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A COMPREHENSIVE APPROACH TO THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN GLOBALIZATION

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Abstract

The information and communication technology (ICT) is a leading factor in the emergence and process of globalization. One can obviously claim that globalization could not have taken place without ICT. Since the industrial revolution, ICT has developed gradually. The many related technological advances in information and communication have led to globalization. The electric telegraph, satellites, telephone, television, computer and the internet have all played an important role in this process. In particular, the internet has gained importance over the last few decades in terms of globalization because it provides a low cost, reliable, and fast network and as a result, information is now available anywhere and in real time. ICT has also affected the social and cultural, environmental, and economic aspects of globalization in many countless ways. The world economy is connected thanks to ICT and a global economy has emerged. Thus, e-commerce and international trade has advanced, and financial markets have become more connected. Moreover, the environment is the most significant global issue related to our ability to sustain life. The applications and systems of ICT have helped to conduct studies which have aimed to keep the environment safe and protected. Furthermore, global popular culture and new types of societies have emerged as a result of the impact of ICT. Nowadays, we often hear the expressions, 'network society', and 'information society'. As a result, social movements have become global and more effective. The Arab Spring and Occupy Wall Street movements are good examples of the actions of these societies.

Keywords: The Information and Communication Technology (ICT), Globalization, Economic Globalization, Social Globalization, Environment and ICT.

INTRODUCTION

The term ICT is a general one that includes any communication and information device or application such as a computer, the internet, radio, television, phone, and satellite. It is a leading player in the process of globalization. In other words, the most important factors that have made globalization possible are the technological advances made to information and communication systems. In fact, the information and communication technology (ICT) has affected our lives so strongly that, it may not be possible to imagine a world without it. Thanks to ICT, distances have shrunk, and fast, cheap, and online communication have been forthcoming, and accessing information has become easier and easier. As a result, the networks of ICT have become important forms of communication among people living in many communities, and between many companies and governments. As well, new definitions to describe this new mode of communication have emerged, such as, the term 'network society', and the concept of a 'networked economy' in the globalization process.

This study is intended to provide an account of the impact of ICT on globalization through focusing on main aspects of globalization. In order to examine the issue in question, the author examined the evolution of ICT and focused on environmental, social and cultural, and economic aspects of globalization. To that aim, the relevant literature has been reviewed and the issue has been discussed within the context of research topic. The academic journals and books have been seen as significant for being able to assess the issue from a global perspective. Additionally, only specific aspects of globalization (economic, social and cultural, and environmental) have been selected since globalization is a wide-ranging concept with extensive content. It can be viewed as a limitation of the study. However, this study has been important because of its contribution to the literature through providing a comprehensive perspective to the issue.

I. EVOLUTION OF ICT

For almost two decades, the term globalization has been one of the most popular expressions commonly used by people around the globe. In the globalization process, many related events followed and each was affected by additional factors. Therefore, this process has been observed to be very complicated,

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and since these factors are integrated, efforts to locate the origin of globalization appear fruitless. However, one can claim that the developments in ICT have a great impact on globalization. Langhorne (1996) begins his book, "The Essential of Global Politics", by describing these technological advances and asks "why has globalization happened?" The answer to this question is "because of the technological advances in global communication". Therefore, examination of the ICT's evolution would provide insightful point of views in this regard.

Great developments in communication technologies began after a period of industrial development; however, there were early important improvements such as the invention of the printing press, the techniques of navigation, and sailing ships. Afterwards, three stages followed. The first stage involved the appliance of the steam engine and the invention of the electric telegraph. The second stage was the development of orbiting satellites and the global telephone. The last stage was the development of computer technologies and the Internet. Developments followed each other successively, and the communication revolution then led to the globalization era.

a. First Stage (Electric Telegraph and Railways)

The first cornerstone in the evolution of ICT was the development of the appliance of the steam engine and the invention of the electric telegraph. In the 1820s, Robert Stephenson built a mobile locomotive by attaching a steam engine to this. After this invention, the speed and amount of goods and people that could be transported was greatly increased. In addition, news and information started to spread very rapidly (Langhorne, 1996).

The other invention during this stage was the electric telegraph. Although the electric telegraph was first used in the 1790s, it became common after 1837. It provided a form of communication network (Castells, 2010: 37). Furthermore, the information was transmitted independently and in a short time period thanks to the electric telegraph (Langhorne, 1996). In this stage, railways and telegraph played a significant role in making communication easier and in accelerating mobility.

b. Second Stage (Satellite and Telephone)

The invention of the telephone in 1876 by Alexander Graham Bell was really a great invention at that time. Although it provided voice conversation that the telegraph could not do, it could not be used effectively until the launching of satellites and invention of computer. Over this period, it was used locally in urban areas, but not used efficiently for long distance calls.

The enabler of the telephone as a global communication device was the orbiting satellite. This development was one of the byproducts of military technology. After World War II, technological innovations accelerated, especially in the field of the military. During World War II, jet engines and rocket weapons were developed. Postwar confrontations between the Soviet Union and the USA resulted in competition. The Soviets moved faster, and successfully launched the first man-made satellite in 1957. However, NASA overcame the Soviet domination of space calls. The first active communication satellite was launched in 1962 for private concerns. In 1969, the first service began to transmit voice and data, and satellite networks started to be used for telephone conversations. The growing numbers of satellites created a global communications network, and this led to a satellite television revolution "Satellite TV has become a global platform for the delivery of a comparatively small amount of media to a very large audience" (Langhorne, 1996: 233-234). Over this period, satellites changed the role of the telephone as a reliable and global communication device and satellite networks became used for serving as global communication networks.

c. Third Stage (Computer and the Internet)

Although the first and second stages of ICT developments are more related to communication technologies, the third stage covers the combination of communication and information technologies. This process was so complex and rapid that it is really difficult to separate communication and information technologies from one another. In this case, ICT is used as an umbrella term that includes both communication and information technologies. This stage includes massive developments in ICT. A number of developments, such as the transistor, integrated circuits, and microprocessors led to the innovation of the computer, computer networks, and finally the internet.

The invention of the transistor in 1947 had been the cornerstone of electronics and especially of computer technology. It was a way to communicate with machines by processing electric impulses. In 1957, the invention of the integrated circuit created a technological explosion. The prices of semiconductors fell and their production increased. Another great invention was the microprocessor also as known the microchip, in 1971. The general purpose computer was first produced in the USA in 1946. Its weight was 30 tons and height was 9 feet. After the invention of the microprocessor, small scale computers were built. User friendly computers were produced in 1984 by Apple's Macintosh. Micro-computing power was enhanced by increasing its microchip power. Bill Gates and Paul Allen developed computer software in 1976 and founded Microsoft, which is one of the giant ICT companies.

Computer networking became possible because of the technological developments in electronic switching, routing and transmission during the 1970s. Fiber optics and laser transmission and progress in computer networking technology increased capacity of the lines. As a result, the global infrastructure of the internet was constituted (Castells, 2010).

Digital information transfers conveyed in packets using computers and telephones produced the most significant development from the point of view of global communication. This idea was born at Massachusetts Institute of Technology in 1962 because of the need for an information system invulnerable to nuclear attacks. Afterwards, ARPANET (Advanced Research Projects Agency Network), the first form of the internet, was designed and published in 1967 by DARPA (Defense Advanced Research Projects Agency) (Langhorne, 1996). ARPANET went online in 1969 and opened its facilities to some research centers. The system which was initially developed for military purposes was used for scientific communication and chatting purposes. In this manner, the system was open to all scientists. During the 1980s, this system was termed the ARPA-INTERNET, and INTERNET. After the ARPANET closed down in 1990, NSFNET, another government (National Science Foundation) operated the network, and took over its mission as the backbone of the Internet. However, after the growth of private networks and pressures of the private companies, in 1995, NSFNET closed. As a result, the internet became fully privatized and did not belong to any government or organization. Only a few agencies have some responsibility on the Internet such as assigning the internet addresses and coordinating some technical issues (Castells, 2010).

The World Wide Web as known 'www' has been one of the most important ICT developments over the last couple of decades. It provides for browsing documents, websites, etc. via the internet. It is a means of global communication, learning and socializing. Its development may be divided into 3 phases. In the first stage, the browser was developed by Tim Berners-Lee and distributed via the internet in 1993. The second stage involved web software development. In this stage, the web browser was evaluated as a commercial product such as a Netscape browser, internet explorer and Internet Information Services (ISS) browser. Moreover, a number of applications were developed and some leading web sites were founded over this period. The last stage was a highly interactive stage. XML based technologies and network based applications increased (Tomer, 2009). As a result of these developments, the internet spread very quickly throughout the world, and it has become a global networking tool. The use of the Internet went up 445 percent from 2000 to 2010, and the number of Internet users has reached about two billion globally (Batchelor, 2011).

As a consequence, the developments of ICT have speeded up over the last few decades and have resulted in the emergence of the internet. Although ICT hosts many technologies, the most remarkable development of ICT is the internet. Traditional communication and information methods such as TV, radio, telephone, newspapers have been reshaped by the Internet. For example, besides the traditional newspaper, this new internet medium has gained much importance today. People can access the latest news without waiting until the next day. In addition, live streams of television and radio can be viewed via the Internet. As a result, the last stage has become the most important stage in the globalization process thanks to the Internet.

II. THE ICT AND THE ASPECTS OF GLOBALIZATION

As mentioned in the previous chapter, ICT has made globalization, which has many aspects that are related to each other, possible. Several key aspects of globalization have been chosen here to show how ICT has affected globalization.

a. Economic

Economic globalization has become inevitable because of developments in ICT (particularly the internet). Without ICT, globalization, especially economic globalization, could not have taken place (Schultz, 2010). In other words, the Internet has provided an online, safe, and sustainable network, which has led to economic globalization.

As a result, a new informational networked global economy has emerged over the last few decades. Its informational features have increased the capacity of companies or nations to provide and process knowledge based information effectively. It is global and networked because a huge core of economic activities can now be handled on a global scale and through a global network (Castells, 2010). ICT is the driving force behind this new economy. After the introduction of the internet, its "e" components became attached to a variety of economic activities and many processes of business became available in real time. The "new" definition embedded in the term "new economy" stems from this process. Economic activity that is powered by ICT is hence the central component of this new economic system (Damaskopoulos, 2004).

The global economy and the world economy should not be confused. The world economy, in which capital flows throughout the world, emerged in the 16th century in the West. The infrastructure provided by ICT and developments in ICT have resulted in the global economy. Whilst some of the components in the

economy have remained local, many components of the economy such as financial markets, international trade, science and technology, and transnational production have been globalized. Consequently, the global economy is "an economy whose core components have the institutional, organizational, and technological capacity to work as a unit in real time, or chosen time, on a planetary scale" (Castells, 2010: 101-102).

ICT has specifically affected the new economy as a result of its speed, low cost, flexibility, networks, and applications. Firstly, geographical distance has become less important and financial markets have become more transparent. Thus, technology has helped the operations of stakeholders by providing an opportunity to monitor the performance of managers. Also, ICT has increased transparency in pricing and process by giving examples of track orders, and the ability to compare prices, and develop consumer relationships. For example, local SMEs (Small-Medium sized Enterprises) can demonstrate their products to the customers in foreign countries thus allowing them to search independently for products that are to their own advantage (Damaskopoulos, 2004).

As a result of the emergence of the internet in 1994 for business purposes, supply chains were also improved significantly. It would generally pose a really great problem to handle the pieces of any business through a single international supply chain, if ICT had not been developed. In addition; in the globalization process, economic growth has occurred and it is very clear that ICT has helped this growth by making global integration of the supply chain and finance possible. Moreover, business has become more efficient as a result of the speed and low cost. Many businesses such as customer services and IT businesses are now conducted globally (Schultz, 2010). The internet related firms have dramatically increased in the 21st century and electronic business transactions in 2003 increased 30 times faster than those in 1998 (Castells, 2010). This growth shows how the internet has markedly influenced business.

Furthermore, boundaries of firms have been reconfigured because of the reduction in transaction costs thanks to ICT. This reduction has provided firms the ability to organize their operations (Damaskopoulos, 2004). As a result, the integrators (such as UPS and FedEx) have increased their importance in this process (Capineri & Leinbach, 2004).

One of the driving factors of economic growth today is productivity. There is a correlation between ICT and productivity. "An indication of the relationship between technology, organizational change, and productivity can be provided by the 1997 study by Brynjolfsson of 600 large US firms, focusing on the impact of organizational structures on the relationship between computers and productivity. Overall, Brynjolfsson found that investments in information technology were correlated with higher productivity" (Castells, 2010: 90).

ICT also provides a network that plays a significant role in establishing greater interconnectedness. Hence, ICT is contributing to the spread of the e-economy by supporting decentralization, providing interactions among participants more freely, and causing opportunities for novel variations and development. From this point of view, e-commerce is related to the e-economy. According to Capineri and Leinbach (2004: 646), "E-commerce implies transactions for a service, which is completed using the Internet from selection to purchase and delivery or it involves 'distribution services' in which a product, whether a good or a service, is selected and purchased on-line but delivered conventionally".

New firms which use e-commerce have been doing business since the 1990s. Traditional firms have also started to use e-commerce on the grounds that e-commerce is a direct and rapid way to reach customers (Capineri & Leinbach, 2004). Additionally, because of ICT's property of availability, e-commerce has grown dramatically. In the US, online retail sales values increased from 19% to 24% in 2008. EBay is a good example that shows the success of this type of web site which gathers manufacturers, consumers and distributors in one virtual zone. Hence, the location of the website is not of much importance in this case (Schultz, 2010). Moreover, Schultz (2010: 38) argued that "With IT, the various parts of a sales transaction can easily be scattered across many states or many countries. Where is the sales transaction when the product information is planned in San Francisco and accessed from a server in New Jersey and the order information is taken from a customer in Iowa and processed by someone in Ireland and shipping is coordinated in Seattle for shipment from a warehouse in Colorado and payments are processed in the Bahamas and questions about the transaction handled in Bangalore?" This is a good example of the emerging state of globalized e-commerce.

When it comes to financial markets, thanks to ICT, these have been working online for the first time in history. Thus, ICT has contributed to the increased circulation of capital between economies in a short time period. For example, cross border transactions in advanced economies between 1970 and 1996 increased by a factor of at least 50 (Castells, 2010). Financial markets that make possible capital flow and investments on a planetary basis are the center of the new economy. ICT has changed financial trading between sellers and buyers, companies, and the stock exchange markets, as well. This change affects not only the financial markets, but also the global economy. Because ICT use reduces transaction costs, financial markets have

become more interdependent on a global scale. The investors who can monitor and assess the financial markets in a real time have provided new opportunities for people to invest in global markets (Damaskopoulos, 2004). Moreover, one of the key factors that has resulted in global interdependence of financial markets is the development of ICT. Economies are interdependent because financial markets are interdependent. The fate of today's economies is substantially shaped by global financial markets. ICT networks and its applications manage the network of global financial markets (Castells, 2010).

Consequently, ICT is the most significant enabler of economic globalization; even though there are other enablers such as trade regulations and economic policies (Schultz, 2010). Indeed, all components of the economy have been affected by ICT. The new economy consists of informational, networked, and global components. Thus, e-commerce and international trade have advanced, and financial markets have become more connected.

b. Social and Cultural

ICT has also affected the social and cultural dimensions of globalization, similar to economic globalization. Cultures have been involved in more cross cultural communication processes. At this point, ICT has an important role to play by providing communication and interaction among all peoples, anywhere. It can include and combine all forms of cultural expression (Castells, 2010). Therefore, the development of ICT has caused the development of a new global culture as well. "The global culture is a patterned way of behaving under global conditions and processes, sustaining the exchange and flow of goods, people, information, knowledge, and images. These exchanges and flows of people, logistics, and minds give rise to communication processes that gain some autonomy on the global level." (Targowski, 2009: 304)

From the point of view of global culture, the development of ICT has also resulted in expansion of the English language. The Internet, has affected English by making this a global communication language. Also, global popular culture has been influenced by the culture of the USA (Langhorne, 2006). As the USA is the pioneer of ICT technology, American culture has been rapidly spread by the products of American ICT firms. On the other hand, even though these globally spread web sites and applications are a part of American culture, they have become less American at the same time. For example, Facebook and Apple are well-known American ICT firms. They have had a rapid increase in securing the market of the communication sector. Facebook has more than 500,000,000 active users. The average monthly use of the site per user is approximately 120 hours. Moreover; the iPhone, one of Apple's products, increased its sales by almost 500 percent in 2009 in the Asia-Pacific countries. Although both of them are American companies, now they are less American because they shape their products by using the feedback of the users from all over the world (Batchelor, 2011). This example represents the strength of cross-cultural interactions that currently exist on a global scale.

Thanks to ICT, people can make social connections regardless of physical distance on a global scale. The reach of ICT makes it possible to interact and communicate in new ways has led to the emergence of the network society (Uimonen, 2003). This networked society is a new form of community that has a certain linked basis and can interact with other communities. In this present society, people today are also assembled online around shared concerns and values. As a result of this process, ICT has become the center of social activity for many. The numbers of online shoppers are increasing, online banking is encouraged by banks, universities are commencing a new type of teaching - online teaching or distance learning -, and email is becoming a common communication method among the people. These improvements show that ICT has helped to create a new global pattern of social interactions. It provides interactions among people more easily and more effectively than ever before (Castells, 2010).

In the context of the information age, the development of ICT has made the information society a reality. Many disciplines have provided different approaches to explaining or defining the information society such as the informed society, mobile society, knowledge society, virtual society, and network society, and so on. These types of information oriented social actions and approaches are positive since informed people can become more knowledgeable and this is very important for the progression of civilization (Targowski, 2009).

In the present network or information society, social movements have also been empowered by ICT. ICT has provided a cheap, easy and rapid way of communicating, which enhances the functionality of social movements. Communication has always been of importance to social movements. Traditional communication media, such as journals, publishing houses, and radio stations, have long been used by activists and groups to promote their cause. However, after the emergence of the internet, this became a means of direct and low cost communication with the public. As a result, the Internet has provided a tool for keeping different activists networked and organized. It has also enabled circulation of information, and has

been used as a forum for protesting against an issue (Della Porta & Mosca, 2005). Thus, civil society has gained a new means of supporting its claims since the internet has made online protests possible.

Such movements have operated globally as a result of the effect of these improvements, with a number of protests occurring simultaneously in different countries. For example, in the case of the World Social Forum, many of the demonstrations against the Iraq war took place in more than 60 different countries in February 2003. Many authors stressed that the only thing which made this protest effective was the internet (Van Laer & Van Aelst, 2010). Moreover, two more important protests can be used to serve as examples of the impact of ICT on social movements on a global scale. The first protest was the anti-G8 protest in Genoa in July 2001 and the second was the European Social Forum (ESF) in Florence in November 2002. Both protests had their own websites and these websites were effectively used for communication purposes among the activists. As such, the internet provided the activists with a tool that helped them to organize and promote their protests (Della Porta & Mosca, 2005).

Within the global justice movement, the internet has also been used for the dissemination of information, and as means of attracting the public interest on global issues. The donation of money for these social movements has become easier as a result of ICT. In two years The Hunger website collected \$ 198 million donations. Some other form of donations sites have emerged such as the Breath Cancer Site. Other forms of action include the use of online petitions. For example, the petition 'site.com' and 'MoveOn.org' sites became famous for being opposed to the impeachment of Bill Clinton in 1998 (Van Laer & Van Aelst, 2010). Online petitions were also used in global protests against transnational firms such as Microsoft, Nike, and De Beers (Della Porta & Mosca, 2005).

As a result, a global popular culture has emerged thanks to the Internet. American culture has become the dominant global culture because of its being a pioneer of the internet. Also, new definitions have emerged such as the network society and information society. In addition, social movements have become global and more effective through the impact of ICT. There is evidence that ICT has been increasingly effective in global movements. For example, the current global social movement Occupy Wall Street is using the capacity of the internet for achieving its purposes. The Occupy Wall Street movement has its own web sites and tries to reach people through ICT on a global scale. The information about the movement has been given out by social bookmarking and social sharing sites such as Youtube, Facebook, Twitter, Digg, Flickr, and Reddit.

c. Environmental

The environment is another important global issue that affects all of us. Environmental problems, such as global warming, air pollution, acid rain, and the thinning ozone layer, are global problems. Concerted efforts are needed to live in better environment since the deterioration of the environment leads to ecological disturbances which threaten our lives.

In this context, there seems to be a paradox between environment and technology because improvements in technology enhance the economic development which makes environmental problems more serious. Whilst ICT may also be viewed in this categorization, one can claim that ICT can provide an essential solution for environmental issues such as environmental pollution and ecological disturbances and may be one of the significant technological components that enhance the global responses to environmental problems.

Information and communication technologies, such as decision support systems (DSS), database management systems (DMS), special software, geographic information systems (GIS), remote sensing, and multimedia, are tools that have recently been developed and are used for analyzing and solving environmental problems. These problems include environmental pollution, which is a serious problem. The waters have been polluted, air quality of majority of the cities in the world is low, and the noise level in cities is still under the environmental standard. To fix these problems, many applications of ICT have been used in many ways, such as monitoring, management, and creating statistical data. ICT also assists environmental management employees in decision making process by sorting, processing and monitoring environmental data. The databases are the main component of these systems. By using these databases, environmental information systems can be applied successfully in the area of decision making. In addition; geographic information systems (GIS) are used in many areas of environmental studies such as city planning, earthquake forecasting, and meteorology (Meng, Fahong, & Lei, 2008).

The other important impact of ICT on the environment is related to its basic advantage. ICT affects forests positively by reducing paper usage (Schultz, 2010). Many ICT applications, such as document management and electronic archive systems, have been developed for institutions in order to reduce their paper use.

Moreover, environmental management can be carried out more easily because ICT provides a consistent online and networked infrastructure. Collecting accurate information around the earth is

impossible without ICT. As well, we can respond very quickly to any urgent needs. Additionally, environmental web sites provide many pieces of environmental information and data. Thus, the public can monitor what is going on with the environment, and they can become more interested in the issue of environmental protection as a result (Meng, Fahong, & Lei, 2008).

Environmental protection is a serious issue. Thus, we should care about and maintain an interest in understanding the facts concerning the environment. We should use all the technological opportunities, especially ICT, to protect the ecosystem. As such, ICT is an important tool, and it should be developed further to assist with the needs of environmental protection.

CONCLUSION

We have entered a new information and communication era. The influence of ICT on our lives has been increasing gradually. People are more interconnected than before thanks to the developments in ICT. Currently, it may not be possible to imagine a world without a smartphone, television, and the Internet for most of us. Not only social and cultural globalization but also other aspects of globalization have been accelerated through the developments in ICT. ICT has played a key role in the establishment of global civil society and global economy. New types of societies have emerged and social movements have become more effective in this process. Financial markets are more connected than ever before, and international trade and e-commerce has advanced, thanks to ICT. Additionally, ICT has facilitated the global response to environmental problems through its applications and systems.

Consequently, we are more global than ever before. There is evidence that ICT has a key role in this process. As ICT has affected entire world in the past, we can be sure that in the future, our cultures, social relations and actions, and economic activities will be shaped dramatically by the influence of future ICT developments.

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