers in the production sector represented 49 percent of the workforce in 1950 and decreased to 43 percent in 1980, a very slight decrease compared to the US economy. (See Table 4.) If the production sector is now separated

into productive and unproductive labour it can be seen that, except for a drop in 1970 (in relative terms), productive labour in this sector has not decreased since 1950. It has maintained an approximate share of 86 percent of the labour in that sector. From the perspective of the overall Mexican labour force, productive labour in 1950 had a participation of 43 percent, which decreased to 37 percent in 1980.

If the data on the composition of the US labour force are compared to those of Mexico, it can be observed that both countries had a high percentage of unproductive workers in 1950. In both cases there is a relative increase of unproductive workers for 1980, although this is considerably sharper in the US than in Mexico.⁷ In 1980 unproductive labour in the US represented 71.6 percent of the work force while in Mexico it was 63 percent.

In both countries there is a relative decline in the share of production workers, although the decline is relatively larger for the US (20%) than for Mexico (6%). This means that in the US there has been a sharp increase in the number of unproductive workers within the production sector. In 1947 there were seven productive workers for each unproductive worker in the US production sector. By 1980 there were only 1.5. (See Table 5.)

The importance of the above data lies in the fact that it shows very clearly that for the US economy the increase in unproductive workers can be significantly accounted for by the increase in unproductive workers within the firm. Curiously the OECD report showed that this category, that is, administrative personnel within the firm, made the largest contribution (58%) to the growth of information employment in OECD member countries.

In the case of Mexico the increase in unproductive workers comes mainly from employment in the non-production sector. (See Table 6.) This could be explained by the fact that this sector includes disguised unemployment, which usually appears under the category of services, as well as employment in the public sector,⁸ an important employer in the Mexican economy. Obviously an analysis of the productivity of labour in both countries would shed important light on this issue, but it falls beyond the scope of this article.

It is evident that both societies are composed of a majority of unproductive workers but for different reasons and with different results. Therefore it cannot be assumed that the effect on capital

TABLE 4
Employment by sectors, Mexico
 (in thousands)

	1950	%	1960	%	1970	%	1980*	%
Information	1,225.505	15.3	2,195.335	19.5	2,870.665	23.5	5,704.192	25.3
Agriculture	4,939.449	61.8	6,184.018	54.9	5,173.267	42.3	6,338.882	32.2
Industry	1,272.713	15.9	1,995.607	17.7	2,505.227	20.5	4,693.585	23.7
Services	554.024	7.0	887.362	7.9	1,658.363	13.7	3,029.902	15.3
Total	7,991.391	100	11,252.317	100	12,207.512	100	19,766.511	100

*Preliminary data.

Source: Based on data from Censo General de Poblacion y Vivienda, Mexico.

TABLE 5
Productive and unproductive labour, United States
 (in thousands)

Year	Production sector ¹		Non-production sector ²		Total percentages		Total
	Productive labour	Unproductive labour	Unproductive labour	Productive labour	Unproductive labour	Productive labour	
1947	15,647	2,862	10,683	53.6	46.4		29,192
1950	15,440	5,785	11,274	47.6	52.4		32,499
1960	15,653	8,991	14,020	40.5	59.5		38,664
1970	21,421	11,994	30,233	33.7	66.3		63,648
1980	22,860	14,237	43,465	28.4	71.6		80,562

1. Includes all production workers in mining, construction, manufacturing, and transportation and public utilities.

2. Includes all production and non-production workers in wholesale and retail trade, finance, insurance and real estate, and services, as well as all non-production workers in mining, construction, manufacturing, and transportation and utilities.

Source: calculated from Employment and Training Report of the President, US Department of Labor, 1981.

TABLE 6
Productive and unproductive labour, Mexico
(in thousands)

Year	Production sector ¹		Non-production sector ²		Total percentages	
	Productive labour	Unproductive labour	Unproductive labour	Productive labour	Unproductive labour	Total
1950	1,343	199	1,577	43	57	3,120
1960	2,156	348	2,600	42	58	5,105
1970	2,714	627	3,761	38	62	7,104
1980	5,062	826	7,646	37	63	13,534

Notes: for a definition of productive and unproductive labour as used in this table see Shaikh (1981). The industry classification rules were those described in Table 5.

Source: calculated from Censo de Poblacion, Direccion General de Estadistica, Mexico, 1950, 1960, 1970, 1980.

accumulation of ‘informatization’ policies and programmes — that is, the massive introduction and utilization of information goods and services in all spheres of social life — would be the same for every social formation regardless of any other economic, political and social determinants. To this we turn our attention now.

Unproductive labour and capital accumulation

The importance of the distinction between productive and unproductive labour lies in its relation to the process of capital accumulation. All kinds of labour use up use-values (goods and services) in the realization of their labour, but productive labour, as the only source of surplus value, not only replaces the use-values used up but also creates additional wealth. On the contrary, unproductive labour uses up society’s wealth without replacing it, therefore creating a limit on the accumulation process.

An increase in the employment of productive workers brings about a net increase in the production of output while an increase in the employment of unproductive workers will actually absorb a portion of the net output and hence decrease the amount available for productive investment. Therefore the larger the number of unproductive workers, the greater the limits imposed on capital accumulation (Shaikh, 1980). For example, all workers use up inputs: a productive worker in a yarn factory will use machinery and wool to produce the yarn and an unproductive worker in the same factory will use pencils, paper, a desk and a computer to estimate a payroll. The hiring of an additional unproductive worker, *ceteris paribus*, means that those inputs are not available for the realization of productive labour. Therefore social consumption is increased but social production is not.

Why then have unproductive workers at all? Why not eliminate them altogether? As the scale of production is extended, unproductive operations required for the circulation and reproduction of industrial capital multiply accordingly. The process of production sets the limits to the scale of unproductive activities in two ways. To do packaging and selling in high volume, large inventories must be on hand. Unproductive activities depend on the quantity of commodities produced which are the object of these activities and not vice versa. On the other hand,

unproductive capital is nothing but surplus value elsewhere created and transferred from the productive sphere of society to the unproductive one. For unproductive capital to make a profit, it is necessary to have surplus value already produced, and surplus value is only produced by productive workers in the process of production of commodities.

Although necessary for social reproduction, unproductive activities are similar to constant capital in the effect that they have over the rate of profit because they create no surplus value. Hence, other things being equal, the smaller the amount of unproductive capital employed as a whole the greater the profit for industrial capital and the higher the overall rate of profit.

For this reason, the industrial capitalist endeavours to limit these expenses of circulation to a minimum, just as he (she) does with his (her) expenses of constant capital. Hence industrial capital does not maintain the same relations to its commercial wage laborers that it does to its productive laborers. The greater the number of productive wage laborers employed under otherwise equal circumstances, the more voluminous is production, the greater the surplus-value or profit... The commercial laborer does not produce any surplus value directly... He (she) adds to the income of the capitalist, not by creating any direct surplus value, but by helping him (her) to reduce the costs of the realization of surplus value. (Marx, 1977a: 353)

It will be recalled that the Marxian formula for computing the maximum rate of profit, r^* , given an annual turnover of capital is:

$$r^* = \frac{S}{C + V} \quad (1)$$

If U stands for unproductive capital (labour and use-values utilized to carry on unproductive activities) because it is a deduction from surplus value, acting at the same time as constant capital, the rate of profit is modified as follows:

$$r' = \frac{S - U}{C + V + U} \quad (2)$$

because U behaves as constant capital (Marx, 1977a). So that $r^* > r'$.

Obviously the smaller the unproductive expenses the higher the rate of profit. Assume, for example, that society as a whole invests

\$100 billion in variable capital and an equal amount in constant capital. Then if the rate of surplus value is set at 100 percent, productive workers will create another \$100 billion as surplus value. Substituting Equation 1 and assuming there are no unproductive expenses, the rate of profit (r^*) will equal 50 percent ($\$100/\200).

If it is now assumed that unproductive expenses are \$50 billion, by substituting in Equation 2, it can be seen that the rate of profit will go down to 20 percent ($\$50/\250). But if by some method capitalists are able to cut unproductive expenses in half, that is, \$25 billion, the rate of profit will equal 33.3 percent ($\$75/\225).

The capitalist class as a whole obviously would benefit from a reduction in total unproductive expenses, including unproductive labour. Unproductive expenses cannot be eliminated altogether because they are a necessary link in the process of capitalist reproduction. Commodities are produced but they have to be distributed, advertised, sold and the money paid for them has to be collected. State activities are also necessary for the social and ideological reproduction of capitalist accumulation. But if unproductive expenses cannot be eliminated they can certainly be reduced, either directly or indirectly, to maximize profits. A direct way to do this would be to decrease the number of unproductive workers or to lower their wages. Working class resistance has made it more difficult for capitalists to attempt such measures for the reduction of unproductive expenses. Nevertheless, there are several indirect ways of achieving this.

The first, which has characterized the development of capitalism almost since its beginning, is the process of division of labour. When unproductive activities are constituted into independent branches of investment, such as the trading sector, one sector of unproductive capital becomes capable of handling the circulation needs of several sectors of productive capital. In this way the number of unproductive workers and overall unproductive expenses are reduced, with a positive effect on the profitability of capital.⁹

Another way of reducing unproductive expenses is by increasing the efficiency¹⁰ of unproductive workers, or by reducing these expenses by decreasing the cost of the materials consumed by unproductive workers in their labour process. How is it possible to increase the efficiency of unproductive workers and reduce the cost of these materials? The information revolution is the answer.

Information revolution or profitability revolution?

The information revolution will affect significantly all aspects of social life, but it is probably the unproductive sector of economic activity that will undergo the most important transformation in this process. This is not mere chance. As seen above, unproductive sectors have increased continuously over the past thirty years in many countries. Computers and other automated devices are rapidly being adopted and utilized in unproductive branches such as banks, insurance companies, real estate agencies, retail stores and management offices. Small computers with access to databanks, multimode communication systems, word processors and telecommunications are sharply altering the nature of managerial labour and information occupations.

For the first time in fifty years the increase in the efficiency of unproductive workers seems to be at the top of the capitalist agenda. This has been of some concern in economic circles since the 1960s because it was found that, regardless of many problems of definition and comparability, the efficiency of unproductive workers was significantly lower than that of productive workers. Fuchs (1965, 1971) found a 1.17 percent per annum differential in the US while Briscoe (1975) found a 1.48 percent differential in Great Britain.

If we examine the office as the place, par excellence, for the development of unproductive activities, for example, in banking, trading, management, clerical work, etc., it is apparent that office labour has remained almost the same for the past fifty years. Even the invention of the electric typewriter was not really a great improvement as far as the efficiency of office labour is concerned. Capital investment per office worker has always been low compared to other sectors. Over the last decade a capital investment of \$40,000 per agricultural worker has brought a 200 percent increase in labour productivity. In manufacturing every \$30,000 spent per worker has seen a doubling of productivity. Only \$2,500 has been invested per office worker and efficiency has increased by 5 percent (Predicasts, 1982).

With the information revolution the efficiency of office employees is set to increase, as investment in office automation more than triples to \$18 billion in the next ten years. Teleconferencing equipment sales are expected to grow at 30 percent per year and electronic mail terminal sales will increase by more than seven times,

not to mention the boom in sales of word processing equipment. Although the extent to which the information revolution will increase the efficiency of unproductive labourers is hard to determine at this point, it seems that it will affect it in a significant way. Werneke (1982) in a report on the impact of office automation on women's employment (women occupy the majority of lower clerical jobs in most countries) showed that as new technology has been introduced in the office, the rise in labour efficiency has allowed more work to be done with the same number or even fewer workers.

In the office the information revolution will also affect the cost of office equipment and materials.

One word processor is cheaper than five typewriters and at the same time it can increase productivity by 150 to 400%. This is no empty sales talk. In those offices where word processors have been introduced office staffs have been cut by one-third to one-half. (Downing, 1981: 276)

The availability of more sophisticated and cheaper telecommunication services is also an important factor. Saunders et al. (1983) report that teleconferencing has been successfully used in the United States by different organizations such as NASA, Bank of America, Exxon, Procter and Gamble, among others. They report that IBM's teleconferencing system reduced travel costs by \$414,000 in 1979, its first year of operation, and by \$830,000 in 1980. A subsidiary of the RCA Corporation held a video conference for 450 sales people around the United States costing 15 percent of the cost of a similar size live conference involving travel expenses. In 1980 the US Post Office reported that business communications costs decreased when using digital data transmission in preference to regular mail. It was estimated that the cost of producing six minutes in a tie line network call was \$0.74; the cost of teletype was \$2.45 for sixty-six words; the cost of a letter mailed in the US would come to \$6.41 per page. Computers are now available to almost any firm regardless of its size because of significant price reductions and processing capacity improvement. It will be recalled that the famous ENIAC (Electronic Numerical Integrator and Calculator) computer developed in 1946 at a cost of thousands of dollars had a capacity that today would cost under \$100.

There is no question that the information revolution will bring about a significant reduction in the cost of those inputs that are used to a large extent by office employees. And this, together with an

increase in the efficiency of unproductive workers, will affect profitability in a positive and direct way by liberating surplus value for capitalist appropriation. It could also be argued that the information revolution could affect profitability in an indirect way to the extent to which it contributes to a reduction in the unit costs of the commodities produced. If this reduction in costs reaches those commodities that form part of workers' consumption requirements the rate of surplus value could be positively affected.

But in order to understand the scope of this information revolution it is necessary to place it within the context of the rationalization of the labour process in capitalist production. The capitalist system is determined by the drive to maximize profitability. In order to achieve this capitalists have to control, rationalize and continually transform the labour process. This is achieved by subdividing it into increasingly specialized and highly defined tasks, reducing human labour to mechanical activities so that eventually real machines may indeed replace mechanized human labour. This tendency towards mechanization is the dominant force in the increase of the social productivity of labour and brings about a decrease in unit costs for the commodities produced. This has a double determination. In the first place it is the result of the struggle between capital and labour and the need for capitalist control over the labour process. In the second, it arises out of the struggle between individual capitals because capitalist competition forces them to mechanize in order to lower unit costs and gain an edge over their competitors.

The impact of the information revolution on the productive sectors of society is rather straightforward. A human hand hits a nail every two seconds. Soon a mechanized arm hits the nail every second and some years later a computerized robot arm hits it every tenth of a second. But the difference between the labourer hitting the nail and a robotized arm might just appear to be of a technological nature: the robotized arm has a longer reach, can carry a 200 lb load and can work continually. In the eyes of the capitalist the worker is an imperfect machine and the machine is a perfect worker. But the real difference is a much deeper and important one and lies in the essence of the capitalist system.

No matter how perfect a robot is, it will never be able to produce surplus value because surplus value can only be produced by productive workers. Information commodities in the workshop, such as fibre optics, computer-aided manufacturing systems

(CAMS), computers, robots, etc., are introduced not to replace human labour but to increase its productivity and the control of capital over the labour process as dictated by the logic of capitalist production established long ago.

The effect of the information revolution on the unproductive sectors has to be analysed within the perspective of the rationalization of the labour process and its mechanization in capitalist production. Manual labour has been carefully specialized over the last 100 years; the turn of mental labour has finally arrived. Office labour will be broken down and transformed as much as manual artisans' labour was in the early period of industrial development. For example, the introduction of word processors in the office could result in a change in the organization of work by splitting secretarial work into typing, correspondence and administrative work. A separate word processing department could then be established which could receive the bulk of typing to be done within an organization, allowing the machinery to be continuously used, thus achieving the maximum use or capacity utilization of the word processing equipment. The change in work organization would result in the deskilling of the word processor operator compared to the traditional secretary. Less skill is required because the layout, accuracy, spelling and correction of work are done by the machine (Curnow and Curran, 1983). A similar case would be that of electronic mail and electronic filing systems. Their adoption in the office would probably mean an increase in the specialization of administrative personnel.

The introduction of new technology or information commodities in either the productive or unproductive branches of the economy is dictated by conditions of capitalist competition. It is not imposed by the technology itself because the technology is neither created nor adopted in a historical vacuum. If a new technology is introduced by a certain capitalist and he or she is successful, the innovator will gain a temporary advantage over the other capitals which operate in the same sphere of investment and will be in a position to ride the wave of higher profits. The new technology will eventually be adopted by all the competing capitals, if they are to survive the battle of competition. When these favourable conditions of operation are generalized the surplus profits accruing to the innovator will tend to disappear. This is the case, for example, in the banking sector. Computers and telecommunications were used at the beginning by a few banks in the industrialized nations, but today the international

banking system as a whole makes use of these technologies in its everyday operations. This explains the existence, for instance, of a highly modernized banking sector in developing countries such as Mexico, Bolivia or even Bahrain when other branches of investment, whether productive or unproductive, are still operating under rather backward conditions.

The above analysis represents the theoretical space within which the information revolution, and the new technology brought about by it, will have to be studied in order to fully understand the scope and possible impact on economic life. Capitalists would certainly like to be able to impose their own rationality over other class interests, but history has proved that this is not always possible. The capitalist class is not a monolithic block. Divisions and struggles within capital itself will shape the dominance of some interests over others. For example, the fight of telecommunication firms to participate in the computer business, or the struggle between new direct broadcast satellites (DBS) with established television firms and the cable television industry (CATV) will in each case result in a different outcome.

Working-class resistance to the introduction of such technologies will certainly determine the extent to which they will be incorporated into economic life. The introduction of these technologies in the workshop and in the office implies not only changes in work practices and skill qualifications but also significant changes in the levels and composition of employment. For example, it is predicted that employment in the service sector will contract more and more as the new technologies are introduced (Henzi, 1982). Labour unions in industrialized countries, where 'information' processes are well on their way, are already fighting the effects of these technologies by demanding retraining programmes for workers, maintenance of previous employment levels and agreements between management and labour prior to their introduction. For example, delegates to the annual conference of the Banking, Insurance and Finance Union of the United Kingdom voted three to one to resist the introduction of these new technologies until employers sign agreements on the conditions of their introduction into the sector. Any attempt by the management to introduce the technology without first agreeing to the terms on which it is to be installed would result in the refusal of employees and workers to operate the equipment (*Microelectronics Monitor*, 1983).

Labour resistance to the adoption of these technologies is still

rather unusual in developing countries where the 'informatization' process is just starting in an erratic and checkered way, but it will certainly appear on labour's agenda in the near future. Finally the incorporation of these technologies into social life will also be affected by other factors such as state policies, cultural elements and tradition, factors that will vary according to each social formation.

Conclusion

If the labour and employment data of any country were analysed today in terms of the theoretical premises advanced by the information economy theory, one would find that almost all societies are already on the path to the information society. Probably information labour and related activities would show significant increases over the past twenty years. Nevertheless, the road to the information economy is not as simple as it seems and if a critique of the information economy is to be developed it will have to address several aspects implicit in this information society theory.

First, it can be shown from a political economy perspective that information labour is unproductive labour. Further, by analysing employment data for the US and Mexico, it was made evident that the increase in information labour can stem from different sources having different effects on capitalist accumulation and social reproduction. In the case of the US this increase is due mainly to the growth of unproductive labour within the firm, that is, within the production sector of US economic activity, whereas in the case of Mexico it is due mainly to an increase in employment in the non-production sectors of the economy which include government employment. The paradox seems to be that the larger the number of unproductive workers the more developed the country. In 1980 over 70 percent of the US work force was unproductive labour whereas in Mexico 56 percent of the work force was productive labour. Obviously no final conclusions can be drawn without a detailed analysis on the productivity of labour in both countries.

Second, even though information labour appears to be so important for information economy theorists, the trend seems to be to aim at its reduction, or at the increase of its efficiency via the utilization of information technology. The extent to which the information revolution will be able to restore the productivity of labour and increase the efficiency of unproductive workers is hard to determine, but it will certainly be attempted.

The information society is not the clean, antiseptic and apolitical society we have been told it is, where democracy and freedom will rule. Capitalism is still the name of the game and profitability its main drive. The information society is a class society where the exploitation of the working class is still its main feature.

There is an important distinction that must be kept in mind when analysing the utilization of information commodities in a given social formation. Information commodities can be used in the workshop or in the office and in both cases their adoption can be analysed within the context of the rationalization of the labour process. When information commodities are used in the workshop they are used to increase the productivity of labour and to create surplus value. These commodities are then productively consumed, that is, they are utilized by productive workers, and this leads to the creation of wealth and the direct expansion of the process of capitalist accumulation. When information commodities are used in the office they are used up by unproductive workers and their consumption is unproductive, that is, although they help restore profitability, their use does not lead to the direct creation of new wealth.

Finally another distinction that has to be made when dealing with the effects of the so-called information revolution is related to the production of information commodities. A country that produces and productively consumes information commodities is better off than a country that imports these commodities and consumes them unproductively. The latter is the case of most Third World countries which have already 'joined' the information revolution mainly by importing large quantities of these information commodities to be used primarily by the public bureaucracies. This characteristic in particular merits further investigation if a thorough critique of the information economy theory is to be developed.

Because the information economy theses are part of a wider developmentalist approach, that links the process of 'informatization' of societies to that of modernization, this theory has to be carefully analysed in order to disentangle all the economic, political and social effects that will result from this 'information' process. Otherwise, on the grounds of modernization, the working class will be increasingly and continuously exploited; and on the grounds of development, developing countries will open their doors to foreign capital and the purveyors of 'informatization' the way they opened their doors in the 1950s and 1960s to the purveyors of industrialization with the economic and social consequences we all know.

Notes

1. For a more detailed treatment and presentation of the data on information labour in the US and Mexico see Arriaga (1984).
2. See the works of D. Bell, W. Dizard, Y. Masuda, S. Nora and A. Minc, E. Parket, M. Porat, I. Singh among others.
3. Smith has two definitions of productive labour but for the purpose of this article only one will be presented.
4. The three levels of abstraction at which Marx develops his concept of productive-unproductive labour are basically those in the three volumes of *Capital*.
5. See Marx (1977a).
6. For an alternative explanation to this phenomenon see Bowles et al. (1983).
7. These data, as well as those for Mexico, leave out agricultural labour. If included, in the case of the US the data would remain almost the same, while in the case of Mexico productive labour would probably increase considerably with respect to unproductive labour.
8. Employment in the public sector almost doubled between 1970 and 1982.
9. For further discussion see Marx (1977b), especially the chapters 'On Commercial Capital' and 'On Commercial Profit'.
10. Because orthodox economic theory does not distinguish between productive and unproductive labour, the concept of productivity of labour is applied to the production of goods and to the production of services. When making the distinction between both kinds of labour, one cannot talk of the 'productivity of unproductive labour'. I therefore use the concept of the 'efficiency' of unproductive labour and leave the concept of productivity to be applied exclusively to productive labour.

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