What is the Digital Economy, and How to Measure it

Mohamed E. Gumah[a] and Zulikha Jamaluddin[b]

Faculty of Information Technology
University Utara Malaysia,06010 Sintok, Kedah
Tel: [a]017-6106762, [b] 04-9284612 E-mail:{ [a]s86380, [b]zulie}@uum.edu.my

ABSTRACT

This paper presents the main elements of digital economy and the measurement of it. Firstly, it gives a general idea about general economy by presenting a short definition of digital economy and the main issues concerning it. Then, the paper presents the measurement of digital economy by three different methods and discusses their results.

Keywords

Digital economy, E-commerce

1.0 INTRODUCTION

The digital economy became the model global economy as the last stage for the devolvement of the economy and it considers as a result of using the information technology in different economic fields, such as what happened in all our life activities.

The growth, integration, and sophistication of information technology and communications is changing our society and economy. Consumers now routinely use computer networks to identify sellers, evaluate products and services, compare prices, and extra market leverage. Business use networks even more extensively to conduct and re-engineer production processes, streamline procurement presses, reach new customer and manage internal operations (Mesenbourg, 2001).

1.1 The objectives of this paper are

This paper gives a general idea about digital economy by presenting an easy definition of digital economy, presenting the main subsectors of digital economy and the central issues concerning it, to give a general idea about digital economy, and presenting a summary of two papers that studied digital economy. Finally, by presenting three ways to measure digital economy and discuss the results.

1.2 What is the digital economy?

We can define digital economy in many ways. Generally we can define digital economy as uses the information technology for a lot of its main processes such as planning, management, and marketing. Kling & Lamp (1990) defined digital economy as: The use of information to interact and communicate in a globalize, high tech economy, and they noted that some writers use the term "digital economy" interchangeably with "new economy" which is a different construct – emphasizing high growth, low inflation, and low unemployment . According to Encarta: business transactions on the Internet where the marketplace that exists on the Internet.

1.3 The history of digital economy

Digital economy based on industries and forms of IT-enabled business activity that are likely to be significant sources of economic growth in the next decade. These include the IT industry itself, electronic commerce among businesses, the digital delivery of goods and services, and the IT-supported retail sale of tangible goods. These developments were initiated (in the U.S.) in the 1950s long before the Internet was conceived as a commercial service, and widely expanded during the 1960s, 1970s, and 1980s (Kling & Lamp, 1999**).**

1.4 The central issues concerning the digital economy

We can summarize the main issues concerning the digital economy as (1) the architecture of the Internet and related network technologies. (2) The regulation of informational content on the Internet.(3)The framework of legal rules needed to create and buttress new and ill-defined markets in cyberspace. (4)Governmental policy with respect to the profound and increasingly important and visible social issues raised by the growing importance and ubiquity of digital communications (Beier, 1999).

1.5 The main subsectors of digital economy

Digital economy, fundamentally, depends on three subsectors. (1) Highly Digital goods and services (2) Mixed digital goods and services (3) IT-intensive services or goods production. On the other hand, it

partly, depends on the IT industry that support of these three segments of the Digital Economy.

1.5.1 Highly Digital goods and services

This subsector includes those goods that are delivered digitally. That also includes services where a substantial portion of the service is delivered digitally. There many kinds of these services such as electronic journals, software sales, music sales and online education.

1.5.2 Mixed digital goods and services

Which include the retail sale of tangible goods, such as music, books and flowers via the Internet, travel reservations, hotel reservations, advertising, on-line sales and secure banking. The production and distribution system for tangible goods can be the same that is used for mail catalog or telephone sales; the Internet serves as another sales channel.

1.5.3 IT-intensive services or goods production

That includes services that depend critically upon IT to be provided. For example, majority of accounting and complex engineering design. All these services depend on IT to conduct and improve its process. This subsector represents a main part in IT subsectors because it gives services and goods completely, depend on IT.

1.5.4 The parts of the IT industry that support of these three segments of the Digital Economy.

That includes any industry supports the different IT subsectors. For example, electronic industries and devices computing industries which support the different subsectors of IT. We have to note that industries are concerning IT subsectors in different rates. For example, electronic industries are so concerning different IT subsectors more than music industry which is still linking of IT subsectors.

1.6 Why measuring digital economy?

We need to measure the digital economy Because of the increasable importance of it and its mainly contributing in the global economy. Many organizations and researchers are trying to create accurate ways to define and measure it. Consequently, we can know what exactly impacts it, and how we can develop it. When we have accurate methods and indicators to measure the digital economy we can come out with accurate concept about it. Then, as a second step, we can know the points of weakness.

2.0 MEASURING THE DIGITAL ECONOMY

There are many studies about measuring digital economy, and many researchers have presented different approaches to give indicators that can be used to measure the digital economy. For example, here are three studies that gave different ways to measure digital economy. Firstly, Mesenbourg (2001) who used e-commerce and business processes as indicators in the measurement. Haltiwanger & Jarmin (2000) who studied the data which is needed in the measurement such as data of e-commerce, IT infrastructure, demographic and worker characteristics, firm and industry structure, and price behaviour. Finally, study of OECD which used output and infrastructure of digital economy to measure it.

2.1 Measuring the digital economy by Thomas L. Mesenbourg

Mesenbourg (2001) described the program of United States Bureau to measure e-business, and discussed the measurement framework and ambitious measurement program which was underway. He identified e-commerce as an initial measurement priority. Then he identified e-understanding and measuring business processes as a second measurement priority. He focused on provide annual e-commerce measure for 1999, a time when e-commerce was beginning to become economically significant. He adopted estimated quarterly retail sales to measure e-commerce as a percent of total sales. Finally, he present some lessons learned.

Mesenbourg (2001) has depended just on e-commerce which is a part of output of digital economy, and he didn't say any thing about the other part of it, which is internet economy. He didn't present any thing about infrastructure of digital economy. On the other hand, all data which he used is US's data related just US's economy. Even we can't consider this study as global study but we can use the way that he use as a model to measure the global digital economy or we can use it to measure the digital economy in other country if we can get the data that he used.

2.2 Measuring the Digital economy by: John Haltiwanger and Ron S. Jarmin

Haltiwanger &. Jarmin (2000) presented kinds of data which are needs for measuring digital economy such as data of e-commerce, IT infrastructure, demographic and worker characteristics, firm and industry structure, and price behaviour. They focused on data collected by Census bureau and other federal statistical agencies in US. Then they defined each kind of data and its function in measuring digital economy but they didn't present a method to use those data to measure it

3.3 Measuring of digital economy by OECD

This study is more preferable because it was adopted by global organization: Organization of Economic Co-operation and Development The study covered the main areas of digital economy in the world, so it was global study. Finally, it used three indicators to measure digital economy, so it has given more accurate results.

The study considered two indicators to measure the digital economy which are the infrastructure in digital economy which is ICT sector, and output of digital economy such as e-commerce and internet economy. These indicators cover all subsectors of digital economy, so, they give a general accurate idea about digital economy and accurate results in the measurement

3.3.1 The infrastructure in digital economy (ICT sector)

According of OECD, the construction of an ICT sector is based on three activities. That is computer hardware manufacturing, telecommunications hardware, software and services, and Information (contact) activities (press, editing, television …)
The definition of the ICT sector by the OECD is based on classes of revision 3 of the international standard industrial classification (ISIC) and includes both manufacturing and services activities.
In2000, the OECD presented an important information study which gives an indication of the importance of the ICT sector to the OECD members and therefore to develop an original measure of ICT intensity. ICT intensity is built from a comparison of the size of the ICT sector to the size of the business enterprise sector with regard to four economic indicators: employment, value added, R&D and total trade.
This approach gives four measures of ICT intensity which are broken down into three groups containing approximately the same number of countries high, medium and low classes. Refer to table1. The four indicators are together to form groups by giving equal weight to each set of indicators.

From table 1, we note that some growing countries as Korea has ICT intensity higher than a big industrial country as Germany although they have same average share of ICT spending in gross domestic product (Germany:5.7% Korea:5.3%) (Pohjola, 2002) , that means that the digital economy does not follow the criterions and requirements of the traditional economy such as diverse natural sources and the industrial base, so every country can has a high level of digital economy if it. has the infrastructure of it Consequently, more global economic competition and good chance for those countries which have no a lot of natural sources to improve its economies.

3.3.2 Output of digital economy: E-commerce and the internet economy

According to Encarta, electronic commerce or e-commerce is the exchange of goods and services by means of the internet or other computer networks. That includes many kinds of goods and services such as electronic journals, software sales, music sales and online education. Actually, E-commerce and the internet economy are the main applications of digital economy.

3.3.2.1 The measuring of e-commerce

Much attention has been focused on the electronic – commerce aspect of the digital economy and e-commerce, mainly over the internet, is obviously a new way of conducting business. The developments of e-commerce with the development of the World Wide Web at the beginning of the 90's result from a combination of technological innovations and regulatory reforms. The measure of the infrastructure needed for the development of e-commerce on data harmonized and updated by recent OECD work. The table2 shows the development of World Wide Web in some countries.

This measure can be completed by data available on the physical of internet traffic which includes some indicators such as web servers by country, internet connected host computers by domain names, and country by country internet use counts by aggregation of national survey. Generally, there are two important elements represent e-commerce: business to business e-commerce (B to B) and business to consumer e-commerce (B to C).We must note that electronic relations are including relations between government and business and costumer (G to B and G to C) and even direct relations between costumers. The major share of e-economy is B to B commerce which accounts for 70 to 80 % with a more rapid progression than B to C. This rapid increase of B to B is mainly due to the migration of transactions from the previous expensive and closed EDI (Electronic Data Interchange operated through private networks) to the internet (Barbet & Coutinet, 2001). Table 3 shows the use of e-commerce in the Scandinavian counties as model.

the internet infrastructure indicator, the internet applications infrastructure indicator, Internet intermediary indicator, and the internet commerce indicator.

Table 1: The ICT intensity of major OECD countries

High ICT intensity	**Medium ICT intensity**	**Low ICT intensity**
Finland	Austria	Belgium
Ireland	Denmark	Germany
Korea	France	Portugal
Sweden	Greece	Spain
US	Japan	
UK	Netherlands	
	Italy	

Table 2: The infrastructure and development of e-economy

	Japan	European union	US
Internet hosts per 1000 inhabitants 1999	19	30	60
Secure web servers per million inhabitants 2000	15	25	170
Installed PC base per 100 inhabitants 1997	20	21	50
Employees using e-commerce enabling technologies 1999 (%)	60	49	65
Cellular mobile subscribers 1999 (%)	45	40	30

Table3: Electronic commerce in Scandinavia and Western Europe for 1998

	Internet trading % of population	B to C turnover per capita ($)	B to B turnover per capita ($)	Total turnover per capita
Denmark	1.6	317	864	1181
Finland	2.9	489	778	1267
Sweden	2.9	525	835	1360
Western Europe	1.2	223	454	677

We can note that the size of B to B bigger than the size of B to C that because of the B to B is relation between two organizations that use the internet to conduct and achieve their business, but the B 2 C is just relation between website that adopted e-commerce and the customer who wants to pay the good or get the service, so, the relation here depends on desire and the number of the customers. To increase B to C element, we have to encourage consumers to more using of internet for their economic activities, such as buying goods or getting services. For that, we have to make secure network as much as possible. We also have to improve the level of the services which are offered by the internet.

3.3.2.2 The measure of the internet economy

According to Philippe & Nathalie (2001), who adopted a study which was conducted by university of Texas, the internet economy breaking down into four layers,

3.3.2.2.1 The internet infrastructure indicator:

Consist of telecommunications companies, internet services providers, internet backbone carriers, last mil access companies and manufacturers of end users networking equipment .(companies such as Cisco and Lucent)

3.3.2.2.2 The internet applications infrastructure indicator:

Consist of software, products and services companies that are necessary to facilitate web. This level includes the consultants and service companies that design, build and maintain all types of web sites from portals to full e-economy sites. (Companies such as Adobe and Oracle)

3.3.2.2.3 Internet intermediary indicator:

Companies that operate at this level are predominantly internet pure player, they generally do not generate revenues directly from transactions, and their web based on business generates revenues through advertising, membership, subscription fees and commissions. (e.g Yahoo)

3.3.2.2.4 The internet commerce indicator:

Companies that are conducting web-based commerce transactions (e.g Amazon). This layer includes a wide variety of vertical industries. They generally generate revenues directly from transactions.

In this study, total sales by the internet economy were initially estimated at $331 billion in 1998, adjusted to $301 billion (adjustment for double counted sales between internet layers) Such a sales based estimate can be appropriate for many purposes but problems arise with the companies with GDP or GDP growth. Table 4 shows all the results for 1998. The date must be adjusted to reflect intermediate sales to all firms and not just intercompany sales between internet economy firms.

Table 4: Internet economy adjusted to GDP concepts for US (1998)

Layer description	Estimated internet revenues in $ billion	GDP share (%)	Contribution to GDP in $ billion
Infrastructure	115	0.37 %	43.1
Applications	56.3	0.60 %	34
intermediary	58.2	0.18 %	10.3
commerce	101.9	0.70 %	71.4
Total	331.4		158.8

A recent report issued by Cisco and University of Texas show that the internet economy generated in 2000 a revenue of $830 billion , which is a 58 % increase from 1999 and a 156 % increase from 1998 .

The methodology of Cisco and University of Texas approach the following in the 2000 and 2001 reports. The first step is the definition of conceptual framework with the construction of the four layers of the internet economy. The second step is based on analyse of firms engaged in the internet economy.

The third step is the use of the reports from consultants.

5. Conclusion

The digital economy is playing a big role in the global economy. It is considered a main part in economies of almost of the industrial countries and even some of growing countries. There are many issues concerning digital economy such as architecture of internet, regulation of informational, and the governmental policies. Because of the increasable importance of digital economy, there are many studies tried to define it and create different ways to measure it such as the study of Mesenbourg (2001) who has depended on e-commerce as indicator to measure the digital economy and the study of John Haltiwanger and Jarmin (2000) who use data of e-commerce, IT infrastructure, demographic and worker characteristics, firm and industry structure, and price behaviour, and the study of OECD which considered two indicators to measure the digital economy, that are the infrastructure in digital economy which is ICT sector, and output of digital economy such as e-commerce and internet economy.

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