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THE EFFECT OF INFORMATION AND COMMUNICATION TECHNOLOGIES ON THE INTEGRATION OF CONTRIES IN INTERNATIONAL TRADE

ABSTRACT

This study aims to investigate the impact of the use of Information and Communication Technology, which is known as ICT in short, on the integration of countries with global trade. Within the scope of this purpose, the ICT Development Index (IDI) and researches conducted on the relationship between ICT and International trade have been examined. The study consists of five parts. The first part is the introduction specifying the concepts, purpose, and design of the study. The second part focuses on the indicators of ICT Development Index (IDI) and indicates the rankings of selected countries and Turkey as well. The third part explains the developments of international trade in the world. The fourth part investigates the researches regarding the effect of ICT on international trade. Finally in conclusion an evaluation is presented based on the information obtained within the scope of this study.
Keydwords: ICT, Development Index-IDI, International trade

BİLGİ VE İLETİŞİM TEKNOLOJİLERİNİN ÜLKELERİN ULUSLARARASI TİCARETE ENTEGRASYONU ÜZERİNDEKİ ETKİSİ

ÖZET

Bu çalışma, kısaca BİT olarak bilinen Bilgi ve İletişim Teknolojileri kullanımının ülkelerin küresel ticaretle entegrasyonuna etkisini incelemeyi amaçlamaktadır. Bu amaç kapsamında BİT Gelişme Endeksi (ICT Development Index-IDI) ile BİT ve Uluslararası ticaret arasındaki ilişkiye yönelik yapılan araştırmalar incelenmiştir. Çalışma beş bölümden oluşmaktadır. İlk bölüm, çalışmanın kavramlarını, amacını ve tasarımını belirleyen giriş bölümüdür. İkinci bölüm, ICT Development Index (IDI) göstergelerine odaklanmakta ve seçilen ülkeler ile Türkiye'nin sıralamalarını da göstermektedir. Üçüncü bölüm dünyadaki uluslararası ticaretle ilgili gelişmeleri açıklamaktadır. Dördüncü bölümde, BİT'in Uluslararası ticarete etkisine ilişkin araştırmalar incelenmektedir. Sonuç kısmında ise, bu çalışma kapsamında elde edilen bilgilere dayalı bir değerlendirme sunulmuştur.
Anahtar Kelimeler: BİT, BİT Gelişme Endeksi, Uluslararası Ticaret

1. INTRODUCTION

Information and communication technology (ICT) is a comprehensive approach to the use of computing and communication technologies (Srivastava, 2008). In the past, communication was used for person-to-person contact. However over the past decade, ICT had eye-catching growth in the global arena (Leon and Leon, 1999), which made researchers, merchants, students and academics easily access required data which are processed and collected from various sources using different computer languages. Hence, it is seen that all dimensions of our daily lives are impacted by computers with ICT.

Thanks to the increasing commercial and financial integration in the world markets, both small and medium sized and large sized businesses are adopting strategies to increase their international activities in order to obtain opportunities from foreign markets. Similarly, both developing and developed countries benefit from foreign trade for growth and development. Exporting is considered the optimum way to enter foreign markets. However, to be able to direct their production to export businesses requires a good organization, sufficient knowledge, experience and capital, qualified employers and competitiveness (Uyan, 2018). At this point, ICT stands out as an important driver.

Countries can be ranked by their ICT capabilities. There are too many pillars to compare a country's capability with another. One of the most important indexes to measure the use of information and communication technology is "ICT Development Index (IDI)" published annually. It is used to monitor and compare developments in information and communication technology among countries and over time (ITU, n.d.).

International trade refers to all business activities beyond the borders, including the transfer of resources, goods, services, knowledge, skills and information (Ball and McCulloch, 1999). In the past, the exchange of goods between countries was not that easy. It used to take a long time to travel to a country to be able to buy or sell something. Merchants used to need to visit countries one by one in order to find the goods they need and sell the goods they carry with. However, nowadays, where ICT and computers dominate, people do not need to travel overseas to buy and sell from other countries, because they have the opportunity to easily find whatever they need from a medium called the internet and easily sell their goods and services. ICT also helps customers and merchants to easily contact and track their goods. In simple words it seems that international trade has fully affected by ICT.

This study investigates the impact of the use of information and communication technology on the integration of countries with global trade based on the IDI Index and researches conducted on the relationship between ICT and International trade. The study consists of five parts. The first part is the introduction specifying the concepts, purpose, and design of the study. The second part explains the indicators of ICT Development Index (IDI) and the countries' rankings. The third part explains the developments of international trade in the world. The fourth part investigates the researches on the effect of ICT on International trade. Finally in conclusion an evaluation is presented based on the information obtained within the scope of this study.

2. INFORMATION AND COMMUNICATION TECHNOLOGIES

Information and communication technology (ICT) is a way to capture, store, process, transfer, retrieve and display data via a computer. Thus, ICT is a collective form of combining the context of computers and various information systems to find the desired solutions for users, and this has affected every stage of human life at the local, national and global levels. If a person or organization strives to achieve specific goals, it cannot be far from the impact of the

development of information and communication technology. In such situations, the role of ICT varies from place to place, person to person, and organization to organization at different levels. Its nature, function and impact depend on the personal or organizational need for information (Prasad & Prasad, 2010).

ICT has revolutionized the whole range in which people live and work. It has changed all aspects of human life and lifestyle. The digital revolution has enabled the processing of data related to a variety of information with greater accuracy, manipulation and simulation. These capabilities are creating a complete world in and around the physical world. Computers and communications are becoming a staple of our lives.

Information and communication technology is a combination of a computing system, communication technologies, and the process of information production and dissemination. This synergistic combination is achieved by convergence for computer and electronic communications. Hence, information and communication technology is not only a single technology but also a comprehensive approach to the use of computing and communication technologies (Srivastava, 2008).

Today, the businesses which are unable to adapt rapidly changing social, political, natural, technological, commercial and economic conditions, and the businesses which are unable to meet these environmental changes and particularly crises, cannot maintain their life for a long time. Even the largest enterprises in the world have an average life span of 40 to 50 years (Uyan, 2017). However, it is possible for businesses to adapt rapidly to environmental changes, take advantage of commercial opportunities and extend their average life expectancy by making effective use of Information and Communication Technologies.

Information and communication technology can help identify important areas of competitive advantage for business organizations, manage the value chain by strategically aligning the critical business process, assist managers in decision making and operational control, and expand international trade.

2.1. ICT Development Index (IDI)

There are various indexes and their indicators that are used to measure the use of ICT of countries such as ICT Development Index (IDI), Measuring Information Society (MIS), Network Readiness Index (NRI), and Global Competitiveness Index (GCI). In this study, the IDI Index, its indicators, and Turkey's ranking in this index have been investigated.

The IDI which is published by the United Nations International Telecommunication Union (ITU) is one of the most important indexes to measure the use of ICT. Based on 11 indicators, the IDI covers 176 economies and ranks countries according to their performance in two consecutive years. It is an important tool that allows governments, researchers, companies and agencies to have benchmarks on the IDI indicators. Mainly, the IDI ranks countries according to their ICT access, usage, and skills, which are composed of 11 different pillars (ITU, 2017).

The IDI is divided into three sub-indices, as shown in Table 1 below. The first stage is Access sub-index which is ICT readiness. The second stage is Use sub-index which includes ICT intensity measures. Finally the 3rd stage is Skills sub-index which is the ICT impact on society.

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Table .1 ICT Development Index Indicators

Dimensions	Indicators	Reference Value	%
ICT Access (Weight 40%)	1. Fixed telephone lines per 100 inhabitants	60	20
	2. Mobile cellular telephone subscriptions per 100 inhabitants	120	20
	3. International Internet bandwidth (bit/s) per Internet user	2'158'212*	20
	4. Proportion of households with a computer	100	20
	5. Proportion of households with Internet access at home	100	20
ICT Use (Weight 40%)	1. Internet users per 100 inhabitants	100	33
	2. Fixed broadband Internet subscribers per 100 inhabitants	60	33
	3. Mobile broadband subscribers per 100 inhabitants	100	33
ICT Skills (Weight 20%)	1. Adult literacy rate	15	33
	2. Secondary gross enrollment ratio	100	33
	3. Tertiary gross enrolment ratio	100	33

Source: ITU (2017).

According to Table 2 shown below, the top 10 countries consist of Northern European and Asian countries. In addition, developing countries achieve relatively low rankings, while the Russian Federation has the highest-ranking.

Table .2 ICT Development Index

ICT Development Index 2017			
Top 10 Countries	**Rank**	**Developing Countries**	**Rank**
Iceland	1	Turkey	67
Korea (Rep.)	2	Brazil	66
Switzerland	3	Mexico	87
Denmark	4	Russia	45
United Kingdom	5	India	134
Hong Kong	6	Indonesia	111
Netherlands	7	China	80
Norway	8	South Africa	92
Luxemburg	9		
Japan	10		

Source: ITU (2017).

Table 3, Table 4, and Table 5 below show the rankings to illustrate the advantages and disadvantages that the countries have in terms of sub-indices. In comparison with other indices, Turkey has a higher ranking with 40th in the Skills sub-index, while India with 121st has the lowest ranking in the Skills sub-index. Russia ranks 13th in the Skills sub-index. Since the Skills sub-index has a weight of 20% in the IDI calculations, the important point is to achieve higher rankings in the basic indices which are the Access and the Use-indices.

Table .3ICT Access Sub-Index

ICT Access Sub-Index 2017			
Top 10 Countries	**Rank**	**Developing Countries**	**Rank**
Luxembourg	1	Turkey	78
Iceland	2	Brazil	80
Hong Kong, China	3	Mexico	94
United Kingdom	4	Russia	50
Malta	5	India	137
Germany	6	Indonesia	105
Korea (Rep.)	7	China	89
Switzerland	8	South Africa	90
Japan	9		
Netherlands	10		

Source: ITU (2017).

Tablo .4 ICT Use Sub-Index

ICT Use Sub-Index 2017			
Top 10 Countries	**Rank**	**Developing Countries**	**Rank**
Denmark	1	Turkey	73
Switzerland	2	Brazil	57
Norway	3	Mexico	76
Korea (Rep.)	4	Russia	51
Iceland	5	India	144
Sweden	6	Indonesia	115
United Kingdom	7	China	69
Luxembourg	8	South Africa	95
Netherlands	9		
Hong Kong, China	10		

Source: ITU (2017).

Table .5ICT Skill Sub-Index

ICT Skill Sub-Index 2017			
Top 10 Countries	**Rank**	**Developing Countries**	**Rank**
Australia	1	Turkey	40
Korea (Rep.)	2	Brazil	71
United States	3	Mexico	95
Greece	4	Russia	13
Belarus	5	India	121
Denmark	6	Indonesia	109
New Zealand	7	China	91
Slovenia	8	South Africa	93
Iceland	9		
Finland	10		

Source: ITU (2017).

According to the Table 6, in all sub-indices, Turkey has a higher value than world averages and it is approximately one and a half points away from the average of the developed countries' IDI score, while it is approximately two points in front of the mean of the developing countries.

Table .6 Average Value and Standard Deviation of Sub-Indices and Turkey (2017 and 2016)

	World		**Developed Countries**	**Developing countries**	**Turkey's Value**
	Average value	**St. Dev.**			
IDI	5.11	2.22	7.52	4.26	6.08
Access sub-index	5.59	2.14	7.83	4.8	6.3
Use sub-index	4.26	2.49	6.91	3.32	4.92
Skill sub-index	5.85	2.18	8.12	5.05	7.97

Source: ITU (2017).

3. INTERNATIONAL TRADE

Trade is an economic organization or system in which goods and services are exchanged for each other or money. Every transaction requires some kind of investment and a sufficient number of customers that can be produced to sell on a regular basis for profit.

Ball and McCulloch (1999) defined international trade as all business activities, including the creation and transfer of resources, goods, services, knowledge, skills and information that transcend national borders. Resources may include raw materials, energy, technical knowledge and patents, capital and organizational skills. Goods include manufactured parts, subsets and assemblies. Services may include accounting, finance, law, consulting, import and

export, healthcare and transportation. Technical knowledge may include product, process, copyright, trademark, and brand technology innovations. Skills may include organizational and managerial skills. Information includes databases as well as information networks.

International trade is a trade whose activities include crossing national borders. This definition includes not only international trade and foreign products, but also the growing service industry in areas such as transportation, tourism, banking, advertising, construction, retail, wholesale, and mass communications (Ball and McCulloch, 1999).

4. ICT AND INTERNATIONAL TRADE RELATION

ICT has known one of the most considered factors for increasing productivity, efficiency and overall performance of a system. New information and communication technologies have created a great change in the economy and network of commercial markets, and has facilitated trade exchanges and the achievement of goals and the development of business plans; as a large part of business transactions are now done online.

The development of information and communication technology has accelerated dramatically in the last decade globally, and according to this event, the "global economy" has accelerated and on the other hand has fueled the leap of information and communication technology.

In recent studies, the low level of technology of companies has been considered as an indicator of export barriers. Dhanaraj and Beamish (2003), in their resource-based study found that technology intensity is a good predictor of export strategy, which approaches to the export performance of small and medium-sized American and Canadian exporters, which also has a positive effect to company’s performance.

In a study that sought to answer the question of how and to what extent information and communication technology can help e-commerce. The results of his study show that companies use ICT science in three ways to acquire the necessary knowledge to operate in global markets: knowledge creation, knowledge transfer and knowledge retention (Kermani and Esfidani, 2006).

The study of Kotnik and Hagsten (2013) shows that in a number of European countries there is a positive relationship between ICT use and corporate exports - where the use of information and communication technology is measured by online presence, the use of online transactions, the intensive human capital of information and communication technology and the ratio of employees with quick access to Internet capacity.

Bascavusoglu-Moreau and Colakoglu (2011) emphasize in their study that once a company becomes an innovator, its desire for innovation no longer depends on the use of technology or ICT. This is particularly important in the context of Turkey's transition from an efficiency-oriented country to an innovation-based one. On the other hand, the export stocks of medium technology and advanced technology products in total exports can be considered whether the firms are currently innovators or not. They also argue that innovative efforts are closely linked to R&D investment, exports, and tool models.

The University-industry collaboration in R&D is considered as an important driver of the ICT usage efficiency. As a matter of fact, the impact of this sub-pillar on countries can be seen by comparing countries’ rank in GCI and IDI Indexes. According to the findings of WEF (2017) and ITU (2017), countries with high ranking in “the University-industry collaboration in R&D” sub-indicator of the GCI also have a high rank in “ICT Development Index (IDI)”.

5. CONCLUSION

This study aimed to investigate the effect of Information and Communication Technology (ICT) on the trade of countries. Firstly the indicators of ICT Development Index (IDI) has been explained. According to IDI 2017, the top 10 countries in terms of ICT development level consist of Northern European and Asian countries. Additionally, developing countries achieve relatively low rankings, while Turkey was ranked 67th. On the other hand, Turkey has a higher IDI score than world averages and developing countries.

Within the scope of this study the findings of WEF (2017) and ITU (2017) have been examined. Accordingly, the University-industry collaboration in R&D seems like a significant driver of ICT usage efficiency. Because countries with high ranking in "the University-industry collaboration in R&D" sub-indicator of the GCI also have a high rank in "ICT Development Index (IDI)".

The researches conducted on the relationship between ICT and trade have also been examined. These studies examined ICT and international trade from many aspects and obtained various results. Some remarkable results can be listed as follows. The technology intensity is a good predictor of export strategy. Companies use ICT science to acquire the necessary knowledge to operate in global markets in three ways: knowledge creation, knowledge transfer and knowledge retention. There is a positive relationship between ICT use and corporate exports. Innovative efforts are closely linked to R&D investment, exports, and tool models, and this is particularly important for Turkey in terms of its transition from an efficiency-oriented country to an innovation-based one.

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