

Technology and Workforce: Comparison between the Information Revolution and the Industrial Revolution

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1. Introduction:

Since around 1750, global wealth has risen in an exponential way¹. What made this possible? Capitalism, colonization, exploitation of the working class, globalization? Each of these phenomena might be an answer to the question, but above all, this amazing economic growth was due to technology. This allowed new organization of production and economic activity. Together technological advancement and reorganization of the production led to an increasing pace in productivity growth.

The Industrial Revolution, which began in Britain in the 18th century, is the direct consequence of a major invention, the steam engine. Its use in cotton mills involved a dramatic increase in production capacities. Thanks to the growth of productivity underpinned by the transformation of technology since the 18th century but also, to the trade unions, the working class struggles and the compromise of the dominant class – emergence of the Welfare State in Bismarck's Germany and later, post-WWII Keynesianism – the standard of living is now spectacularly higher than in the 18th century. However, technological revolutions did not have only positive consequences on workforce. The Industrial Revolution also led to unemployment and, at the beginning, lower real wages. Although there was a slight improvement in standard of living over the period 1790-1840, there was “intensified exploitation, greater insecurity, and increasing human misery² (p.212).” The new working class organized itself in unions and won new work and wage conditions. The cotton mill was “the agent not only of industrial but also of social revolution, producing not only more goods but also the “Labour Movement” itself. (p.192)” The Marx's proletariat also lost struggles against the bourgeoisie but the class consciousness was growing and new political thoughts emerged.

What about the Information Revolution also called Third Industrial Revolution³, whose macroeconomic effects of diffusion were felt essentially since the end of the 1970s? Like the steam engine during the First Industrial Revolution, the Information and Communications Technology (ICT) has completely changed the way society organizes its economic activity. While the 18th or 19th century's machines replaced the manufacturing

¹ Beinhocker, Eric D. The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics. Boston: Harvard Business School P, 2006.

² Thompson, Edward P. The Making of the English Working Class. New York: Vintage Books, 1966.

³ Cf. section 2.

worker, the new “thinking machines” have been “increasingly capable of performing conceptual, managerial, and administrative functions and of coordinating the flow of production, from extraction of raw materials to the marketing and distribution of final goods and services¹ (p.60).” This new computer-based automation has led to a major decline of the global labor force, whether in the manufacturing sector or in the newly evolved service sector, which had been absorbing for more than forty years the job losses in the manufacturing sector. What John Maynard Keynes already called “technological unemployment” in The General Theory of Employment, Interest and Money, is now facing the entire society. As Peter Drucker argues, in the new economic order, the knowledge has displaced the labor and the capital as the key factor of production. While millions of low-skilled workers and an increasing number of suburban middle-income wage earners feel the bite of re-engineering and the impact of technological displacement, a small elite of knowledge workers, entrepreneurs and corporate managers reap the benefits of the high-tech global economy. This new social order in which inequality is based on knowledge represents a major challenge.² The knowledge society leads to important employment and social issues. Re-engineering, automation, outsourcing and offshoring have led to unemployment, underemployment and temporary work for the blue-collars, the African-Americans in the US or the suburbs’ inhabitants in France³ and globally all low-skilled workers. The reorganization of production is now also threatening the most important political group in developed countries – the middle class. Job insecurity leads to big issues in terms of social cohesion, violence and crime.

The education system, the social contract, the income redistribution, the working time and the whole role of state have to be rethought in order to take on the challenge of the knowledge-based society in a high-tech global economy.

The purpose of this paper is to compare the consequences of technology on the workforce in terms of income, employment and standard of living. It would be also interesting to study how the labor force struggles to take advantage of industrial revolutions and how it self-organizes. First, we will look closely at the current situation and the consequences of the Information Age on the workforce. Then, we will examine the First Industrial Revolution and the evolution of the working class condition during it. All of these should lead us to find the similarities and the differences between both technological revolutions and possible solutions

¹ Rifkin, Jeremy. The End of Work. New York: Jeremy P. Tarcher/Penguin, 2004.

² Drucker, Peter F. "The Age of Social Transformation." The Atlantic Monthly Nov. 1994: 53-80.

³ The French translation of the suburbs, “la banlieue”, often does not refer to the upmarket areas of the city but to the impoverished suburban areas on the outskirts of some cities. These neighbourhoods are frequently associated with social problems such as delinquency, unemployment and unrest.

for the 21st century social challenges. It would be interesting to speak briefly about the different transformations of technology between the 18th and the 21st century. Also we will look at the economic waves and industrial revolutions in order to connect through time the Information Revolution with the First Industrial Revolution and emphasize the role of the trends and the waves in the economic growth and capitalist development.

2. Technological transformation, waves and industrial revolutions

First of all, it is useful to give a concise definition of the First Industrial Revolution: it is the “transformation of technology based on new sources of power, the revamping of economic and labor organization through the factory system, and the ascendancy of manufacturing in what had been predominantly agricultural economies¹ (p.4).” When we generally think about the Industrial Revolution, we think of the one which began around 1760-1770 in Britain. But there is more than one industrial revolution. We can actually see three industrial revolutions since the 18th century, but before broaching this subject, it is important to look at the thoughts of two economists, Nikolai Kondratiev and Joseph Schumpeter. They made a wonderful contribution to economic history with their long wave theories. Nikolai Kondratiev first argued that the capitalist development was made of long waves, named by Schumpeter “Kondratiev waves”. These waves are 45-60 years long and represent one cycle of global economic growth. They are successive sine curves highly linked to innovations. According to his theory, we are currently in the 5th Kondratiev wave, the Information Technology one. The first era was led up by the steam engine, the second by railways and steel, the third by electrical engineering and chemistry, and the fourth by petrochemicals and automobiles. In his theory, he also divides each economic cycle in four periods: prosperity, recession, depression and improvement. Before Kondratiev, Clarke, Jevons, Marx, and Engels have already all emphasized the same point. They “all witnessed periods of unrest, economic turbulence, and great famines in the midst of overproduction and plenty. And they noticed the regularity of these ups and downs, as well as the great structural

¹ Stearns, Peter N. Interpreting the Industrial Revolution. Washington: American Historical Association, 1991.

changes that accompanied capitalist development¹ (p.73).” Taking up the thought of Kondratiev, Joseph Schumpeter showed the importance of history’s role in understanding capitalism. For Schumpeter, the process of capitalist development should be explained by a different phenomenon than equilibrium: by an “industrial mutation ... that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism² (p.83).” The five Schumpeterian long waves are: the Industrial Revolution (1771), the age of steam and railways (1829), the age of steel, electrical and heavy engineering (1875), the age of oil, automobile and mass production (1908) and the age of information and telecommunications (1971). For Schumpeter, the growth is driven by innovation: it is a cyclical co-evolution of technology, business models and institutions. However, some historians, like von Tunzelmann or Chandler, prefer to bring together the first and second Kondratiev waves as the “First Industrial Revolution”, the third and fourth ones as the “Second Industrial Revolution” and the present one, the Information Revolution, as the “Third Industrial Revolution”. Incidentally, Jeremy Rifkin uses this term in The End of Work.

3. The social issues of the Information Revolution

In the 1970s, the developed world entered into a new age, one of information. Since then, the Information and Communications Technology (ICT) has totally changed our way of life, leisure and our means of communication and information. Internet is obviously the best example of this technological revolution. But, as we will see, the Information Technology has had even more repercussion on the organization of the production and on the labor market, resulting in tremendous consequences on the workforce of developed countries. The ICT combined with the refashioning of the state, the Reagan-Thatcher years, the economic deregulation and the globalization made an explosive combination in terms of social issues.

¹ Freeman, Chris, and Francisco Louçã. As Time Goes By. New York: Oxford UP, 2002.

² Schumpeter, Joseph A. Capitalism, Socialism and Democracy. London: Unwin University Books, 1974.

Before dealing with the social consequences of the Information Age, it would be interesting to briefly look at the characteristics of the Information Age businesses¹ (p.10). First, mass production became mass customization in the Information Age. IT and information tools are key elements that make mass customization feasible. In the Industrial Age, labor served the machines. In the Information Age, technology serves the workers. Nowadays, the labor applies knowledge instead of performing repetitive tasks. Whereas Industrial Age businesses were based on command and control structure, information age businesses use common control structure. Finally, the most important asset and the key driving economic input in the Information Age is knowledge, not capital.

Let's look now at the crucial element for the workforce: employment. In fact, it is more useful to first look at unemployment. The main problem with official unemployment statistics is that it does not account for all unemployed workers. The unemployment rate of the United States, 4.7 percent in November 2007², does not take into account the millions of discouraged workers³ or underemployed people. In France, the official rate was 8.6 percent at the end of 2006: The French magazine "Marianne" annually publishes an unofficial unemployment rate, which in 2006 was around 18 percent⁴! Instead of the official 2.1 million unemployed people, the magazine counted 4.4 million people, including the "hidden" unemployed workers. In the United States, after the 1989-1992 recession, millions of "discouraged workers simply gave up and dropped out of the workforce and therefore were no longer counted in the official statistics. Many others were incarcerated. In 1980, the prison population stood at 503,000 inmates. By the year 2000, nearly two million people were in prison (Rifkin: p.xii)." Hence, we will rather look at the global trends in every big sector of activity; particularly the reorganization of production in the manufacturing and service sectors, and its resulting layoffs. In order to better understand the current transformations in production, it is useful to open a historical parenthesis.

In 1900, 36 percent of the Americans worked on a farm. They are currently less than 3 percent. During the first half of the 20th century, the manufacturing sector absorbed the majority of the useless farmers. In 1960, the blue-collars represented 34 percent of the U.S. labor force. This rate dropped to 16 percent in 1997 and it might be as little as 5 percent by

¹ Tjaden, Gary S. "Measuring Information Age Business." The Information Revolution. Ed. Alan L. Porter and William H. Read. London: Ablex Corporation, 1998. 3-21.

² US department of labor <www.bls.gov>.

³ According to Jeremy Rifkin, they were 4.4 million in the U.S. in 2003 (Rifkin: p.xviii).

⁴ "Baromètre du chômage." Marianne 10 Feb. 2007.

2020¹ (p.237). It is the third big economic sector of the 20th century, the service sector, that took over the manufacturing jobless. The services are currently employing four workers out of five. But now, even this economic sector, thanks to technological advancement, needs less and less of a labor force to run. Actually, the emerging knowledge sector seems to be the only one able to provide new jobs. One of the big challenges for the 21st century's society is that these jobs need high-skilled workers with high educational background. In order to show the evolution of the three traditional economic sectors, especially manufacturing and services, we will provide a few examples.

The first example is in the automobile industry, which in the U.S. provides one out of twelve manufacturing jobs. All automakers are re-engineering their production to increase productivity and thus eliminating jobs. At the end of 2005, General Motors announced that it would cut 30,000 jobs in North America by the end of 2008.² Between 1978 and 1993, GM had already eliminated 250,000 jobs³. As Jeremy Rifkin argues, "Robots are becoming increasingly attractive as a cost-cutting alternative to human labor on the automobile assembly line. The Japanese, far ahead of other automakers, have robotized much of their production lines (Rifkin: p.131)." With new thinking machines, intelligent robots, programming language, voice communication, the need for workers in automobile plants will dramatically decrease in the 21st century. Another example of this obvious trend can be found in the steel industry, which has been a leading sector of the industrialization process and has provided millions of jobs to workers in developed countries during the 19th and 20th centuries. This industrial sector is currently eliminating more and more jobs by introducing automation and information technologies. "According to the International Labor Organization, finished steel output from 1974 to 1989 dropped only 6 percent in the Organization for Economic Cooperation and Development (OECD) countries while employment fell by more than 50 percent. More than one million jobs were lost in the steel industry in OECD nations during this fifteen-year period (p.135)." Finally, according to a study published in November 2003 by Alliance Capital Management, 31 million manufacturing jobs were eliminated between 1995 and 2002 in the world's twenty largest economies.

What about the service sector where the majority of workforce is currently employed? This sector includes a lot of areas of activity: from retail to insurance, from transport to education, from healthcare to tourism and restaurants. During the 20th century, this sector

¹ Porter, Alan L., and Ann Bostrom. "Less Labor, Longer Lives: Time to Share." The Information Revolution. Ed. Alan L. Porter and William H. Read. London: Ablex Corporation, 1998. 237-257.

² <http://money.cnn.com/2005/11/21/news/fortune500/gm_cuts/index.htm>.

³ "GM Drive to Step Up Efficiency is Colliding with UAW Job Fears." Wall Street Journal 23 June 1993.

increased enormously to become the first economic sector in terms of employment. Nobody seriously thought that the service's jobs would be threatened by the displacing-labor technology. However, in the telephone industry, employment declined by 179,800 between 1981 and 1988 (p.142). In the postal service, more and more sophisticated machines became able to read addresses on letters and automatically sort them, much faster than traditional workers. Automation and computerization are just beginning in the service sector and we can predict that re-engineering and reorganization of the production will spread during the 21st century, creating many new layoffs. The wholesale and retail sectors have already been affected by the automation revolution. According to Jeremy Rifkin, "Electronic shipping is only a small part of the revolutionary changes taking place in retailing. Electronic shopping is also quickly penetrating the retail market, threatening the jobs of tens of thousands of sales clerks, managers, stock personnel, maintenance crews, security guards, and others who make up the retail employment complex (p.156)." For the moment, the only sector where new jobs are available is the knowledge sector. But for unskilled or even skilled blue and white-collar workers, the retraining is naive because of a weak educational background. One third of American adults is "functionally, marginally, or completely illiterate (p.37)."

In addition to unemployment, American workers are affected by underemployment. In November 2007, the work week for production and nonsupervisory workers was around thirty-four hours.¹ It clearly means that many employed people are underemployed. "In mid-2003, more than 4.8 million Americans wanted full-time work but were only able to find part-time employment (Rifkin: p.xvi)." On the other hand, the real wages in France and in the United States have also been declining at the beginning of the century, especially for low-skilled jobs. All of these changes in employment have consequences on consumer demand and economic growth as well. If workers lose their jobs, are underemployed or if wages do not increase enough to keep up with inflation, workers cannot continue consuming or only by using consumer credit. Jeremy Rifkin argues that "what's continuing to keep the American economy afloat is consumer debt (p. xvi)." The same increasing consumer credit happened just before the Wall Street Crash of 1929... Most economic and political leaders thought that the Information Age would have, as the previous ages, beneficial effects on workforce. The "trickle-down technology" which has applied for more than a century does not seem to work anymore. Jean-Baptiste Say, who argued that supply creates its own demand, was the first economist to theorize the technological trickle-down effect. Later, the neoclassical economists

¹ US departement of labor <www.bls.gov>.

argued that technological advancement increases productivity, allowing production of goods at a cheaper cost per unit. These lower prices would stimulate the consumer demand, which would itself in turn lead to additional production, creating a virtuous cycle of bigger production and consumption. Thus the initial layoffs due to technological advancement would be compensated by additional hiring to satisfy the higher consumer demand. Moreover, thanks to lower prices, consumers would have extra money to buy other products, which would stimulate production and employment in other parts of the economy (p.16). Unfortunately, the current working people of developed countries do not really feel this trickle-down technology. The only element which allows Americans to keep consuming is actually consumer credit. Indeed, with the end of the Welfare State, the new financial capitalism, higher and higher expected return on investment, the enterprises continually have to increase their profit margins. Karl Marx had already seen this underlying trend of capitalism when he published the *Capital*. He argued that the main producer's objective was to reduce labor costs and displace workers with capital equipment in order to get greater control over the means of production. Nowadays, with more and more market pressure on corporations, greater expectation of stockholders, pension funds and so on, the "wild" capitalism that Karl Marx was talking about 150 years before is facing the 21st century's labor force. Until the 1970s, the market economy has had positive impact on social conditions of the workforce. However, since then, social benefits gained by workers during the Keynesian area, have been shrinking. Jeremy Rifkin gives us relevant figures: "In 1979 the average weekly wage in the United States was \$387. By 1989 it had dropped to \$335. In the twenty-year period from 1973 to 1993, American blue-collar employees lost 15 percent of their buying power (p.168)." Adding to the new financial trend, the labor-displacing information technologies have increased misery among a important portion of workers. The inequalities are growing in all developed countries. As the wealth distribution remained quiet stable in the United States between 1963 and 1983, the income gap between the richest people and the workers have tremendously increased since the 1980's. Rifkin also underlines the huge gap between "a small cosmopolitan elite" and "increasingly impoverished workers and unemployed persons (p.173)." Finally, the Information Age is facing the growth of the new knowledge class, made of workers able – thanks to their better education - to take advantage of the new high-tech economy.

The current social transformation has terrible consequences on the workforce. The situation of the African-Americans and of the suburbs' inhabitants in France is a fine example of the social problems led to by unemployment, discrimination and poverty. The poverty rate

of African-Americans, which exceeded 33 percent in the early 1990s, was still more than 24 percent in 2006¹. The black community was hit the worst by the deindustrialization in the United States. When the Big Three auto companies began to lay off workers because of automation, African-Americans, who represented the bulk of unskilled workers, were the first to lose their jobs. As Jeremy Rifkin argues, “Permanent joblessness has led to an escalating crime wave in the streets of America’s cities and the wholesale disintegration of black family life (Rifkin: p.77).” In France, the situation for the immigrant people living in the suburbs of Paris or other cities is not better than in America. We can remember the French civil unrest of November 2005 when the whole country was “burning”. It was the consequence of years of unemployment and misery. In November 2007, young suburb’s inhabitants were rioting again, after the death of two young men. Christian Delorme, a priest in the suburbs of Lyon, answered to a journalist’s question; the meaning of the current revolts was the consequence of much suffering. He was shocked that the media and the politicians never talked about the huge unemployment suffered since the 1980s by the suburban population. He said that “The young people could legitimately believe that they were able to find a job twenty-four years ago. The despair was not the same as nowadays. ... The unemployment and the discriminations made them lose the confidence².” The French sociologist Loic Wacquant, Professor at UC Berkeley, studied both the “black ghetto” in the U.S. and the “working class banlieues” in France. He remarked the advanced marginality of a new “underclass” in the ghettos. After the Keynesian area, the ghettos have been transformed by unemployment and life deterioration. According to him, “For the residents of flagging working class areas, the reorganization of capitalist economies – visible in the shift from manufacturing to education-intensive services, the impact of electronic and automation technologies in factories and offices, and the erosion of unions ... have translated into unusually high rates of long-term joblessness and a regression of material conditions³ (p.10).” He questioned the refashioning of the state and the penal treatment to urban marginality. There is undoubtedly a correlation between job insecurity, unemployment and crime. A study also “showed a striking correlation between growing wage inequality and increased criminal activity (Rifkin: p.208).” While, in

¹ US Census Bureau <www.census.gov>.

² « Une haine née contre une accumulation de souffrances. Je suis frappé de constater que, dans le traitement médiatique et politique, jamais il n'est fait allusion au fait que nous sommes en présence de populations qui subissent un chômage massif depuis un quart de siècle. Il y a vingt-quatre ans, les jeunes pouvaient légitimement croire qu'ils allaient trouver du travail. La désespérance n'était pas la même. Lors de la marche, ils faisaient référence aux valeurs de la République. Le chômage et les discriminations ont eu raison de leur confiance. » "Trente ans de désespérance en banlieue." *Le Monde* 08 Dec. 2007.

<<http://www.lemonde.fr/web/article/0,1-0@2-3224,36-987383@51-982356,0.html>>.

³ Wacquant, Loic. "When Cities Run Riot." *UNESCO Courier* Feb. 1993.

the 1950s, workers had long-term employment, pensions, and promotions in the same enterprise for their all lives, they are now in a global workplace where unemployment, underemployment and temps are daily. In addition, the end of the Welfare State, of the “collective worker”, and the emergence of “desocialized wage labor” have drastically changed the life of the former working class.

To conclude this section about the social issues of the Information Age, it would be very interesting to approach the labor unions and their main weapon: the strike. As we will later see, at the beginning of the First Industrial Revolution, the unions did not exist at all. The workforce condition was awful. However, the labor movement gradually grew up, trade unions appeared and different social movements arose during the 19th century: The working class was organizing itself. In the 20th century, unions had an uneven development. We must remark here that the labor movement progressed during the post-WWII Keynesian area. This progress stopped around the midst of 1970s and the union membership declined until now. In 2006, 12 percent of workers were union members in the United States.¹ France has one of the lowest rates, only 8 percent. Two examples well illustrate the trend at the end of the 20th century. The first one took place in Britain, the cradle of unionism’s country. On January 1st 1995 ended a very long strike that had begun on July 1986. About thirty workers of the Keentons Sons Company picketed in order to protest against their layoffs while workforce was lacking. The picket has been lifted without any result and the strikers’ delegate declared: “Fifty years have been necessary to our forebears to set unions up. No more than fifteen have been necessary to destroy them.” This quotation was obviously referring to the Thatcher years². The second example is very symbolic. It shows us how technology can be used against the workforce nowadays, in the simplest possible manner... In September 1995, Detroit, one of the last American unionism’s stronghold, was witness to angry strikers who were blocking the entrance of a building in order to stop trucks from coming in. In order to skirt the strike, the management merely decided to helicopter the factory’s production above the strikers’ heads. This story tells us a lot about the situation: workers using struggle methods of the 1930’s outclassed by the modern technology³ (p.69). These two symbolic examples highlight the current defeat of the former working class. An American striker also said: “We have forgotten our historical heritage; we have forgotten to teach it to our children. We are paying the price now. We are struggling for the eight-hour day again!” Another union activist added:

¹ US department of labor <www.bls.gov>.

² Bairoch, Paul. *Victoires et déboires*. Vol. III. Paris: Gallimard, 1997.

³ Frank, Thomas C., and David Mulcahey. "L'envers du miracle économique américain." *Manière de voir* Oct.-Nov. 2007: 68-70.

“We have made so many concessions that we have forgotten what we learnt during the 1930’s. Everything has been conquered, not given. We must struggle from now on. The American middle class will otherwise disappear (p.70).” The current weak position of the trade unions may be one of the reasons of the decreasing workforce condition in the Information Age. According to Rifkin, “shorter workweeks and increased wages could have been tied to increases in productivity. Instead, labor capitulated (Rifkin: p.86).” Strong and resolute trade unions are of primary importance to gain better life conditions, higher wages and job security. Marx’s class struggle needs human beings to fight, and above all, the workers must have a “class consciousness”. We will see that the working class had to struggle during the 19th century to benefit from the productivity gains.

4. The social consequences of the First Industrial Revolution

We will follow the same approach we took for the Information Revolution to study the First Industrial Revolution. We will then begin to see how the material condition of the workforce essentially that of its new emerging component – the working class – changed during this industrial revolution and soon after. It means we will attempt to evaluate the evolution of the standard of living, of the real wages and unemployment. Then, as in the previous section, we will see how the working class experienced its new condition, its new social and political status and how it organized itself to exploit its numerical power and get better living conditions.

The Industrial Revolution began in Britain around 1760-1770. The emergence of the water-powered followed by steam-powered mechanization, of the cotton mills drastically changed the economic and social world course. The Industrial Revolution and the French Revolution of 1789, what Hobsbawm called the “dual revolution”¹, together transformed the world. The Industrial Revolution had enormous consequences on the production of goods since it led to the continual process of increased productivity. The First Industrial Revolution was the starting point of a virtuous economic cycle that increased the wealth of developed countries in an exponential way. However, we should wonder how this higher wealth has

¹ Hobsbawm, Eric J. The Age of Revolution. London: Weidenfeld and Nicolson, 1962.

been distributed at the beginning of the industrialization process, how the mill workers were living during the Industrial Revolution, and how this tremendous revolution in production influence the economic and social condition of the labor force.

We will so start by examining the material consequences that the Industrial Revolution had on the new working class. The standard of living is the element which best represents the economic condition of the labor force during the end of the 18th century and the beginning of the 19th. Did this standard of living increase or not during the industrialization process? It has been and still is a tremendous debate between historians. “Optimists” think that it increased, at least since the 1840s and “pessimists” such as Hobsbawm, highlight the increasing misery of workers during the industrialization and definitely exclude an improvement before 1844. Eric Hobsbawm, a “pessimist”, prefers to show the growing inequality when he says that “the gap between the rich and the poor certainly grew wider and more visible” (p.206). The long days of work in the factory were almost slavery and the wages were, at least until 1840, just enough to survive and to keep creating the surplus value¹. The new working man was certainly less free than the former serf. He had to work for longer hours than the peasants, until sixteen hours a day during the beginning of the Industrial Revolution² (p.620). Moreover, the “new factory proletariat” was “under the strict control and the even stricter discipline imposed by the master or his supervisors, against whom they had virtually no legal recourse and only the very beginnings of public protection” (Hobsbawm: p.208). In The Making of the Working Class, Thompson notices the controversy on the standard of living and the “ideological muddle” (Thompson: p.207). He attempts to do his own analysis. He claims that the condition of the majority did not get better between 1790 and 1830. However, during the union’s awesome period of 1832-1834, he catches sight of increasing real wages among organised workers. The workforce good time was very short because trade unions were beaten down as soon as 1833 until 1837, and the following four years were depressive for the economy. As Thompson says, the half a century following the very beginning of Industrial Revolution was not a success story. After almost eighty years of the industrialization process, the British standard of living still was at the point of subsistence (p.209). He concludes his analysis with two relevant affirmations. First, he notices “a slight improvement in average material standards” over the period 1790-1840. However, there was, at the same time, “intensified exploitation, greater insecurity, and increasing human misery”.

¹ This exploitation was very beneficial to the industrialization process and the economic growth of capitalist countries.

² Bairoch, Paul. Victoires et déboires. Vol. I. Paris: Gallimard, 1997.

While most workers were “better off than their 1790s forerunners”, the small increase in material condition was suffered as “a catastrophic experience (p.212).”

We will show now that work issues we have seen about the Information Age could be already found in the 19th century. Such phenomena as laborsaving technologies or unemployment are not new and actually appeared, or at least increased in the First Industrial Revolution. In The Condition of the Working Class in England¹, Engels shows in a brilliant way, using many statistical measurements, how machinery and technical innovations had displaced the human work in textile manufacturing. He already noticed that “every improvement in machinery leads to unemployment (p.151).” Engels also disproves the “trickle-down technology” argument. According to him, as to Jeremy Rifkin, this phenomenon cannot by itself solve the unemployment challenge caused by technological advancement and automation. On the other hand, Hobsbawn has been able to show that unemployment rates could reach 20-30 percent in the main industrial districts of Lancashire and Yorkshire during the depression years (Freeman: p.185). Like now, unemployment could last for more than a year in 1841-1842². However, since unemployment compensation did not exist yet, the new unemployed man’s situation was worse than today. Moreover, the workers persistently claimed that improved machinery led to wage reductions, although the bourgeoisie denied it (Engels: p.154). These unemployment and wage problems remind us the current situation. The current decreasing income of a large part of the low-skilled workforce leads to a decrease in consumption. This under-consumption had already been theorized in 1817 by the Leicester framework-knitters as “an under-consumption theory of capitalist crisis:

That in proportion as the Reduction of Wages makes the great Body of the People poor and wretched, in the same proportion must the consumption of our manufactures be lessened. That if liberal Wages were given to the Mechanics in general throughout the Country, the Home Consumption of our Manufactures would be immediately more than doubled, and consequently every hand would soon find full employment (Thompson: p.206).”

The social consequences on the working class condition, such as unemployment, exploitation, the sixteen-hour workday and in general very hard work conditions in the plants led to discontent and misery. The labouring poor were ready for the revolution...

¹ Engels, Friedrich. The Condition of the Working Class in England. Oxford: Basil Blackwell, 1958.

² Hobsbawn, Eric J. Labouring Men. London: Weidenfeld and Nicolson, 1964.

The new economic order which led to a growing income gap between the proletariat and the bourgeoisie was at the root of the revolutions of 1848. Moreover, as Marx argues, “with the development of industry, the proletariat not only increases in number; it becomes concentrated in greater masses, its strength grows, and it feels that strength more¹ (p.17).” Indeed, as the working class made up 20-25 percent of the working population before the Industrial Revolution, it accounted for around 60 percent at the end of the 19th century in Western Europe. Moreover, the new concentration of the workers in the mills built a revolutionary mass and made the class consciousness, “the working people’s consciousness of their interests and of their predicament *as a class* (Thompson: p.711)”, possible. As Marx argues, “the bourgeoisie forged the weapons that bring death to itself (p.14).” The first workers’ protest against the Industrial Revolution, called Luddism, was the action of machine-breakers, which just attacked the new threatening machines. This social movement took place in England between 1811 and 1816. On the Continent, both revolts in 1831 and 1834 of the Lyons silk-workers, the *canuts*, may be considered as part of the Luddite movement² (p.451-452). The trade unions, which rose up around the early 1830s in Britain, were the result of the need for the permanent mobilization of the working class. As Hobsbawn highlights, “A decent livelihood could not be achieved merely by occasional protest which served to restore the stable but temporarily disturbed balance of society. It required the eternal vigilance, organization and activity of the “movement” – the trade union, the mutual or co-operative society, the working-class institute, newspaper or agitation (Hobsbawn 1962: p.209).” Large strike movements took place during the first part of the 19th century. Since there was no political means to defend the workers’ interest before the Chartist movement, the social movement was the only one way for the workforce to gain part of the economic growth’s benefits. Chartism started in 1838 in Britain. The Chartists obtained millions of signatures between 1838 and 1848 in order to grant new political rights to the working class. But all petitions were rejected by Parliament and universal suffrage for men over 21, which was one of the most important demands, only appeared decades later, in 1918. Meanwhile, on the Continent, the social revolutions of 1848, the “Spring of Nations”, were brutally repressed. However, all of these social and revolutionary movements were not fruitless. Rather they were the roots of the political and economic improvements for the following generations. They were the beginning of the long struggle of the working class, the start of the great labor movement for better living and working conditions. Last but not least, new

¹ Marx, Karl, and Friedrich Engels. The Communist Manifesto. Filiquarian, 2005.

² Bairoch, Paul. Victoires et déboires. Vol. II. Paris: Gallimard, 1997.

political thoughts, such as socialism, emerged. This new emancipation idea was growing up throughout the 19th century. First were the utopian socialists¹, such as Robert Owen in Britain and Saint-Simon in France. In 1848, Marx and Engels published the Communist Manifesto which would have enormous consequences on 20th century's history. Actually, the whole Marxist theory would have a dramatic influence on the 20th century revolutionary's thought. Finally, in 1864 appeared the first International Workingmen's Association. One hundred years after the beginning of the Industrial Revolution, the workforce was at last internationally organized. As a symbol, the First International was founded in London, in the country where Industrial Revolution was born. From then on, the working class, conscious of its collective power, was armed to struggle.

5. Conclusion:

We will conclude this study by first comparing the consequences of both industrial revolutions. The modern workforce's living conditions are so much better than in the 19th century that it is irrelevant to compare the current standard of living with that of the First Industrial Revolution. For that matter, we must recognize that the industrialization process and its underlying dramatic economic growth have a very beneficial long-term effect on workers' condition. The growth of productivity and wealth were necessary conditions, but not sufficient ones. The working class of the 19th and 20th centuries struggled through trade unions and political parties. The emerging "communist" countries all around the 20th century's world and the fear of socialist revolutions might also have led to the social compromise, fairer distribution of wealth and the Welfare State. And we said, the comparison of both revolutions in terms of wages or living conditions is useless. However, we may compare the *evolution* of wages, unemployment and standard of living during these two transformation's processes. For the moment, in the developed countries, the majority of the workers is still employed and still has good living conditions. However, we have been entering in a global process of re-engineering, worldwide reorganization of production using new information technologies and the automation to lay off developed countries' workers in

¹ Term introduced by Marx and Engels in The Communist Manifesto.

order to reduce labor cost and thus increase the profit margins and the stockholders' dividends. We can already see the social consequences of this new economic order. The most vulnerable people are the youth, the low-skilled workers, the African-Americans in the United States or the poor suburban inhabitants in France. The new urban underclass is growing up and leads to dramatic consequences on social cohesion and security. In a world where automation is putting more and more workers in the manufacturing and services sectors out of a job, the Welfare State has created a new urban marginality. According to Loic Wacquant, a new class, the "precariat"¹ is emerging. The trinity of "sans", job-less, home-less and paper-less migrants² are also leading to enormous social challenges. As Wacquant argues, the great dilemma is how to organize the precariat. We should add that the great challenge for the labor force as a whole is how to reorganize itself to gain a portion of the Information Age's economic profits, and also, how to build new global solidarity between workers of China, Brazil, Germany, India, Canada and so on. As we have already seen, it is the union of all workers and their struggles which compelled the upper classes to make concessions. Finally, we must realize that labor has totally changed. Thanks to automation, almost all manufacturing production is done without workers, and services need less and less workforce. The knowledge sector will remain the only one to need human intelligence; at least until the thinking machines are intelligent enough to displace the knowledge workers. Our society's challenge is thus to educate people in order to have high-skilled workers. This requires a remaking of the education policy. For the other workers, as Rifkin suggests, the development of the social sector or the reduction of the work week³ are possible solutions. The sharing of productivity gains and the redefinition of the social contract might also bring down the increasing poverty and the precariousness. The actual issue is how we want the production gains of the Information Revolution be distributed, how we want the coming world be.

¹ Precariat is a mix of proletariat and precariousness.

² <http://sociology.berkeley.edu/faculty/wacquant/wacquant_pdf/LW-TERRITORIALSTIGMAGEADVDMARG-Proofs.pdf>

³ We must remember that the work week, which lasted more than 80 hours at the beginning of the First Industrial Revolution, decreased to 60 and then 40 hours with the advancement of technology and the Second Industrial Revolution. The French reduction of the work week from 39 to 35 hours, introduced by the government of Lionel Jospin had good consequences in terms of unemployment and leisure. However, Nicolas Sarkozy, the new French President wants to cancel, or at least to "adapt", this social measure.

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