

Olena A. Grishnova¹, Tetyana O. Kostenko²

INFORMATION TECHNOLOGIES WITHIN THE SYSTEM OF NOVEL FACTORS OF LABOUR PRODUCTIVITY GROWTH: TRENDS AND PARADOXES

The article reveals the role of information technologies as one of the key factors in labour productivity growth under current conditions. Various approaches to informatization influence upon the social labour relationship and through them – upon the labour productivity are systematized. The contribution of information technologies into the average annual growth of labour productivity in a range of countries is demonstrated. The impact of IT on the system transformation of social labour relations is studied by a set of parameters.

Keywords: labor productivity; productivity growth factors; information technology; informatization; telecommuting; outsourcing.

Олена А. Грішнова, Тетяна О. Костенко

ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ В СИСТЕМІ НОВІТНІХ ЧИННИКІВ ЗРОСТАННЯ ПРОДУКТИВНОСТІ ПРАЦІ: ТЕНДЕНЦІЇ І ПАРАДОКСИ*

У статті розкрито значення інформаційних технологій як одного з основних чинників зростання продуктивності праці в сучасних умовах. Узагальнено різні підходи до впливу інформатизації на соціально-трудові відносини і через них – на продуктивність праці. Показано внесок інформаційних технологій у середньорічне зростання продуктивності праці для окремих країн. Досліджено вплив інформаційних технологій на системну трансформацію соціально-трудових відносин за комплексом характеристик.

Ключові слова: продуктивність праці; чинники зростання продуктивності праці; інформаційні технології; інформатизація; телеробота; аутсорсинг.

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Елена А. Гришнова, Татьяна О. Костенко

ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ В СИСТЕМЕ НОВЕЙШИХ ФАКТОРОВ РОСТА ПРОИЗВОДИТЕЛЬНОСТИ ТРУДА: ТЕНДЕНЦИИ И ПАРАДОКСЫ

В статье раскрыто значение информационных технологий как одного из основных факторов роста производительности труда в современных условиях. Систематизировано различные подходы к влиянию информатизации на социально-трудовые отношения и через них – на производительность труда. Показано вклад информационных технологий в среднегодовой рост производительности труда для отдельных стран. Исследовано влияние информационных технологий на системную трансформацию социально-трудоовых отношений по комплексу характеристик.

Ключевые слова: производительность труда; факторы роста производительности труда; информационные технологии; информатизация; телеработа; аутсорсинг.

Problem setting. Current rapid scientific and technical progress accompanied by social changes dramatically transforms human lives. Both communities and individuals come into possession of powerful technologies making lives more comfortable

¹ Taras Shevchenko Kyiv National University, Ukraine.

² Taras Shevchenko Kyiv National University, Ukraine.

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and the realization of broad spectrum of creative ideas significantly easier to achieve.

The socioeconomic systems at the present stage of development let information technologies (IT) permeate virtually all the spheres of human activities. The information technologies have swiftly become a vital developmental stimulus for the world economy. They let individuals as well as companies and public institutions solve their social and economic tasks more efficiently and creatively than ever. The positive influence of the information technologies on the efficiency of economic systems is one of the decisive factors of socioeconomic development which deserves to be studied thoroughly and critically.

Recent research and publications analysis. It should be noted that the rise of the information technologies has given birth to the notions of the economics of information (Stigler, 1961), information society (Toffler, 2000) and postindustrial society (Bell, 2004). The problems, related to the creation, usage and influence of IT by the modern society are studied by A.A. Chukhno (2001), O.P. Dubas (2011), N.A. Guk (2011) and other Ukrainian scientists. This topic is actively investigated by their numerous Russian colleagues, such as V.L. Inozemtsev (2000) and V.B. Britkov (2012). M. Kastels (2001) is one of the influential investigators, whose theory of information capitalism in the network society has contributed to the development of information technologies.

Nonetheless, some problems associated with the influence of IT on labor productivity are still understudied.

Under the influence of the global processes caused by the scientific and technical progress a set of decisive factors affecting labor productivity is being transformed. Dynamic development of IT, which has manifested itself with exceptional intensity during the last two decades, became the most important of the mentioned factors.

The research objective is to determine the contribution of information technologies to productivity growth and to characterize major changes of social and labor relations under the development of new technologies, including the IT industry.

Key research findings. IT can be defined as a multitude of tools and methods for collecting, processing, storage and transmission of data for the purpose of obtaining a qualitatively new information about the state of an object or a process, or a phenomenon (Britkov, 2012).

Though nobody doubts nowadays that IT do facilitate the growth of labor productivity in the high-tech sectors, their usefulness for other sectors is still an open question.

The majority of early investigations have failed to reveal any significant correlation between IT and labor productivity. For example, according to S. Roach (1987), the amount of investments into information technologies per workplace in service sector has grown during 1977–1986 several times, yet the productivity of an average worker has not significantly changed. The data presented by K. Morrison and E. Berndt (1990) demonstrate the negative influence of IT development on labor productivity. G. Lopveman (1994) and B. Barua (1991) have noted the lack of convincing arguments capable of refuting the presumption of the independence of IT investments and labor productivity. B. Prasad and P. Harker (1997) assert that the influence of IT on banks efficiency is zero or even negative. The companies spending their IT-

budgets predominantly on the support of the existing IT systems in average outperform the ones opting for the implementation of new information technologies. The probable explanation is the prolonged support for the existing systems lets the staff get further along the learning curve and thus use them more efficiently.

In 1987 an American economist and Nobel laureate R. Solow said: "You can see the computer age everywhere but in the productivity statistics". In economic publications this quotation known as "the Solow paradox" is often referred to in conjunction with the fact that during the 1970–1980 period the American economy productivity has been demonstrating the negative dynamics despite the annual increase of investments into the IT sector by 20–25%. The IT expenditures in the US has risen from 7.1% of the GDP in 1992 up to 8.3% in 2000 (Vakhitova, 2007).

The Solow paradox can at least partially be explained by the imperfections of the used measurement methodology which ignored some of the productivity aspects (such as improvements in the quality of the production and the working conditions enhancements in various areas). Another explanation has been offered by the so called Davis's delay hypothesis. An Oxfordian investigator of the economic history P. David (1990) has come to the conclusion that the impact of electrification on the other areas of the economy has become noticeable only in 40 years after its beginning.

A comparable number of investigators whose data deserves to be studied with as much attention have concluded that the contribution of IT to labor productivity is beneficial.

Thus, E. Brynjolfsson (1996) and F. Lichtenberg (1995) have shown that the aggregate contribution of IT to labor productivity is positive. Moreover, F. Lichtenberg has indicated that the positive effect of IT is exceptionally strong and stable and that in terms of productivity 6 IT-illiterate workers can be substituted by just one IT user.

Using Cobb-Douglas production function E. Brynjolfsson and L. Hitt have concluded that computers contribute to the firm-level output significantly. They found that computer capital contributed an 81% marginal increase in output, whereas non-IT capital contributed only 6%. E. Brynjolfsson and L. Hitt (1993) have estimated that the added benefits brought by IT during a year practically correspond to the costs of their implementation. Moreover, in a long-term perspective two- to eightfold payback is to be expected. According to K. Whelan (2000), computerization is responsible for 0.8% of the aggregated annual GDP growth in the 1996–1998 period.

E. Brynjolfsson (1996) believes that during 1970–1990 0.3% of the averaged annual economic growth is attributed to the spread of IT. R. Gordon (1998) assesses that in the USA the use of IT during the second half of the 1990s has diminished the annual inflation by 0.5–1%. S. Oliner and D. Sichel (1994) ascribe 1–1.1% of the annual growth of GDP in the USA during the second half of the 1990s to the development of information technologies. Moreover, these authors believe that IT are responsible for up to two thirds of the labor productivity growth observed in the USA during the second half of the 1990s.

Towards the end of the 20th century the productivity growth in the US economy has been significantly increasing. In the 1987–1995 period the average annual increase was 1.4%, but in 1995–2000 it exceeded 2.5%. That trend has been coinciding with the accelerated growth of the investments in American IT sector. The

1987–1995 and 1995–2000 periods were marked by the average annual growth of the investments by 11% and 20.2% correspondingly, which means almost a twofold increase in rate (Gartner Inc., 2008).

The greatest contribution of IT to the labor productivity growth in the 1996–2008 period has been observed in the USA and Ireland, and the lowest one – in France and Spain (Table 1).

Table 1. Average contribution of IT to the annual labor productivity growth in the 1990–1995 and 1996–2008 periods, %

1990–1995			1996–2008		
Country	Growth of labor productivity	IT contribution	Country	Growth of labor productivity	IT contribution
Norway	3.11	0.85	Ireland	3.76	1.9
Sweden	2.95	0.96	Sweden	2.67	1.33
Italy	2.83	1.09	Finland	2.02	1.4
Finland	2.65	0.43	USA	1.74	1.9
Ireland	2.39	0.68	Austria	1.73	0.75
Austria	2.32	0.76	Norway	1.71	0.68
UK	2.2	0.74	Denmark	1.45	0.59
Germany	2.11	0.52	Germany	1.38	0.67
Denmark	1.99	0.72	Switzerland	1.10	0.43
Belgium	1.9	0.92	UK	1.08	1.21
Spain	1.22	0.06	France	1.00	0.18
France	1.13	0.23	Belgium	0.78	0.35
USA	1.12	0.71	Netherlands	0.77	0.48
Netherlands	0.63	0.29	Italy	0.56	0.36
Switzerland	-0.03	-0.42	Spain	0.28	0.14

Composed by the authors on the data from (EIB Papers, 2011; World Economic Forum, 2012).

Rapid development of IT causes drastic changes in the modern world. The influence of information technologies on employment and on labor relations is predominantly positive as reflected in Table 2.

When assessing the socioeconomic importance of the IT industry we should admit its ability to provide workplaces for numerous highly-skilled professionals (web-designers, programmers, lawyers etc). The results of the studies conducted by the Datamonitor company as well as the Microsoft corporation's estimates indicate that the creation of each workplace in the IT sector is accompanied with the creation of 4 workplaces in the industries which either are supportive for the development of software products or are involved in the practical use of software products.

In particular, material and technical support for software production together with the related printing and packaging industries on average create 1.3 new workplaces. Software-consuming sectors (education, finance and banking, as well as commercial mediators, distributors, retail vendors, all kinds of electronic businesses etc.) are enriched with 2.7 newly created workplaces on average (Guk, 2011).

The average annual growth of the software market in Ukraine during 2005–2010 is estimated by 17%. It has allowed to create more than 30,000 new workplaces and increase the contribution to the state budget by 246 mln USD. Now Ukraine ranks fourth in the world by the number of certified IT professionals after the USA, India and Russia. 40% of Ukrainian IT-professionals are working in Kyiv, 19% in Kharkiv, 16% in Lviv, 7% in Dnipropetrovsk and 4% in Odessa (World Economic Forum, 2012).

Table 2. Influence of IT on the employment and labor relations, composed by the authors

A characteristic	Prior to informatization	After the informatization
Nature of work	Strict subordination to the constraints imposed by machinery specifications	Personal freedom in accomplishment or working tasks
Working conditions	Strictly scheduled and standardized, often physically demanding and harmful	Comfortable individualized and computerized workplaces
Character of work	Reproductive and predominantly low-skill manual labor	Creative intellectual high-skilled labor
Motivation	Predominantly productive (economically expedient) employment	Predominantly rational (socially and economically feasible) employment
The form of employment	Standardized, regulated	Often improvised, remote
The structural composition of employment	Predominantly in the material production sector	Predominantly in the service, scientific and educational sectors
Qualification requirements	Basic qualifications obtained at the beginning of professional career	Constant improvement of qualification, mastering new information technologies and resources
The employer-employee relationships	Full dependency on the employer	Partnership based on employee's unique skills
The working day	Often multi-shift and strictly regulated	Flexible hours within a working day, week or a year depending on employee's preferences
Employment opportunities	Standard, limited by the availability of workplaces	Multivariate and flexible with the dynamic allocation of workplaces and rich possibilities for searching for a new job
Professional distribution of labor and introduction of new classes of employees	The "blue collars", i.e. qualified employees predominantly occupied with physical activities, and the "white collars", i.e. various officials as well low- and middle-level managers, occupied with intellectual activities	The "virtual collars", occupied with implementation and support of IT products
Working career	Standardized, linear, constituting a consequential set of workplaces spanning up to retirement	Individualized, nonlinear and devoid of strict timing
Compensation to employees	Traditional, i.e. standard for the occupied position and depending on the production amount or on working hours	Contractual compensation with multitude of financial sources including intellectual rent
Typical duration of employment contacts	Long-term	Short-term
Motivation of employees	The wage is the principal stimulus and the main source of satisfaction of all employee's needs	The material stimuli are secondary to the opportunities for self-fulfillment in the course of development and application of new intellectual skills
Workload	Standard daily, weekly and annual workload	Individual approach to the balance between working and other activities
Job placement	Traditional	By means of electronic recruiting
Interpersonal communication at work	Business meetings and other forms of natural communication	Virtual or digital communication instead of natural one
Labor efforts	Significant efforts aimed at the realization of production tasks	Reduced labor efforts due to increasing labor productivity

Infrastructural changes in telecommunication gave an impetus to the development of novel flexible schemes of the employment which are not requiring physical concentration of oworkers in some place. The latest trend in this area is telecommuting (teleworking). The opportunities provided by high-capacity telecommunication channels free personnel from almost all spatial constraints. Their use allows handicapped people as well as residents of remote regions work at home.

Rapid proliferation of new technologies let employees outsource and shift production out of enterprises' physical borders. As a result, the traditional concept of worker gradually gives way to the notion of a service provider. In addition to the obvious positive aspects, these socioeconomic trends have some drawbacks as jobs and social guarantees are getting relatively unstable and less advantageous.

IT are especially attractive for multinational companies interested in communication channels capable of uniting widely dispersed office premises with production facilities and storehouses which allows take into account a vast set of production factors for rapid decision-making and control the activities of units located in different parts of the world.

The systematic development of information society requires the active use of the modern IT aimed at the improvement of national economy's effectiveness by the introduction of IT into traditional sectors, by increasing labor productivity and by diversification and modernization of the economy through the support provided to innovative projects which eventually fosters national competitiveness.

Conclusion. The following aspects of the positive impact of IT on productivity at the micro- and macro-levels should be emphasized:

1. IT improve labor productivity by providing effective tools for data transmission and processing which is necessary for labor activity coordination.
2. The investments into IT development promote the "capital deepening"; i.e., they increase the capital employment ratio and consequently improve the labor efficiency and productivity.
3. Information technologies transform business processes by making them more efficient and transparent.
4. Information technologies "blur the boundaries" between employees and employers, thus reducing the need for regulation of employment and complexifying it at the same time.
5. IT reduce the time of production tasks execution, thus enabling the productivity growth.
6. Information technologies extend the flexibility and freedom of choice in professional lives of people, and thus – in their personal lives as well.
7. IT facilitate the development of creativity and new professional skills. They allow users to carry out numerous projects simultaneously and solve complex problems quickly.
8. The information era requires increasingly more educated employees, and therefore the development of IT is associated with the growing investment in the education sector as well as with the emergence of such tools for professional development as social networks.

The development of information technologies has a multifaceted influence on labor relations and productivity. This influence is complex and not always quantita-

tively assessable yet there are no reasons to doubt it will continue to grow in the observable future. We are going to witness further professional diversification at labor market whose participants are getting progressively less dependent on the places of their residence. Thus, the qualitative aspect of the influence of information technologies on the work-related issues in general and on labor productivity in particular is more important than the quantitative one.

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КНИЖКОВИЙ СВІТ



СУЧАСНА ЕКОНОМІЧНА ТА ЮРИДИЧНА ОСВІТА
ПРЕСТИЖНИЙ ВИЩИЙ НАВЧАЛЬНИЙ ЗАКЛАД

НАЦІОНАЛЬНА АКАДЕМІЯ УПРАВЛІННЯ

Україна, 01011, м. Київ, вул. Панаса Мирного, 26

E-mail: book@nam.kiev.ua

тел./факс 288-94-98, 280-80-56



Фінансово-економічний розвиток України в умовах глобалізації: Колективна наукова монографія / За ред. Я.В. Белінської. – К.: Національна академія управління, 2008. – 212 с. Ціна без доставки – 25 грн.

Монографія присвячена фінансово-економічним проблемам розвитку економіки України в умовах глобалізації. Викладені теоретико-методологічні питання розробки стратегії входження України у світове господарство та формування фінансово-економічного механізму цього процесу. В основу викладу матеріалу монографії покладені багаторічні дослідження науковців в галузі економічної теорії, фінансів та банківської справи, які були апробовані на сторінках авторитетного журналу "Актуальні проблеми економіки" в 2004–2007 роках. В монографії обґрунтовано шляхи забезпечення структурно збалансованого економічного зростання економічної системи України та її ефективного міжнародного співробітництва, визначені напрями вдосконалення всіх ланок господарської системи.