review scientific article

Intelligent systems in the international economy

ANA VIZJAK
University of Rijeka
Faculty of Tourism and Hospitality Management Opatija, Croatia
anav@fthm.hr

DANIELA GRAČAN
University of Rijeka
Faculty of Tourism and Hospitality Management Opatija, Croatia
danielag@fthm.hr

ANDREJA RUDANČIĆ-LUGARIĆ
University of Rijeka
Faculty of Tourism and Hospitality Management Opatija, Croatia
alugaric@fthm.hr

Abstract

The scientific, technical and information-communication revolution has had a significant effect on the general changes occurring in the modern economy, determined by places, roles and the contributions of modern systems. The existing intelligent operating systems in turn establish the conditions necessary for the further development of modern society in general. The factors which refer to the above statement result in the need for key changes in the previously existing level of knowledge, abilities, creativity, innovativeness, motivation, and the productivity of human resources which work and create new technical-technological conditions. They should adjust to the newly-created situations better and faster, as well as provoke and develop new changes. This especially refers to leading entrepreneurial, managerial, expert and other specialised human resources of enterprises, whose obligation it is to introduce its business to the market and to achieve the best economic effect possible. After successful international activities undertaken by the World Trade Organisation (WTO), the role of small and medium-sized enterprises in the international economy has been growing stronger. The need for further successful operations by economic and other entities in new, creative conditions should be based on contemporary scientific achievements which should make use all the benefits of intelligent systems.

Nowadays, an increasing number of companies are using modern technologies in their business operations and internet technology is a very significant part of this process.

Keywords: intelligent systems, economy, co-operation, innovativeness, human resources

1 Introduction

In an attempt to apply a modern way of thinking of current international economic growth supported by innovative solutions which have affected developed countries of western Europe for almost 50 years, it is also necessary to find ways outside of these processes and this especially refers to the Croatian economy (Božićević, 1992, 12). Both newly created and past organisational principles should be taken into consideration in this process as well as possibilities developed by the information society. This is a very difficult and complex process in which multidisciplinary activities should be used along with a great deal of work and co-operation, the linking of current social values, as well as innovative achievements of the society with contemporary scientific resources and human resources and their possibilities of use. In this process it is also important to learn and define the basic strategy and tactics of the market appearance, followed by maintenance of the national or international market. Taking into consideration these theses, this paper analyses the role of information technologies in the further innovation development of the national or international economy.

2 The role of technology in information society

There are many questions regarding the impact and consequences of the past scientific discoveries on the current and future development of human society. This question is relevant because of the impact of application of new products, technologies and services on human labour and life. National or international scientific or professional places in which one can, without any haste imposed by modern time, calmly and steadily ponder these newly-opened questions of the modern era, are very rare. One strives to find the best answers to these questions and also tries to eliminate the unwanted side-effects before they appear in all their negativity. According to some authors, the greatest obstacle to such positive effects are the disciplinary limitations of the current educational practices in national educational institutions, which is even more stimulated by how quickly acquired knowledge becomes outdated, the loss of contact with further education upon completion of post-secondary education and losing insight in contemporary, newly discovered scientific insights.

In this respect the scientist Jon Katz, in one of his scientific works, points out that technology is not just some word with a meaning but rather an occurrence which, by its activity, causes an unavoidable moral effect. His hero, through his actions, comes into conflict with society's legal system and as it usually happens in life, the most dangerous individual for the system is the one who foresees the final outcomes and effects of real events in society while the leading elite does everything in its power to isolate such individuals and eliminate them from the social environment in which they could carry out their ideas. The main character is a side-effect of technological changes which have, by their uncontrolled application, spread fear and insecurity in the community, unprepared for such an innovation process (Katz, 1998).

Unfortunately, such events also occur in the modern societies of many less developed and transition countries. These actions are based on ignorance and limited scientific insights and especially if a profession is tainted by political and other laymen's structures in society, these things happen along with strong support from a biased media. This is the time when truly bizarre scenes and actions take place. Such behaviour and actions have a direct effect on weakening of a country's economic power, cause fear for the survival of the country's working population, and directly encourage the creation of a negative climate in which everything is better than the honest and creative work of an individual.

With every new modern technology, it must be analysed whether the issue is the direct application of science, technology as a mere procedure, or whether the acting force is the system which satisfies the needs of the respective society. The application of new technologies causes changes not only in the respective environment but in the entire economic system of a country because the these changes primarily occur with the objective of meeting the needs of modern man who

operates in the immediate or distant environment of applied technology. The movement to meet the needs of modern man was already stimulated in the 1950s by the development of new scientific achievements in the field of cybernetics and the corresponding cybernetic systems. Acceptance of these insights brought about a new way of treating nature and society; techniques and technology have emerged. On the other hand, this has enabled previously unthought-of developments in physics, chemistry, microelectronics, communications, informatics and other sciences. In order to accept these innovations and to understand the newly-created processes, new knowledge and insights were needed. In this process, the greatest role was that of computer application which stored all of the acquired knowledge, integrated in the computer process. Afterwards, it provided the possibility of use to a wide circle of users. Further computer development resulted in increasing operating abilities and provided for wider use. Development of computer and computer technology continues. All of this has had a significant effect on all industries and has been the basic agent of new changes in society. This has become especially evident in the developed Western countries. The developed countries of the West have become connected by the systems of global communications and have created the world computer system called www – the World Wide Web. This system has expanded the possibilities of the existing computers even further.

A global computer system called ETHERNET, designed by Bob Metcalf, has been growing stronger lately. In Metcalf's opinion, the real value of his computer system increases exponentially, while the price of the expansion of the system itself grows linearly (Lipnack & Stamps, 1991). According to realistic estimations of many authors, it is expected that there will be over a billion users of this computer system by the end of this millennium which will inevitably cause both many positive and negative changes in people's lives.

Computer technology has been increasingly applied in many fields of human activity and becomes the most replaceable part of human activity. In order to use increasingly more complex programmes on a modern computer, it takes ever greater know-how and ability. In this particular field of human activity, modern technology finds its great application and has a significant effect on users. With the assistance of computer technology, businessmen, scientists, and public administration can very successfully co-operate and communicate within others in their profession and as well as with other users. In this way, computer technology users start co-operating internationally which has a significant impact on global co-operation relations and intergovernmental competition. By means of computer technology, new products and new technologies are offered to the world. It is enough to turn on the computer in order to contact any part of the world without censorship or control by repressive government organs. In this way, world knowledge is at the disposal of anyone who shows an interest because a large treasury of general knowledge has been created which has been stored in computers. Methods for storing the world's knowledge in computers have been perfected. There are great collections of general knowledge and expert systems which have been increasingly used via a computer network (Chorafas, 1990). After such insights, one thinks differently of the very role of knowledge. Knowledge becomes a highly esteemed value which is especially appreciated in the most developed countries (Moschella, 1997). The same happens with technologies. They are all a reflection of the knowledge accumulated so far with a hint on how to do something in a better way. The term «technological gap» should be taken into consideration in this respect. It was created to improve the understanding of the difference in the possibilities of organisation and application of the manufacturing process in undeveloped countries. In this way, the world is divided into those who own the contemporary knowledge and those who do not (Božićević, 1996, 245).

In this respect, it should be noted that the term «technological gap» is not fully adequate for the world economic order because there are technological differences among the developed countries as well and these differences are great because technological achievements in some countries have reached such progress in some professions that have been reached in the other neighbouring, also developed countries, but on the basis

of another profession. These other countries greatly lag behind the first countries in terms of know-how. In this way, a new information society is created; the one which has a tendency to divide people into those who own the information, the know-how and skills, and those who do not. They are the «INS», or the leading layer, and the subordinates are the «OUTS» layer. They do not own the information or own half of the information (McHale, 1972, 195). Many authors predict a conflict between these two groups of people because their habits, needs, and desires will be different.

In this context, the opinion of E.F. Schumacher, the author of a technological work called «Small Is Beautiful» is also relevant. In this work, Schumacher presents the idea of the so-called «desirable technology» as helpful in overcoming the existing technological differences in the world with an emphasis on the realisation of the desired transfer from the traditional, labour-intense economic system to the highly developed capital and energetic manufacturing system. He proposes that the foundation of the economy should be based on Buddhism; a religion which prefers the so-called correct way of life (modesty and the sacrifices of the individual) which allegedly achieves the highest social contribution with the least possible spending of material resources. This idea has attracted the attention of the developed, as much as the undeveloped world countries; however, the idea has not been realised in practice because except for caring about the for social well-being, there is too great a desire for personal gain in the world as well as a desire to have the power to rule over people by those leaders who are ready to destroy the world for their own pleasure, for which there are many examples in history. The term «intertechnology» applies to the interpretation of Schumacher's ideas which could be interpreted as inter-knowledge which should be realised as a bridge which would connect traditional technologies and their substitution with new technologies developed in the developed countries. This idea has not been realised in practice. Instead, synchronised technologies have been applied, adjusted to local resources of the country which adopts them, or local opportunities synchronise with foreign financial investments (Gould, 1987). Except for the strong resistance of traditional manufacturing technologies, such an attitude was boosted by difficulties originating from the energy crisis, and accelerated entrance of the developed societies in the informatics era.

Increasing damage to nature caused by traditional manufacturing technology and the accelerated destruction of natural resources in the 1970s resulted in the necessity to protect remaining natural resources which, in turn, has encouraged debates on the creation of «clean» technologies. In all contemporary debates on technological issues, technological procedures and the application of technology, the most important opinion is that of the interaction of modern development of economy and society, and their dependence on environmental protection and the given resources (Tibbs, 1993). The manners of adjustment to new ways of manufacturing greatly depend on the reduction of environmental damage, in the process of which new technologies are applied, as well as new materials and raw materials. A constant obligation is the recycling of rejected products and of other waste and the development of new technologies for these auxiliary activities. In order to achieve this it takes new knowledge and human resources trained in a new way.

3 New knowledge and human resources are necessary for the application of new technologies

This part of the paper is marked by the idea by D. Wolker and J. Henri from the book *Managing Innovation*, in which they state: "It is relatively easy to have an idea; however, to realise an idea in a useful and effective way, is a true endeavour" (Henry & Walker, 1991, 3). Thus, turning an idea into a useful product is a true, but also a very difficult endeavour. For example, there have been a great number of innovators in Croatia who have realised many ideas which mankind has found useful throughout history. However, we are witnesses to a very negative attitude regarding the environment towards innovators and almost hostile behaviour which is especially reflected in the non-existent social support to the innovative work of individuals. Also, the support of the social

community which would stimulate innovation activity is weak. The innovators do not have at their disposal entrepreneurial capital, scientific institutions on the level of a manufacturing unit, nor do they have access to government institutions. In many companies, politically correct or loyal individuals are appointed to responsible management positions. They are incompetent in the field of manufacturing needs and technological organisation and they think of their current job just as a step in their climb on the ladder towards political power. Naturally, in such a climate, it is hard for a creative individual to work and create. Innovation is not realised in a reasonable fashion and the individual is ignored and often ridiculed.

On the other hand, when a regime in some country demands urgent innovation changes in order to realise its political ideas, there is the situation of «ad hoc» innovation creation.

This creation is usually short-term and relatively successful and the leadership which orders such innovation is often unaware of damages caused in the long run to resources and the natural environment. People often forget that in the modern age, all complex tasks and problems of the economy or society should be resolved by joint activities of all professions and by scientific influence.

The approach to business activities, manufacturing and services has been changing significantly in the world economy. Thus, a trend has emerged in which an increasing number of large world companies are doing business with an increasingly smaller number of employees. For now, employment and innovativeness have been provided in small and medium-sized enterprises in which an innovative individual is especially valued. In this environment, an individual, assisted by information technology as well as a high degree of knowledge and skills and assisted by the government, achieves remarkable results. The world economy should not only make use of cutting edge technologies and know-how, but should also bear in mind that this greatly expands human possibilities for action (Mitscham, 1994). In this respect, it should be noted that nature has given man the possibility to organise his environment and other people and that such activity must be stimulated in order to create a new environment, acceptable to people.

Adjustment to the new way of thinking and acting should be pointed out in the analysis of innovative technological changes in the developed world and the necessary innovation for mankind in order to survive on this planet**.** New ways of behaving should be taken into consideration with the assistance of new technology. These actions will not be based on the possibility of immediate touch, sensation, or taste. Without a new way of thinking based on abstractions of the information society, all agents who operate in a newly structured society will be pushed back or to the margins of society.

In already begun process of realising such a society, there is a transfer from the world of technology to the world of an individual, of new interpersonal relationships. In this respect, the adjustment of the government to a new function of ensuring the living and working conditions of its inhabitants is especially significant, where the replacement of the traditional teamwork and its adjustment to simulated teamwork should be the focus of all changes, where an individual and his ability and knowledge are fully appreciated. In this way, completely new working groups are created which are focused on individual problems. The members of these groups act with the assistance of the best computer technology are fully aided by the government and all scientific institutions. In such a working environment, each employee will be linked to the world and all the available world knowledge in the scientific field as well as corporate and manufacturing field via a computer network (Lipnak & Stamps, 1991). Successful work of such a simulated team depends on the actions of another simulated team, and they will all depend on different information networks of the future. In order for them to work in such conditions, completely different knowledge and abilities will be necessary and a special category will be the ability to use the knowledge which depends on other knowledge. In this respect, educational institutions of our time are already faced with the difficult task of the preparation and creation of human resources capable to operate in the new living

and working conditions of the new era. In this new operations, all the know-how and skills acquired so far become just a staring point for operating under the new living and working conditions in the new information era and with new information technologies.

4 Changes in the fields of technology and organisation

A new information society cannot be attained by application and development of the old electrical-mechanical technology. It is also necessary to adopt and functionally apply new high technologies and the corresponding structure, organisation, and management.

This new process has slowly started covering almost all fields of national and international economic and social life in the developed countries. Without these extensive changes in the entire society, it is not possible to realise changes in the technological structure of the national and international economy.

The new process should be well-designed, planned and systematic. It is not possible to jump into the new at once, i.e. to replace the existing technical-technological basis with a new one. The process can be successfully achieved by using the existing achievements and connecting them with new innovation. In this process, the selection of the right technology has an important role, as well as the selection of its adoption and application on concrete projects.

In this respect, an important issue is in which way to select new technologies – low, medium, and high technologies. Nowadays, high technologies have been accepted often without thinking and the necessary conditions for their adoption, such as microelectronics, biotic genetics, photonics, etc. However, experts know that high technologies do not occupy more than ten per cent of the total technological structure in the most developed world countries, for example, the USA. At the same time, in practice, there are numerous examples of inclusion of the high technology in some traditional technical-technological systems (Drucker, 1992, 13).

In their reflections on this problem, some authors advocate a thorough analysis of the technological structure of each country by comparing the obtained results with the conditions in other developed countries, also taking into consideration the historical development which has led them to the current state and the conditions under which certain technological changes took place, as well as tendencies which are present in terms of the future technical and technological development.

Following this approach, it is notable that in many economies, especially those of underdeveloped countries, there has not only been a lag behind in the technical-technological structure of the developed countries, but also great differences in the total economy of the aforementioned countries. In particular, one should note developmental differences between agriculture and industry, basic industries and infrastructure, manufacturing of production resources and production, consumption resources, production of raw materials and the processing industry, import and export, production facilities and the degree of their actual use, investment and results; in short, between the hardware and the software, hardware and lifware, and orgware. The existing differences in each country should be eliminated by the processes of adjustment. Based on this conclusion, further analysis in this paper will provide the possible directions and manners of adjustment, including changes in the technical and technological structure of each country, with the objective of a more successful transfer to the future information society.

The first course of action would be the elimination of the existing differences in the economy of each country. All economic anomalies, such as expensive investments and buildings of inadequate use value, should be rejected for reasons of poor possibilities of meeting quality requirements and demand. The second course of action in the field of technology could be marked as a process of modernisation of the technology of selected traditional crafts which has been rejected in the developed countries and the products of which can still be economically justified and successful on the national and international market. Modernisation

implies the instalment in a technological system of factors of new preferably high technologies based on electronics, robotics, new materials or use of new energy sources. Such application can be achieved in the ship building industry, agriculture, railway traffic, etc. This also includes the corresponding changes in the characteristics of traditional products and services in accordance with the new needs and demands of the market of the new information society.

The third course of action could be defined as the necessity to give up any new construction in any manufacturing and traffic or other industries on the old technical-technological basis, and rather to build on the new technical-technological basis, which should be based on a new and high level by choosing the technological type and level which corresponds to the given industry. This also implies new manufacturing and service programmes. This orientation implies overcoming, i.e. eliminating two possible obstacles. The first refers to scientific and professional preparation in terms of selection, adjustment and successful application of the new, modern technology, and the corresponding new organisation system and management methods. The other obstacles might appear in the form of socio-psychological resistance to the new and nostalgia for traditional technical-technological systems which used to signify great production and a high employment rate of the labour force and in this sense had a great part in the economic structure.

The fourth course of action which seems justified is close to the third in terms of content because it is oriented towards completely new industries, new programmes, new products and services, new markets, including participation in the parts of a new world product or a project. This implies manufacturing of parts for a world product or a service. This is also the fastest way to reach the developed world. This course of action also includes developing of numerous small and medium-sized enterprises and new craftsmanship, all the way to teleworking and the new, so-called «cottage industry». Realisation of any of these courses of action and concepts depends on financial, i.e. investment capital, whether one's own or foreign, whether in the form of a loan or direct investment, whether independently or as a joint venture of both sources of national and foreign origin. At the same time, it presents the necessity to link several factors such as programmes, productive and interest affiliation in traffic, science and research, educational and marketing activities, a new tax policy, a more flexible individual organisation with the greatest possible independence of complex systems which were created in this way.

Technical-technological changes based on contemporary technological achievements must be present as a necessity, a demand and condition of the inflow of foreign capital, whether independently or as joint venture. Undeveloped countries should not allow acceptance of old technical-technological systems which are ecologically inadequate, nor technology which is becoming outdated.

In the process of introducing new technologies, undeveloped countries should take into account new employment, i.e. demographic aspect of technical-technological restructuring, especially since the birth rate has been high in most of the undeveloped countries. This will cause growth of employment demand in the long run and new, modern technologies drastically reduce the share of human labour in production and traffic.

It is thus necessary to design a strategy of technical-technological development which will include contemporary technological achievements but also take into account their use which will also ensure opening of new «labour fields» by the opening of new workplaces, but also self-employment in one's own business (Deželjin, Zoričić, 1996, 11–16).

Conclusion

With their ideas, individuals have always gathered and stimulated their peers to join them in action. In this way, they created action groups which jointly realised various ideas and tasks. In relation to these historical experiences, these historical basics should be continued in the future. In order to achieve general scientific and social development, scientists should participate in solving the above-mentioned problems in co-operation with domestic entrepreneurs.

The government should particularly act in favour of the creation of positive conditions for acceptance of stimulative programmes and creation of favourable innovation conditions, and adjusting to new circumstances brought about the new upcoming information society. Innovativeness should be encouraged and innovation stimulated from the aspect of sustainable development policy, but also general new needs which emerge in relation to the contemporary economic growth which, on the other hand, realises a higher level of living quality for all the people in a society.

By assisting the development of an innovation movement within a society, the educational needs of innovators should not be forgotten; the people who have to use education and educational abilities throughout their active life in order to act innovatively. In this respect, special attention should be devoted to the creation of national human resources and strengthening the need and desire to acquire knowledge. In the educational process, the necessity to understand the need for changes should be especially important. In this way, the constantly present fear of new technologies will be reduced. This fear is based on ignorance and an unreadiness to accept the new and the unknown as well as being the result of limited cognitive abilities. All of this causes great damage to the national economy and indirectly to the international economy as well and disturbs a positive general economic growth in the world.

General economic growth greatly depends on the development of national economies and maintenance on the market, and this requires increasingly more knowledge and abilities, especially professional knowledge. Business activities require flexibility, speed, creativity and innovation. Only a comprehensive approach to this problem guarantees that integral co-ordination of all potential factors will be achieved which affect human life and actions. Such a relationship helps that costs of activities and mistakes which inevitably occur in any production process decrease substantially and increase productivity and usefulness in general. In this respect, special attention should be devoted to bringing up and teaching positive human values to future generations so these future generations will surely operate and live in a new information society. In raising future generations, special attention should be devoted to the responsibility for national development, responsible behaviour towards their working and living environments. If this is not achieved, it will be impossible to achieve adequate scientific and business tasks which will create a society of conflict, deprived of freedom and progress.

Inteligentni sistemi v mednarodni ekonomiji

Povzetek

Znanstvena, tehnična in informacijsko-komunikacijska revolucija so pomembno vplivale na spremembe moderne ekonomije in njenih sistemov. Inteligentni operacijski sistemi so tako vzpostavili pogoje za nadaljnji razvoj moderne človeške družbe, ki jih narekujejo potrebe po ključnih spremembah predhodnih ravni znanja, sposobnosti, ustvarjalnosti, inovativnosti, motivacije in produktivnosti človeških virov, ki proizvajajo in ustvarjajo nove tehnično-tehnološke razmere. Vse to zahteva še boljše in hitrejše prilagajanje novo ustvarjenim situacijam in spodbujanje ter udejanjanje novih sprememb. To še posebno velja za vodilne podjetniške, menedžerske, strokovne in druge specializirane človeške vire v organizacijah, ki so zadolženi za prisotnost njihovih organizacij na trgu in njihovo doseganje najboljšega možnega ekonomskega učinka. Potreba po nadaljnjih uspešnih aktivnostih ekonomskih in drugih subjektov v novih, ustvarjalnih razmerah mora izkoristiti prednosti inteligentnih sistemov. Vedno večje število podjetij danes že uporablja sodobne tehnologije v njihovih poslovnih operacijah in internetna tehnologija pri tem igra pomembno vlogo.

Ključne besede: inteligentni sistemi, ekonomija, kooperacija, inovacija, človeški viri

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