Information Technologies, A New Global Division of Labor, And the Concept of Information Society

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Abstract

Utilizing the "old" economical theory of Marx and its conceptual apparatus, we indicate a possibility of **decomposition** of capitalistic economic and political systems; the decomposition can be brought about by **new global division of labor**. We make an attempt at proving the existence of exact correspondence of the ICT revolution and the **efficiency (productivity) of the knowledge production process**; the latter has been tied to general laws of the "old" theory, that is the issue of migration and especially concentration of capital. We propose a new way of looking at the issue of the so-called Information Society.

Key words: global division of labor, Information Society, ICT, production of knowledge, productivity, Marx.

Introduction

One can get the impression that due to the deep economic crisis around the world, our attitude to the 19th century theories of capitalism – and to Marx's studies in particular – has changed. We must admit that the author of *Das Kapital* would be surprised to see newspaper headlines (Spring 2009) postulating widespread nationalization of many sectors of American economy, including banking. This belated Atlantic affirmation of the theory of the genius from Trier will soon – as one might guess – cease; you nearly can't hear it yet. However, until it is fresh in our memory, I suggest we jump at the opportunity and use **Marx's "old" theory of economy and its conceptual apparatus** to analyze the present form (stage) of development of the capitalist system. I believe that such an analysis will help us better understand the fundamental changes in the global economic mechanism, in particular the emergence of a new **global division of labour**. Apart from that, it may help us get a better insight into the **essence of the changes** caused by the IT revolution and the role of the latter in the change of **productivity of scientific knowledge production process**. It all greatly simplifies the discussion on the so-called information society.

I present my points in the following order: in point 1, I am trying to present the core of the IT revolution. The analysis is to justify that the achievements of information technology determine the above productivity of knowledge production process, especially as regards scientific knowledge. In point 2, I am confronting Marx's "old" theory of economy and its conceptual apparatus for the first time. I am recalling the rather obvious relation between the quality of generated scientific knowledge and the quality of "means of production" used to generate it. Point 3 is another meeting with Marx's "old" theory of economy and its conceptual apparatus: the notion of capital migration and concentration is used to present the changes affecting the "traditional", if we may call it this way, investment activity. It is about the migration of capital to research industries and its subsequent concentration. In point 4, we will cross paths with Marx's theory for the third time. The analysis will take into account the global business transactions conducted by cross-border corporations. I will try to justify the point about the emergence of the new, global social division of labour and to describe its most significant consequences (in the context of the tasks set forth). In point 5, I will use the most important results of the previous analysis to suggest a different approach to the issues of the so-called Information Society.

1.

The thesis that the IT revolution changed our life on Earth has already been convincingly justified; it has been confirmed for almost 30 years in the work of many researchers, including the participants of the ETHICOMP conference. The question still open is the general, theoretical analysis of the functioning of the capitalist system in its present form – with global economy and markets, with an absolute advantage of cross-border corporations, with a fundamentally changed, the so-called **productiveness of labour**, etc. The last change – as we all know – is a **direct result of technological development** – an indirect result of research development, and an indirect result of the aforementioned **IT revolution**. This revolution determines – that's obvious – the **productivity of all manufacturing processes in the economy**, hence it influences **the knowledge production process**, and above all – the process of **scientific knowledge production**.

A question should arise how does the IT revolution determine the productivity of knowledge production process, scientific knowledge in particular?

An unprecedented achievement of the IT revolution is certainly a qualitative change in the social systems of communication – this peculiar and important **decomposition of the communication area of the whole species**. When this issue needs to be illustrated, the humanists usually reach for the following examples: a computer network and its services, mobile and satellite telephony, computerized cable telephony – also traditional mass media – press, television and radio. All these systems to a various extent make use of sophisticated information and communication technologies, without which none of the related media can function at all. Do we know how this technology works?

Let's have a look at one gadget from this technological field, one of today's most popular – a mobile phone. Using subtle electronics, specialized microcomputers have been built (I mean this is what our cell phones really are) and they have been connected into a strange network system; each system component, after it's turned on, becomes a node within the system. A cell phone network – like any other IT system – forwards data generated in its nodes.
The data generated in the network system nodes are audio signals representing human speech, converted into digital data stream. A telephone must first create them and then send them at a considerable speed into the network, so that on reaching the recipient's phone – after they are decoded and re-transformed into acoustic signals – they can be received by human ear. It is assumed that the time for: data processing and preparation in the broadcasting node, transferring the data through the network into the receiving node, and last – re-transforming the data in the receiving node into acoustic signals, **must be short enough** for the people talking on the line to have the impression they are talking face to face.

Human speech is not a big challenge for today's microcomputers. Sampling such a signal at a frequency of 8 kHz using 13-bit recording format for the recording of each data stream sample, we will generate a sample of 13 kilobytes per second. Once they are encrypted (or rather compressed), one cell phone "pushes" about 13 kilobits per second into the network.
Small data streams can be easily converted into a river of data and the latter in a real ocean of digital information. Let's try to count: a thousand callers charges the network with 13 megabits per second, a million callers gives 13 gigabits per second, etc. Each of these one-million portions of data pushed into the network every second must be permanently controlled. First, it must be accepted for expedition and carefully labelled (from whom) and addressed (to whom). Then the best transmission route must be found in order to transfer the data, which is then verified for completeness. Next, a note on transfer parameters is recorded (including start time, duration, amount of data, etc.) for storing in an archive (for billing purposes). And all that in a millionth of a second, every second.

To effectively complete such a complex task, **every second of the system's work** requires an incredibly huge, **gigantic number of calculation operations**. Only the process of controlling and recording data used for billing purposes requires hundreds of thousands of measurements be made within a fraction of a second, let alone the resulting calculations. They may not be too complicated in terms of mathematics, but they must be completed in a dramatically short period of time – time counted in a millionth part of a second. **At the moment we have no other technology capable of undertaking such an enterprise**.

Or let's take another, very contemporary example: human genome contains nearly 3 billion nucleotide pairs. Loose estimates [Wikipedia] say that in order to print its record, we would have to use hundreds of volumes the size of a phone book from a city of a 5-million population.

Only these data show the dramatic **qualitative gap** which separates the times of science using notebooks and pencils – and an abacus – or maybe even a logarithmic slider, then an electronic calculator – from nowadays, when the results analysis – not to mention the measurement process, that is data collection for subsequent studies (calculations) – requires calculations on data sets containing billions of billions of components. Taking account of the operation called sequencing (microbiology, genome) creates a research situation where the broadly understood measurement, evaluation and comparison must be applied to data sets of sizes ranging from 10^{12} to 10^{18} elements – or perhaps even bigger. Should only one such measurement and comparison of the obtained results take only one second – I will only remind you that one year is approximately 3.2×10^7 seconds – the conversion of such a collection of figures without fast computers would take hundreds, or maybe even thousands of years. Which means it would be impossible to **complete it within a reasonable period of time**.

We also have to add that microbiologists have for some time now used computer models simulating biochemical process in the cells. These are standard procedures in branches of science in which computer simulation **is actually the only way** to complete calculations reaching billions operations per second.

So, the fundamental achievement of the IT revolution comes down to the transformation of **each social activity undertaken to satisfy our needs** into a homogenous galaxy of encoded information. The transformation is made using electronic machinery working at unimaginable speed (productivity). The same unimaginable speed (and productivity) is used to process ("calculate") the galaxy of encoded information according to a preset scheme and eventually – also at an extreme speed – to restore its "natural" qualitative diversity from which the whole process started.

Once again, the essence of the IT revolution comes down to a **universal (and universalizing) tools** working at enormous speed. It can convert a variety of **qualities** into uniformity of encoded information, which after processing (purely calculation operations) can be restored to their original, qualitative diversity – of course, in a transformed form. Thanks to that, a large number of activities undertaken by people in order to satisfy their needs can be competed dramatically fast, with extreme efficiency, in an extremely safe manner, etc. **Or** – which is of fundamental importance for our analysis – can be undertaken at all (**like in the case of the identification of the human genome, for example**). And this is why we can believe and state that the IT revolution, like no other revolution, **determines the productivity of the knowledge production process** – especially scientific knowledge.

2.

There is a fragment in the introductory parts of the first volume of *Das Kapital* (chapter 1, "Commodities") in which Marx conducts a subtle analysis of fundamental importance for the whole work, i.e. the analysis of relations between the prices and the values of the "world of commodities":

"*(...). The value of commodity would therefore remain constant, if the labour-time required for its production also remained constant. But the latter changes with every variation in the productiveness of labour. This productiveness is determined by various circumstances, amongst others, by the average amount of skill of the workmen, the state of science, and the degree of its practical applications, the social organisation of production, the extent and capabilities of the means of production, and the physical conditions. (...)*". [K. Marx, Capital, Volume I, Progress Publishers, Moscow, 1954, p. 47]

I recall this issue for several reasons. Well, human uses a variety of **tools** to produce all that he/she needs as a historically developed social being. Some tools are very simple and have not changed for hundreds of years (e.g. a hammer, a plane, an axe), but other – such as **digitally controlled robots**, are a true technical masterpiece. The precision and speed of operation, the incredible versatility (multifunctionality), low energy consumption, remote functionality control etc. – the latest generations of these tools are separated from their predecessors by 25-years' qualitative gap.

For the production of these and similar tools – or speaking more broadly – **means of production** – we need one more important component – **knowledge**. To build a modern, digitally-controlled industrial robot, we must have **top quality scientific knowledge** including many specific disciplines. This raises a question: where to get the knowledge required to produce a robot or other precision tools (means of production) and goods we need for living (more generally: for the social conditions of life reproduction)?

In a capitalist economy based on commodity and money, especially at the present stage of its development, knowledge can (actually) be produced in the same way as most of other technically and technologically advanced products. You get financing for the construction and furnishing of laboratories, you employ scientists and specialists and after some time – as it usually happens in every other business – you get the product – a technical or technological solution, a new technology, new production materials, plants, chemicals, etc. Sometimes the product is just "pure theory". We sell such it to a contractor or we offer it on the market like **any other commodity**.

Knowledge production, as is commonly known, does not only depend on the size of the capital involved. Of fundamental importance are two other essential elements of the production process – the workforce qualification (quality) of direct manufacturers – i.e. **the scientists and the specialists** – and the **quality of tools** they use. Only such a combination – sufficient financial resources, highly skilled "scientific workers" and the best possible "research tools" – guarantee the best quality of knowledge required by the market. I emphasize it because – as has been already pointed out – telecommunication and information technologies have impact on the productivity of knowledge production process by providing the best quality tools for its "production".

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We must also add that the knowledge required for the production of everything that a human needs or wants is – and it is also commonly known – diversified. For example, the technology used for producing hair dye offering permanent colour marked as "dark" is something different than the technology used for the production of transgenic soya resistant to certain herbicide or

the production of reactor fuel – let alone the technology used for manufacturing nanorobots. This is why an important distinctive element is the **importance, which a given area of knowledge (technology) has for the interests of a country (or a corporation) in which or for the money of which it was developed**. This is one of the sources of strength for the complicated system of arbitrary patent and legal regulations used by institutionalized violence to support those **who will violate the rights of an individual, of other countries or fundamental international conventions for the sake of maintaining the exclusiveness of use of a certain technology.**

3.

The analysis of global financial markets in the last 50 years shows that the **production of broadly understood knowledge** involves enormous funds. Thanks to that, we could observe an unprecedented and incredible increase in the quantity and quality in this peculiar **field of economy**. The scientific and technical revolution that has taken place over that time – the IT revolution being only its fundamental component – confirms the effectiveness of such an investment strategy – **investing in research industries, in the creation of knowledge production industries**.

We have long known that knowledge production may be **a more profitable business** than steelworks or coal mines. Thus – and these are the **principles of Marx's "old" theory of economy**, at any given time and in a given economy, some capitals will move from industries based on raw materials (or "normal", production ones) to knowledge production industries, promising higher profit. **Such a process can be stimulated in a planned way** through rational financial policy of the state, the immigration policy, etc. The United States have for many years appeared as a good example of such solutions.

Along with the migration of capital to knowledge production industries, we will also observe it becomes more **concentrated** – of course, after a certain time and along with the development of this field of economy. Let us remind ourselves that according to the diagnosis formulated by the author of *Das Kapital*, the progressive concentration of capital is the inherent feature of the **entire** capitalist economy; therefore, it must also refer to the **knowledge production industry**. The combination of at least two system trends – the migration of capital to knowledge production industries and its concentration – and **the desire to control the species-strategic production branches** creates a situation in which **the global process of knowledge production** is dominated by capital controlled by people (corporations) and state institutions located in selected geographic territories of the planet.

Just in case, let us remind ourselves that the migration of capital to research industries does not mean that other industries located in a given territory will no longer use, for example, steel or coal. The materials will be bought elsewhere in the world – where their mining or production is locally profitable, and where **the local capital has no real investment alternative** between the production of knowledge and materials.

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As we all know, the homeland of computer technologies (information or telecommunication and information technologies) is the United States. It was the first place to use them as tools – originally in support, then also as a replacement to a variety of efforts undertaken to satisfy our needs. **The U.S. has not allowed this leadership to be taken from them until today**, and since the 1980s, they have strengthened them in a manner almost **excluding any attempt at real competition**. The control over the strategic nodes of the Internet and the global positioning system (GPS) are just the most spectacular proofs of this domination.

The U.S. also have a long tradition – reaching the second half of the nineteenth century – of

investing major capital in knowledge production areas and, as I have mentioned before, a positive tradition of creating perfect working and living environments for scientists and top-class specialists. As we have proven before, this is an essential factor determining the success in this peculiar, nonetheless very important field of economy. Therefore, it comes as no surprise to anybody that that it is the U.S. that has for many decades produced knowledge upon which economic processes of fundamental importance for life on Earth depend, in the recent years also including natural processes.

4.

We have already mentioned that the today's stage of social development is characterized by: (a) **global business operations of large, cross-border corporations** and (b) **unimaginable concentration of capital** (on a global scale). We can read in a report by the Institute for Policy Studies [*http://www.corporations.org/system/top100.html*] that "51 largest 'economies' in the world are corporations and only 49 are countries". Let us recall here – just in case – that the domination of cross-border corporations and the extraordinary global concentration of capital are the result of complicated and long-running economic, political and military processes. Many economic and political crises, wars, military coups, secret service operations, demonstrations of mass destruction weapons, progress of medicine, new scientific discoveries and technologies etc. – they all have had impact on it. This is what Marx's "old" theory of economy holds.

Cross-border corporations, whose suggestions for a long time now have had impact on the governments of the most powerful nation-states, may invest their capital in research (information) industries, using the existing and creating new branches of knowledge production. Here, too, no reasons can be seen for which **the migration – and especially the concentration of capital** – could not develop to a level beyond the reach of many "normal" nation-states. Right now, we can venture to suggest that the **control** of the global knowledge production process **does not depend upon (national) governments** but is rather **the domain of large corporations**. By definition, they are not limited by any geographical territory, but for obvious reasons they MUST use them. Depending on various factors, they will focus on first league territories (like U.S., UK, Japan), second league (such as China, India) or still others. Of course, there are possible alliances with local, national research industries in different places around the world; in extreme cases, it will be a relatively small network of research institutes, or even a single university. No need to ask who will decide about any research-related issues in this case.

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To sum up the current discourse, we can conclude the following: (a) the inter-branch flows of capital and its concentration at the national and super-corporate level, (c) the developed (and monopolized) advantage in the area of IT technologies and other areas of knowledge production – at the national and super-corporate level – all this **results in a new, global division of labour**. Its essence – as I can see it today – manifests itself in the fact that some of Earth's population can focus on the self-controlled and carefully protected territory producing scientific knowledge and state-of-the-art technologies, that is everything that drives and underlies the changes in the **global productiveness of labour**. This community may – on a global scale – achieve a status which even a few decades ago – at an earlier stage of civilization development and in a totally different dimension – belonged to institutions and people focusing on the **production of knowledge at the local level** – in "separate", "national" capitalist societies. This process, describable and empirically confirmable in a manner characteristic of natural sciences, can lead to interesting conclusions (and assumptions) on the condition of today's capitalist economy and on the transformation of the whole social and historical process dominated by this formation.

Taking over the control over the process of changes in productiveness of labour determining the **productivity of knowledge production industries** and its monopolization should be regarded – and this is my opinion, anyway – as the most revolutionary change in the history of mankind – in the entire social and historical process. Let us repeat – there is a relatively **small community** (a corporation or a state institution) which can **monopolize** (on a global scale) the **process of change in the productiveness of labour in knowledge production industries** – which means it may indirectly monopolize the process of knowledge production on the planet – thus indirectly taking control of the global process of manufacturing everything a human being or the Earth's natural environment needs and will need.

5.

Looking at the records from the history of science and invention since – let's assume – the turn of the 18th and the 19th century, we will observe a certain regularity. There is – and let's assume this to be our starting point – a single genius working in a small laboratory full of retorts, melting pots, gas burners, mineral samples, plants, cabinets filled with dead animals and insects, voltaic piles etc. It happens sometimes that the laboratory and the "research programme" are paid for by the inventor him/herself. But even then – and the Darwin case is a classic example of that – some projects could not be carried out without serious financial support of third persons and/or institutions.

This touching image of a "scientist's workshop" is quickly replaced with "knowledge manufactories" which are transformed at the turn of the next century into real factories. There emerge the stubs of future research industries which cannot function without remarkable financial commitment.

Since the very beginning, that is since the times of the "scientist's workshops", knowledge production has been entrapped – generally speaking – by **national economies**. It has not been – and is still not – a surprise. For many decades, the capitalist production has functioned in this very way (national economies) and the cross-border corporations, so frequent in today's economic landscape, were of little importance (if any).

However, the capitalist mode of production has evolved over time, although the basic objective of the system – to maximize profit – has not changed. When it became clear that this goal cannot be achieved within national limitations – they were rejected. The national corporate forms HAD TO be replaced by cross-border forms (super-corporations). This is the vision of the present, but mainly the future, of the economy and research industries.

And by the way: the development of the capitalist system has led us to where it has been easily noticed that knowledge production is a profitable business. Since then, both the capitalist economy and the knowledge production process are subject to different rules – different from the times when knowledge was created in "scientist's workshops", "knowledge manufactures" or the first "factory (industrial) forms". This is undoubtedly a new quality in the historical process. Indeed, an important factor in this new situation is that **scientific knowledge is produced as a commodity – for profit**. In other words, production of a certain type of knowledge is interesting for a corporation (a national or a cross-border one) **as long as it serves the purpose of generating (maximizing) profit from the invested capital** – such are the principles of Karl Marx's "old" theory of economy.

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Presently, it is difficult to indicate an area of science, which would achieve spectacular results without gigantic money. There are disciplines in which the minimum investment (just sustaining the life of a discipline) must exceed the GNP of most countries in the world. This

has influenced and will influence the "geographical deployment" of research industries. Because, on the one hand, we have the state – a great (and in the past even the greatest) source of funds for research, on the other hand, we have corporations – increasingly serious sources of funds, and maybe the only ones in the future. **All of them** – providers of astronomical research funding – **are usually connected with a certain continent, country, area and/or field of economy**. Therefore, it is easy to justify the conclusion that the highest quality research, which – let us repeat – requires enormous funding, will most likely be carried out in places (geographical location) and in such a way (the most widely understood management) as agreed and accepted by the owners of the funds spent on it. It is obvious that also the profits from this activity will stay where the corporations want them to.

We have made a circle and we can now reach for the conclusions we have made so far. The global capitalist system, in the course of its own development, transforms its production mechanism so that a relatively small community of people (on a global scale) monopolizes the manufacturing of a **product** fundamental for the satisfaction of nearly ALL historically developed needs of a human being. The product is **contemporary scientific knowledge**. It is worth considering whether this approach to "research industries" – the way we look from the angle of Marx's "old" theory of economy and its conceptual apparatus – does not contribute to a better – and more meaningful – understanding of the so-called **Information Society**.

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